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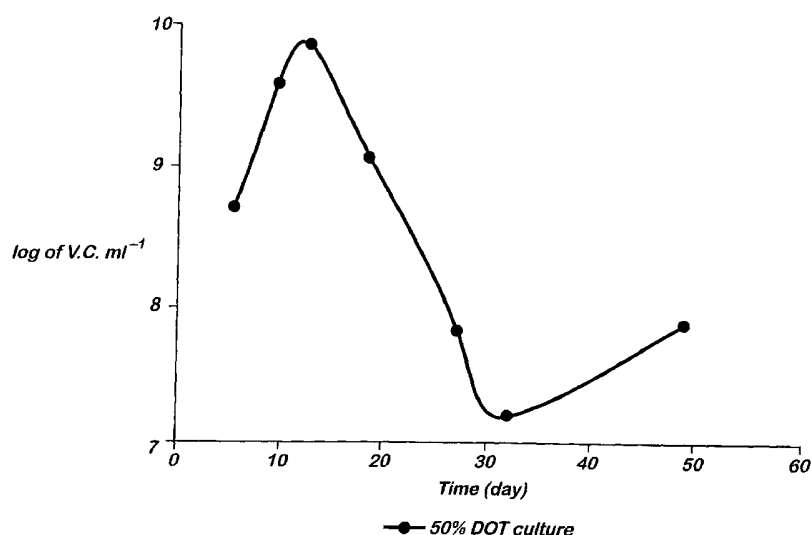
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(54) Title: MYCOBACTERIAL ANTIGENS EXPRESSED DURING LATENCY



(57) Abstract: A method is provided for identifying mycobacterial genes that are induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium. Said induced or up-regulated genes form the basis of nucleic acid vaccines, or provide targets to allow preparation of attenuated mycobacteria for vaccines against mycobacterial infections. Similarly, peptides encoded by said induced or up-regulated genes are employed in vaccines. In a further embodiment, the identified genes/peptides provide the means for identifying the presence of a mycobacterial infection in a clinical sample by nucleic acid probe or antibody detection.



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MYCOBACTERIAL ANTIGENS EXPRESSED DURING LATENCY

The present invention relates to a method of identifying a gene in mycobacteria the expression of which is induced or up-regulated during mycobacterial latency, to the isolated peptide products, variants, derivatives or fragments thereof, to antibodies that bind to said peptides, variants, derivatives or fragments, to DNA and RNA vectors that express said peptides, variants, derivatives or fragments, to attenuated mycobacteria in which the activity of at least one of said induced or up-regulated genes has been modified, to vaccines against mycobacterial infections, and to methods of detecting the presence of a mycobacterial infection.

Many microorganisms are capable of forming intracellular infections. These include: infections caused by species of *Salmonella*, *Yersinia*, *Shigella*, *Campylobacter*, *Chlamydia* and *Mycobacteria*. Some of these infections are exclusively intracellular, others contain both intracellular and extracellular components. However, it is the intracellular survival cycle of bacterial infection which is suspected as a main supportive factor for disease progression.

Generally, these microorganisms do not circulate freely in the body, for example, in the bloodstream, and are often not amenable to drug treatment regimes. Where drugs are available, this problem has been exacerbated by the development of multiple drug resistant microorganisms.

A number of factors have contributed to the problem of microbial resistance. One is the accumulation of mutations over time and the subsequent horizontal and vertical transfer of the mutated genes to other organisms. Thus, for a given pathogen, entire classes of antibiotics have been rendered inactive. A further factor has been the absence of a new class of antibiotics in recent years. The emergence of multiple drug-resistant pathogenic bacteria represents a serious threat to public health and new forms of therapy are urgently required.

For similar reasons, vaccine therapies have not proved effective against such intracellular microorganisms. Also, increased systemic concentration of antibiotics to improve bioavailability within cells may result in severe side effects.

Mycobacterium tuberculosis (TB) and closely related species make up a small group of mycobacteria known as the *Mycobacterium tuberculosis* complex

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(MTC). This group comprises four species *M. tuberculosis*, *M. microti*, *M. bovis* and *M. africanum* which are the causative agent in the majority of tuberculosis (TB) cases throughout the world.

5 *M. tuberculosis* is responsible for more than three million deaths a year world-wide. Other mycobacteria are also pathogenic in man and animals, for example *M. avium* subsp. *paratuberculosis* which causes Johne's disease in ruminants, *M. bovis* which causes tuberculosis in cattle, *M. avium* and *M. intracellulare* which cause tuberculosis in immunocompromised patients (eg. AIDS patients,
10 and bone marrow transplant patients) and *M. leprae* which causes leprosy in humans. Another important mycobacterial species is *M. vaccae*.

M. tuberculosis infects macrophage cells within the body. Soon after macrophage infection, most *M. tuberculosis* bacteria enter and replicate within
15 cellular phagosome vesicles, where the bacteria are sequestered from host defences and extracellular factors.

It is the intracellular survival and multiplication or replication of bacterial infection which is suspected as a main supportive factor for mycobacterial
20 disease progression.

A number of drug therapy regimens have been proposed for combatting *M. tuberculosis* infections, and currently combination therapy including the drug isoniazid has proved most effective. However, one problem with such treatment
25 regimes is that they are long-term, and failure to complete such treatment can promote the development of multiple drug resistant microorganisms.

A further problem is that of providing an adequate bioavailability of the drug within the cells to be treated. Whilst it is possible to increase the systemic
30 concentration of a drug (eg. by administering a higher dosage) this may result in severe side effects caused by the increased drug concentration.

The effectiveness of vaccine prevention against *M. tuberculosis* has varied widely. The current *M. tuberculosis* vaccine, BCG, is an attenuated strain of *M. bovis*. It is effective against severe complications of TB in children, but it varies
35 greatly in its effectiveness in adults particularly across ethnic groups. BCG vaccination has been used to prevent tuberculous meningitis and helps prevent

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the spread of *M. tuberculosis* to extra-pulmonary sites, but does not prevent infection.

5 The limited efficacy of BCG and the global prevalence of TB has led to an international effort to generate new, more effective vaccines. The current paradigm is that protection will be mediated by the stimulation of a Th1 immune response.

10 BCG vaccination in man was given orally when originally introduced, but that route was discontinued because of loss of viable BCG during gastric passage and of frequent cervical adenopathy. In experimental animal species, aerosol or intra-tracheal delivery of BCG has been achieved without adverse effects, but has varied in efficacy from superior protection than parenteral inoculation in primates, mice and guinea pigs to no apparent advantage over the
15 subcutaneous route in other studies.

There is therefore a need for an improved and/or alternative vaccine or therapeutic agent for combatting mycobacterial infections.

20 An additional major problem associated with the control of mycobacterial infections, especially *M. tuberculosis* infections, is the presence of a large reservoir of asymptomatic individuals infected with mycobacteria. Dormant mycobacteria are even more resistant to front-line drugs.

25 Infection with mycobacteria (eg. *M. tuberculosis*) rarely leads to active disease, and most individuals develop a latent infection which may persist for many years before reactivating to cause disease (Wayne, 1994). The current strategy for controlling such infection is early detection and treatment of patients with active disease. Whilst this is essential to avoid deaths and control transmission,
30 it has no effect on eliminating the existing reservoir of infection or on preventing new cases of disease through reactivation.

Conventional mycobacterial vaccines, including BCG, protect against disease and not against infection. Ideally a new mycobacterial vaccine will impart sterile
35 immunity, and a post-exposure vaccine capable of boosting the immune system to kill latent mycobacteria or prevent reactivation to active disease-causing microorganisms would also be valuable against latent infection.

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Conventional detection of latent mycobacterial infection by skin testing may be compromised. For example, current TB detection methods based on tuberculin skin testing are compromised by BCG vaccination and by exposure to environmental mycobacteria.

5

New strategies are therefore required for more effective diagnosis, treatment and prevention of mycobacterial latent infection.

10

To develop specific strategies for addressing latent mycobacterial infection it is necessary to elucidate the physiological, biochemical and molecular properties of these microorganisms.

15

At present, there is no suitable *in vivo* model for studying mycobacterial latent infection and such a model is unlikely to provide sufficient microbial material to enable detailed analysis of the physiological and molecular changes that occur.

20

Studies to date have used either static cultures which allow tubercle bacilli to generate oxygen-depletion gradients and enter a non-replicating persistent state in the sediment layer, or agitated sealed liquid cultures (Wayne and Lin, 1982; Cunningham and Spreadbury, 1998; Wayne and Hayes, 1996). Transition to a non-replicating persistent state in these models coincides with a shift-down to glyoxylate metabolism, resistance to isoniazid and rifampicin and susceptibility to the anaerobic bactericidal action of metronidazole (Wayne and Hayes, 1996).

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For example, a number of publications have described the analysis of mycobacterial gene and protein expression profiles following exposure of the mycobacteria to various environmental stimuli. These include Sherman, D.R. *et al* (2001) PNAS, vol. 98, no.13, pp.7534-7539; Hutter, B. (2000) FEMS Microbiol. Letts. 188, pp.141-146; Michele, T.M. *et al*. (1999) Antimicrobial Agents and Chemotherapy, vol. 43, no. 2, pp. 216-225; Yuan, Y. *et al*. (1998) PNAS, vol. 95, pp. 9578-9583; Boon, C. *et al* (2001) J. Bacteriol., vol. 183, no. 8, pp. 2672-2676; Cunningham, A.F. *et al* (1998) J. Bacteriol., vol. 180, no. 4, pp. 801-808; Murugasu-Oei, B. *et al* (1999) Mol. Gen. Genet., vol. 262, pp. 677-682; and a number of patent publications such as WO99/24067, WO99/04005, WO97/35611, and WO92/08484. The mycobacteria employed in these analyses have been grown in crude, batch systems, with the result that

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there is little or no control of the environmental stimuli to which the mycobacteria have been exposed. Accordingly, the bacteria experience a large number of complex, interactive environmental stimuli, some of which may have rapid and transient effects in terms of gene and protein expression.

5

Such studies are poorly defined and controlled, and experiments relying on self-generated oxygen-depletion gradients have yielded inconsistent results. In addition, the described studies have been conducted over a relatively short duration in terms of post-inoculation growth, in many cases up to approximately 2 weeks post-inoculation, with the result that the cultured bacteria are exposed to environmental stimuli associated with the mid to late exponential phase, and/or the early stationary phase.

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In view of the above, there is a need for a defined and controlled model for studying mycobacterial (eg. TB) persistence which simulates key features of the *in vivo* environment.

15

According to a first aspect of the present invention there is provided an isolated mycobacterial peptide, or a fragment or derivative or variant of said peptide, wherein the peptide is encoded by a mycobacterial gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

20

25

Latency is synonymous with persistence. These terms describe a reversible state of low metabolic activity in which mycobacterial cells can survive for extended periods without cell division.

30

In contrast to the various prior art analyses, the present invention is concerned with the induction or up-regulation of mycobacterial genes (and the corresponding gene products) during long term latency conditions rather than during the onset of latency (ie. late exponential phase, or early stationary phase).

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The preferred culture method of the present invention is that of batch fermenter

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culture. This method permits careful monitoring and control of growth culture parameters such as pH, temperature, available nutrients, and dissolved oxygen tension (DOT). In particular, temperature and DOT may be strictly controlled. In contrast, careful monitoring and control is not possible with convention,
5 crude batch culture systems, with the result that mycobacteria cultured by such systems are exposed to a multiplicity of complex, interactive environmental stimuli, some of which may have rapid and transient effects in terms of gene and protein expression. Thus, the batch fermenter system of the present invention allows relatively careful control of environmental stimuli so
10 that a mycobacterial response to a particular stimulus (eg. nutrient starvation) can be analysed in relative isolation from other environmental stimuli that may otherwise obscure or modify the particular mycobacterial response of interest.

In use of the present method it is possible to ensure that the principal latency
15 induction parameter employed is starvation of carbon, and preferably the starvation of carbon and energy. This means that the accidental induction or up-regulation of genes that are solely responsive to other environmental switches may be substantially prevented. Accordingly, false-positive identification of genes that are induced or up-regulated under conditions unrelated to carbon
20 starvation and/or energy limitation may be substantially avoided.

The term "nutrient-starving" in the context of the present invention means that the concentration of the primary carbon, and preferably the primary energy
25 source, is insufficient to support growth of the mycobacteria. "Nutrient-starving" is a term associated with an established mid to late stationary phase of a batch culture growth curve. Under such conditions the mycobacteria are metabolically stressed, rather than simply reduced in growth rate.

In more detail, exponential growth is that period of growth which is associated
30 with a logarithmic increase in mycobacterial cell mass (also known as the "log" phase) in which the bacteria are multiplying at a maximum specific growth rate for the prevailing culture conditions. During this period of growth the concentrations of essential nutrients diminish and those of end products increase. However, once the primary carbon and/or primary energy source falls
35 to below a critical level, it is no longer possible for all of the mycobacterial cells within the culture to obtain sufficient carbon and/or energy needed to support optimal cellular function and cell division. Once this occurs, exponential growth

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slows and the mycobacteria enter stationary phase. Thereafter, the mycobacteria become nutrient starved, and enter latency. It is this latent state in the growth phase, rather than the late exponential phase or early stationary phase, with which the present invention is concerned.

5

Carbon starvation refers to a growth state in which the concentration of exogenous carbon is insufficient to enable the bacteria to grow and or replicate. However, when in this state, there may be other energy sources (eg. endogenous reserves, secondary metabolites) that are available to maintain essential cellular functions and viability without supporting growth. Thus, carbon starvation is associated with a mid or late stationary phase condition in which the exogenous carbon source has become depleted and bacterial growth has substantially ceased. In terms of a batch fermenter culture of mycobacteria, this typically occurs at 20 days (or later) post inoculation.

15

The onset of stationary phase *vis-a-vis* the time of inoculation will depend on a number of factors such as the particular mycobacterial species/strain, the composition of the culture media (eg. the particular primary carbon and energy source), and the physical culture parameters employed.

20

However, as a guide, the end of exponential phase and the onset of stationary phase generally corresponds to that point in the growth phase associated with the maximum number of viable counts of mycobacteria.

25

In use of the present invention, the exponential phase mycobacterial cells are harvested from the culture vessel at a point in the growth phase before the maximum number of total viable counts has been achieved. This point in the growth phase may be mimicked under continuous culture conditions employing a steady state growth rate approximating $\mu_{\max}$ and providing a generation time of approximately 18-24 hours. In a preferred embodiment, the exponential phase mycobacterial cells are harvested when a value of between 2 and 0.5 (more preferably between 1 and 0.5) log units of viable counts per ml of culture medium less than the maximum number of viable counts per ml of culture medium has been achieved. Thus, the "exponential" phase cells are generally harvested during mid-log phase.

35

For example, if the maximum viable count value is 1×10^{10} per ml, then the

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"exponential" phase cells would be preferably harvested once a value of between 1×10^8 and $1 \times 10^{9.5}$ (more preferably between 1×10^9 and $1 \times 10^{9.5}$) viable counts per ml has been achieved. In the case of *M. tuberculosis*, this would be approximately 3-10, preferably 4-7 days post-inoculation.

5

In use of the present invention, the nutrient-starved, batch fermenter cultured mycobacterial cells are harvested from the culture vessel at a point in the growth phase after the maximum number of total viable counts has been achieved. This point in the growth phase may be mimicked under continuous
10 culture conditions supporting a generation time of at least 3 days. In a preferred embodiment, the stationary phase mycobacterial cells are harvested when the viable counts per ml of culture medium has fallen by at least 0.5, preferably at least 1, more preferably at least 2 log units less than the maximum number of viable counts per ml of culture medium. Thus, the nutrient-starved cells are
15 generally harvested during mid- to late-stationary phase.

For example, if the maximum viable count value is 1×10^{10} per ml, then the stationary phase cells would be preferably harvested once the viable count number had fallen to a value of at least $1 \times 10^{9.5}$, preferably at least 1×10^9 , more
20 preferably at least 1×10^8 viable counts per ml. In the case of *M. tuberculosis*, this would be approximately at least day 20, preferably at least day 30, typically day 40-50 post-inoculation. Longer post-inoculation harvesting times of at least 100 days, even at least 150 days may be employed. For mycobacteria generally, the mid to late stationary phase cells are preferably
25 harvested at least 20 days, preferably at least 30 days, more preferably at least 40 days post-inoculation.

Suitable media for culturing mycobacteria are described in Wayne, L.G. (1994) [*in* Tuberculosis: Pathogenesis, Protection, and Control published by the
30 American Society for Microbiology, pp. 73-83]. These include Middlebrook 7H9 Medium [see Barker, L.P., *et al.* (1998) Molec. Microbiol., vol. 29(5), pp. 1167-1177], and WO00/52139 in the name of the present Applicant.

In use of the batch fermenter culture method, the starting concentration of the
35 primary carbon source (and preferably the primary energy source) is at least 0.5, preferably at least 1 gl^{-1} of culture medium. Such concentrations are considered to be not nutrient-starving. Conversely, "nutrient-starving"

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conditions are associated with a primary carbon and energy source concentration of less than 0.5, preferably less than 0.2, and more preferably less than 0.1 gl^{-1} of culture medium. The preferred carbon and energy source is glycerol.

5

In a preferred embodiment, the starting concentration of glycerol is at least 1, preferably 1-3, more preferably approximately 2 gl^{-1} of culture medium. The onset of "nutrient-starving" conditions is associated with a concentration of less than 0.2, preferably less than 0.1 gl^{-1} of culture medium.

10

Other primary carbon and energy sources may be employed such as glucose, pyruvate, and fatty acids (eg. palmitate, and butyrate). These sources may be employed at substantially the same concentrations as for glycerol.

15

The pH of the culture medium is preferably maintained between pH 6 and 8, more preferably between pH 6.5 and 7.5, most preferably at about pH 6.9.

20

In one embodiment, the dissolved oxygen tension (DOT) is maintained throughout the culture process at at least 40 % air saturation, more preferably between 50 and 70 % air saturation, most preferably at 50% air saturation.

25

The dissolved oxygen tension parameter is calculated by means of an oxygen electrode and conventional laboratory techniques. Thus, 100 % air saturation corresponds to a solution that is saturated with air, whereas 0% corresponds to a solution that has been thoroughly purged with an inert gas such as nitrogen. Calibration is performed under standard atmospheric pressure conditions and measured at 37 °C, and with conventional air comprising approximately 21 % oxygen.

30

In another embodiment of the present invention, latency may be induced by a combination of carbon and/or energy source starvation, and a low DOT.

35

In a preferred embodiment, the DOT is maintained at at least 40 % air saturation, more preferably between 50 and 70 % air saturation, until the mycobacterial culture has entered early-mid log phase. The DOT may be then lowered so as to become limiting, for example in increments over a 5 or 6 day period, and the culture maintained at a DOT of 0-10, preferably at a DOT of

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approximately 5 % until the stationary phase cells are harvested.

The carbon and energy starvation, and optional low oxygen tension latency induction conditions of the present invention are culture conditions that are conducive for a mycobacterium to express at least one gene which would be normally expressed *in vivo* during latency of the mycobacterium's natural target environment which is believed to involve a low carbon and energy, and low oxygen environment.

The mycobacterium is selected from the species *M. phlei*, *M. smegmatis*, *M. africanum*, *M. caneti*, *M. fortuitum*, *M. marinum*, *M. ulcerans*, *M. tuberculosis*, *M. bovis*, *M. microti*, *M. avium*, *M. paratuberculosis*, *M. leprae*, *M. lepraemurium*, *M. intracellulare*, *M. scrofulaceum*, *M. xenopi*, *M. genavense*, *M. kansasii*, *M. simiae*, *M. szulgai*, *M. haemophilum*, *M. asiaticum*, *M. malmoense*, *M. vaccae* and *M. shimoidei*. Of particular interest are members of the MTC, preferably *M. tuberculosis*.

In use, it is preferred that those genes (ie. as represented by cDNAs in the detection assay) which are up-regulated by at least 1.5-fold under stationary phase conditions *vis-a-vis* exponential phase conditions are selected. In more preferred embodiments, the corresponding up-regulation selection criterium is at least 2-fold, more preferably 3-fold, most preferably 4-fold. In further embodiments up-regulation levels of at least 10-fold, preferably 50-fold may be employed.

The term peptide throughout this specification is synonymous with protein.

Use of mycobacterial peptide compositions, which peptides are associated with mycobacterial latency, provide excellent vaccine candidates for targeting latent mycobacteria in asymptomatic patients infected with mycobacteria.

The terms "isolated," "substantially pure," and "substantially homogenous" are used interchangeably to describe a peptide which has been separated from components which naturally accompany it. A peptide is substantially pure when at least about 60 to 75% of a sample exhibits a single peptide sequence. A substantially pure peptide will typically comprise about 60 to 90% w/w of a protein sample, more usually about 95%, and preferably will be over about

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99% pure. Peptide purity or homogeneity may be indicated by, for example, polyacrylamide gel electrophoresis of a protein sample, followed by visualizing a single polypeptide band upon staining the gel. Alternatively, higher resolution may be provided by using, for example, HPLC.

5

A peptide is considered to be isolated when it is separated from the contaminants which accompany it in its natural state. Thus, a peptide which is chemically synthesized or synthesized in a cellular system different from the cell from which it naturally originates will be substantially free from its naturally associated components.

10

The present invention provides peptides which may be purified from mycobacteria as well as from other types of cells transformed with recombinant nucleic acids encoding these peptides.

15

If desirable, the amino acid sequence of the proteins of the present invention may be determined by protein sequencing methods.

20

The terms "peptide", "oligopeptide", "polypeptide", and "protein" are used interchangeably and do not refer to a specific length of the product. These terms embrace post-translational modifications such as glycosylation, acetylation, and phosphorylation.

25

The term "fragment" means a peptide having at least five, preferably at least ten, more preferably at least twenty, and most preferably at least thirty-five amino acid residues of the peptide which is the gene product of the induced or up-regulated gene in question. The fragment preferably includes an epitope of the gene product in question.

30

The term "variant" means a peptide or peptide "fragment" having at least seventy, preferably at least eighty, more preferably at least ninety percent amino acid sequence homology with the peptide that is the gene product of the induced or up-regulated gene in question. An example of a "variant" is a peptide or peptide fragment of an induced/up-regulated gene which contains one or more analogues of an amino acid (eg. an unnatural amino acid), or a substituted linkage. The terms "homology" and "identity" are considered synonymous in this specification. In a further embodiment, a "variant" may be

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a mimic of the peptide or peptide fragment, which mimic reproduces at least one epitope of the peptide or peptide fragment. The mimic may be, for example, a nucleic acid mimic, preferably a DNA mimic.

5 For sequence comparison, typically one sequence acts as a reference sequence, to which test sequences may be compared. When using a sequence comparison algorithm, test and reference sequences are input into a computer, subsequent coordinates are designated, if necessary, and sequence algorithm program parameters are designated. The sequence comparison algorithm then calculates
10 the percentage sequence identity for the test sequence(s) relative to the reference sequence, based on the designated program parameters.

Optimal alignment of sequences for comparison may be conducted, for example, by the local homology alignment algorithm of Smith and Waterman
15 [Adv. Appl. Math. 2: 484 (1981)], by the algorithm of Needleman & Wunsch [J. Mol. Biol. 48: 443 (1970)] by the search for similarity method of Pearson & Lipman [Proc. Nat'l. Acad. Sci. USA 85: 2444 (1988)], by computer implementations of these algorithms (GAP, BESTFIT, FASTA, and TFASTA - Sequence Analysis Software Package of the Genetics Computer Group,
20 University of Wisconsin Biotechnology Center, 1710 University Avenue, Madison, Wis. 53705), or by visual inspection [see Current Protocols in Molecular Biology, F.M. Ausbel et al, eds, Current Protocols, a joint venture between Greene Publishing Associates, Inc. and John Wiley & Sons, Inc. (1995 Supplement) Ausbubel].

25 Examples of algorithms suitable for determining percent sequence similarity are the BLAST and BLAST 2.0 algorithms [see Altschul (1990) J. Mol. Biol. 215: pp. 403-410; and "<http://www.ncbi.nlm.nih.gov/>" of the National Center for Biotechnology Information].

30 In a preferred homology comparison, the identity exists over a region of the sequences that is at least 10 amino acid residues in length.

The term "derivative" means a peptide comprising the peptide (or fragment, or
35 variant thereof) which is the gene product of the induced or up-regulated gene in question. Thus, a derivative may include the peptide in question, and a further peptide sequence which may introduce one or more additional epitopes.

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The further peptide sequence should preferably not interfere with the basic folding and thus conformational structure of the peptide in question. Examples of a "derivative" are a fusion protein, a conjugate, and a graft. Thus, two or more peptides (or fragments, or variants) may be joined together to form a derivative. Alternatively, a peptide (or fragment, or variant) may be joined to an unrelated molecule (eg. a peptide). Derivatives may be chemically synthesized, but will be typically prepared by recombinant nucleic acid methods. Additional components such as lipid, and/or polysaccharide, and/or polyketide components may be included.

10

All of the molecules "fragment", "variant" and "derivative" have a common antigenic cross-reactivity and/or substantially the same *in vivo* biological activity as the gene product of the induced or up-regulated gene in question from which they are derived. For example, an antibody capable of binding to a fragment, variant or derivative would be also capable of binding to the gene product of the induced or up-regulated gene in question. It is a preferred feature that the fragment, variant and derivative each possess the active site of the peptide which is the induced or up-regulated peptide in question. Alternatively, all of the above embodiments of a peptide of the present invention share a common ability to induce a "recall response" of a T-lymphocyte which has been previously exposed to an antigenic component of a mycobacterial infection.

20

In a preferred embodiment, the peptide is selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279 and 281.

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According to a second aspect of the invention there is provided a method of identifying a mycobacterial gene the expression of which is induced or up-regulated during mycobacterial latency, said method comprising:-

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culturing a first mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation;

5 culturing a second mycobacterium under culture conditions that are not nutrient-starving and which support exponential growth of the second mycobacterium;

10 obtaining first and second mRNA populations from said first and second mycobacteria respectively, wherein said first mRNA population is obtained from the first mycobacterium which has been cultured under nutrient-starving conditions obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation, and wherein said second mRNA is obtained from the second mycobacterium which has been cultured under conditions that are not nutrient-starving and which support exponential growth of said second mycobacterium;

15 preparing first and second cDNA populations from said first and second mRNA populations respectively, during which cDNA preparation a detectable label is introduced into the cDNA molecules of the first and second cDNA populations;

20 isolating corresponding first and second cDNA molecules from the first and second cDNA populations, respectively;

 comparing relative amounts of label or corresponding signal emitted from the label present in the isolated first and second cDNA molecules;

25 identifying a greater amount of label or signal provided by the isolated first cDNA molecule than that provided by the isolated second cDNA molecule; and

 identifying the first cDNA and the corresponding mycobacterial gene which is induced or up-regulated during mycobacterial latency.

30 Reference to gene throughout this specification embraces open reading frames (ORFs).

 The various embodiments described for the first aspect of the present invention apply equally to the second and subsequent aspects of the present invention.

35

 The term "corresponding first and second cDNA molecules from the first and second cDNA populations" refers to cDNAs having substantially the same

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nucleotide sequence. Thus, by isolating the cDNA copies relating to a given gene under each culture condition (ie. exponential phase, and stationary phase), it is possible to quantify the relative copy number of cDNA for that gene for each culture condition. Since each cDNA copy has been produced from an mRNA molecule, the cDNA copy number reflects the corresponding mRNA copy number for each culture condition, and thus it is possible to identify induced or up-regulated genes.

In one embodiment, the first and second cDNA molecules are isolated from the corresponding first and second cDNA populations by hybridisation to an array containing immobilised DNA sequences that are representative of each known gene (or ORF) within a particular mycobacterial species genome. Thus, a first cDNA may be considered "corresponding" to a second cDNA if both cDNAs hybridise to the same immobilised DNA sequence.

In another embodiment, the first and second cDNAs are prepared by incorporation of a fluorescent label. The first and second cDNAs may incorporate labels which fluoresce at different wavelengths, thereby permitting dual fluorescence and simultaneous detection of two cDNA samples.

The type of label employed naturally determines how the output of the detection method is read. When using fluorescent labels, a confocal laser scanner is preferably employed.

According to one embodiment, fluorescently labelled cDNA sequences from stationary and exponential phase cultured systems were allowed to hybridise with a whole mycobacterial genome array. The first cDNA population was labelled with fluorescent label A, and the second cDNA population was labelled with fluorescent label B. The array was scanned at two different wavelengths corresponding to the excitable maxima of each dye and the intensity of the emitted light was recorded. Multiple arrays were preferably prepared for each cDNA and a mean intensity value was calculated across the two cDNA populations for each spot with each dye, against which relative induction or up-regulation was quantified.

In addition to the above mRNA isolation and cDNA preparation and labelling, genomic DNA may be isolated from the first and second mycobacteria. Thus,

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in a preferred embodiment, labelled DNA is also prepared from the isolated DNA. The labelled DNA may be then included on each array as a control.

5 According to a third aspect of the present invention, there is provided an inhibitor of a mycobacterial peptide, wherein the peptide is encoded by a gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-
10 starving and which support exponential growth of said mycobacterium, wherein the inhibitor is capable of preventing or inhibiting the mycobacterial peptide, from exerting its native biological effect.

Such inhibitors may be employed to prevent the onset of, or to cause a break
15 in the period of mycobacterial latency (ie. induce re-activation). In this respect, mycobacteria are more susceptible to treatment regimens when in a non-latent state, and the combined use of drugs to kill latent mycobacteria (eg. TB) would significantly reduce the incidence of mycobacteria by targeting the reservoir for new disease and would thereby help reduce the problem of emerging
20 drug-resistant strains.

The inhibitor may be a peptide, carbohydrate, synthetic molecule, or an analogue thereof. Inhibition of the mycobacterial peptide may be effected at the nucleic acid level (ie. DNA, or RNA), or at the peptide level. Thus, the inhibitor
25 may act directly on the peptide. Alternatively, the inhibitor may act indirectly on the peptide by, for example, causing inactivation of the induced or up-regulated mycobacterial gene.

In preferred embodiments, the inhibitor is capable of inhibiting one or more of
30 the following:- 2-nitropropane dioxygenase, acetyltransferase, oxidoreductase, transcriptional regulator, acyl transferase, UDP-glucose dehydrogenase, phosphoribosylglycinamide formyltransferase, 1,4-dihydroxy-2-naphthoate octaprenyl, gmc-type oxidoreductase, 3-hydroxyisobutyrate dehydrogenase, methylmalonate semialdehyde dehydrogenase, dehydrogenase, mercuric
35 reductase, glutathione reductase, dihydrolipoamide, transposase, proline iminopeptidase, prolyl aminopeptidase, quinolone efflux pump, glycine betaine transporter, phosphatidylethanolamine N-methyltransferase, chalcone synthase

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2, sulfotransferase, glycosyl transferase, fumarate reductase flavoprotein, 8-amino-7-oxononanoate synthase, aminotransferase class-II pyridoxal-phosphate, bacteriophage HK97 prohead protease, penicillin-binding protein, fatty acyl-CoA racemase, nitrilotriacetate monooxygenase, histidine kinase response regulator, 5 peptidase, LysR transcription regulator, excisionase, ornithine aminotransferase, malate oxidoreductase, thiosulphate binding protein, enoyl-CoA hydratase, acyl-CoA synthetase, methyltransferase, siroheme synthase, permease, glutaryl 7-aca acylase, sn-glycerol-3-phosphate transport system permease, enoyl-CoA hydratase/isomerase, acyl-CoA dehydrogenase, esterase, lipase, cytidine 10 deaminase, crotonase, lipid-transfer protein, acetyl-CoA C-acetyltransferase, aminotransferase, hydrolase, and 2-amino-4-hydroxy-6-hydroxymethyldihydropterine pyrophosphokinase.

15 In a further embodiment, the inhibitor may be an antibiotic capable of targeting the induced or up-regulated mycobacterial gene identifiable by the present invention, or the gene product thereof. The antibiotic is preferably specific for the gene and/or gene product.

20 In a further embodiment, the inhibitor may act on a gene or gene product the latter of which interacts with the induced or up-regulated gene. Alternatively, the inhibitor may act on a gene or gene product thereof upon which the gene product of the induced or up-regulated gene acts.

25 Inhibitors of the present invention may be prepared utilizing the sequence information of provided herein. For example, this may be performed by overexpressing the peptide, purifying the peptide, and then performing X-ray crystallography on the purified peptide to obtain its molecular structure. Next, compounds are created which have similar molecular structures to all or portions of the polypeptide or its substrate. The compounds may be then 30 combined with the peptide and attached thereto so as to block one or more of its biological activities.

Also included within the invention are isolated or recombinant polynucleotides that bind to the regions of the mycobacterial chromosome containing 35 sequences that are associated with induction/up-regulation under low oxygen tension (ie. virulence), including antisense and triplex-forming polynucleotides. As used herein, the term "binding" refers to an interaction or complexation

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between an oligonucleotide and a target nucleotide sequence, mediated through hydrogen bonding or other molecular forces. The term "binding" more specifically refers to two types of internucleotide binding mediated through base-base hydrogen bonding. The first type of binding is "Watson-Crick-type" binding interactions in which adenine-thymine (or adenine-uracil) and guanine-cytosine base-pairs are formed through hydrogen bonding between the bases. An example of this type of binding is the binding traditionally associated with the DNA double helix and in RNA-DNA hybrids; this type of binding is normally detected by hybridization procedures.

The second type of binding is "triplex binding". In general, triplex binding refers to any type of base-base hydrogen bonding of a third polynucleotide strand with a duplex DNA (or DNA-RNA hybrid) that is already paired in a Watson-Crick manner.

In a preferred embodiment, the inhibitor may be an antisense nucleic acid sequence which is complementary to at least part of the inducible or up-regulatable gene.

The inhibitor, when in the form of a nucleic acid sequence, in use, comprises at least 15 nucleotides, preferably at least 20 nucleotides, more preferably at least 30 nucleotides, and most preferably at least 50 nucleotides.

According to a fourth aspect of the invention, there is provided an antibody that binds to a peptide encoded by a gene, or to a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated during culture of a mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

The antibody preferably has specificity for the peptide in question, and following binding thereto may initiate coating of the mycobacterium. Coating of the bacterium preferably leads to opsonization thereof. This, in turn, leads to the bacterium being destroyed. It is preferred that the antibody is specific for the mycobacterium (eg. species and/or strain) which is to be targeted.

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In use, the antibody is preferably embodied in an isolated form.

Opsonization by antibodies may influence cellular entry and spread of mycobacteria in phagocytic and non-phagocytic cells by preventing or
5 modulating receptor-mediated entry and replication in macrophages.

The peptides, fragments, variants or derivatives of the present invention may be used to produce antibodies, including polyclonal and monoclonal antibodies. If polyclonal antibodies are desired, a selected mammal (eg. mouse, rabbit,
10 goat, horse, etc.) is immunized with an immunogenic polypeptide. Serum from the immunized animal is collected and treated according to known procedures. If serum containing polyclonal antibodies to a desired mycobacterial epitope contains antibodies to other antigens, the polyclonal antibodies may be purified by immunoaffinity chromatography.

15 Alternatively, general methodology for making monoclonal antibodies by hybridomas involving, for example, preparation of immortal antibody-producing cell lines by cell fusion, or other techniques such as direct transformation of B lymphocytes with oncogenic DNA, or transfection with Epstein-Barr virus may
20 be employed.

The antibody employed in this aspect of the invention may belong to any antibody isotype family, or may be a derivative or mimic thereof. Reference to antibody throughout this specification embraces recombinantly produced
25 antibody, and any part of an antibody which is capable of binding to a mycobacterial antigen.

In one embodiment the antibody belongs to the IgG, IgM or IgA isotype families.

30 In a preferred embodiment, the antibody belongs to the IgA isotype family. Reference to the IgA isotype throughout this specification includes the secretory form of this antibody (ie. sIgA). The secretory component (SC) of sIgA may be added *in vitro* or *in vivo*. In the latter case, the use of a patient's
35 natural SC labelling machinery may be employed.

In one embodiment, the antibody may be raised against a peptide from a

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member of the MTC, preferably against *M. tuberculosis*.

In a preferred embodiment, the antibody is capable of binding to a peptide selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281 and a fragment, variant, and derivative of said SEQ IDs.

In a further embodiment, the antigen is an exposed component of a mycobacterial bacillus. In another embodiment, the antigen is a cell surface component of a mycobacterial bacillus.

The antibody of the present invention may be polyclonal, but is preferably monoclonal.

Without being bound by any theory, it is possible that following mycobacterial infection of a macrophage, the macrophage is killed and the bacilli are released. It is at this stage that the mycobacteria are considered to be most vulnerable to antibody attack. Thus, it is possible that the antibodies of the present invention act on released bacilli following macrophage death, and thereby exert a post-infection effect.

It is possible that the passive protection aspect (ie. delivery of antibodies) of the present invention is facilitated by enhanced accessibility of the antibodies of the present invention to antigens on mycobacterial bacilli harboured by the infected macrophages. Indeed, *acr* expression is low during logarithmic growth, but increases at the stationary or oxygen limiting stage, and particularly in organisms which replicate within macrophages. As *acr* expression appears to be necessary for mycobacterial infectivity, it is possible that antibody binding may block macrophage infection by steric hindrance or disruption of its

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oligomeric structure. Thus, antibodies acting on mycobacterial bacilli released from killed, infected macrophages may interfere with the spread of re-infection to fresh macrophages. This hypothesis involves a synergistic action between antibodies and cytotoxic T cells, acting early after infection, eg. $\gamma\delta$ and NK T cells, but could later involve also CD8 and CD4 cytotoxic T cells.

According to a fifth aspect of the invention, there is provided an attenuated mycobacterium in which a gene has been modified thereby rendering the mycobacterium substantially non-pathogenic, wherein said gene is a gene the expression of which is induced or up-regulated during culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

The modification preferably inactivates the gene in question, and preferably renders the mycobacterium substantially non-pathogenic.

The term "modified" refers to any genetic manipulation such as a nucleic acid or nucleic acid sequence replacement, a deletion, or an insertion which renders the mycobacterium substantially reduced in ability to persist in a latent state. In one embodiment the entire inducible or up-regulatable gene may be deleted.

In a preferred embodiment, gene to be modified has a wild-type coding sequence selected from the group consisting of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280 and 282.

It will be appreciated that the above wild-type sequences may include minor variations depending on the Database employed. The term "wild-type" indicates

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that the sequence in question exists as a coding sequence in nature.

According to a sixth aspect of the invention, there is provided an attenuated microbial carrier, comprising a peptide encoded by a gene, or a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

In use, the peptide (or fragment, variant or derivative) is either at least partially exposed at the surface of the carrier, or the carrier becomes degraded *in vivo* so that at least part of the peptide (or fragment, variant or derivative) is otherwise exposed to a host's immune system.

In a preferred embodiment, the attenuated microbial carrier is attenuated salmonella, attenuated vaccinia virus, attenuated fowlpox virus, or attenuated *M. bovis* (eg. BCG strain).

In a preferred embodiment, the peptide is selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279 and 281.

According to a seventh aspect of the invention, there is provided a DNA plasmid comprising a promoter, a polyadenylation signal, and a DNA sequence that is the coding sequence of a mycobacterial gene or a fragment or variant or derivative of said coding sequence, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which

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maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium, wherein the promoter and polyadenylation signal are operably linked to the DNA sequence.

The term DNA "fragment" used in this invention will usually comprise at least about 5 codons (15 nucleotides), more usually at least about 7 to 15 codons, and most preferably at least about 35 codons. This number of nucleotides is usually about the minimal length required for a successful probe that would hybridize specifically with such a sequence.

In preferred embodiments, the DNA "fragment" has a nucleotide length which is at least 50%, preferably at least 70%, and more preferably at least 80% that of the coding sequence of the corresponding induced/up-regulated gene.

The term DNA "variant" means a DNA sequence that has substantial homology or substantial similarity to the coding sequence (or a fragment thereof) of an induced/up-regulated gene. A nucleic acid or fragment thereof is "substantially homologous" (or "substantially similar") to another if, when optimally aligned (with appropriate nucleotide insertions or deletions) with the other nucleic acid (or its complementary strand), there is nucleotide sequence identity in at least about 60% of the nucleotide bases, usually at least about 70%, more usually at least about 80%, preferably at least about 90%, and more preferably at least about 95 to 98% of the nucleotide bases. Homology determination is performed as described *supra* for peptides.

Alternatively, a DNA "variant" is substantially homologous (or substantially similar) with the coding sequence (or a fragment thereof) of an induced/up-regulated gene when they are capable of hybridizing under selective hybridization conditions. Selectivity of hybridization exists when hybridization occurs which is substantially more selective than total lack of specificity. Typically, selective hybridization will occur when there is at least about 65% homology over a stretch of at least about 14 nucleotides, preferably at least about 70%, more preferably at least about 75%, and most preferably at least about 90%. See, Kanehisa (1984) Nuc. Acids Res. 12:203-213. The length of homology comparison, as described, may be over longer stretches, and in

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certain embodiments will often be over a stretch of at least about 17 nucleotides, usually at least about 20 nucleotides, more usually at least about 24 nucleotides, typically at least about 28 nucleotides, more typically at least about 32 nucleotides, and preferably at least about 36 or more nucleotides.

5

Nucleic acid hybridization will be affected by such conditions as salt concentration (eg. NaCl), temperature, or organic solvents, in addition to the base composition, length of the complementary strands, and the number of nucleotide base mismatches between the hybridizing nucleic acids, as will be readily appreciated by those skilled in the art. Stringent temperature conditions are preferably employed, and generally include temperatures in excess of 30°C, typically in excess of 37°C and preferably in excess of 45°C. Stringent salt conditions will ordinarily be less than 1000 mM, typically less than 500 mM, and preferably less than 200 mM. The pH is typically between 7.0 and 8.3. However, the combination of parameters is much more important than the measure of any single parameter. See, eg., Wetmur and Davidson (1968) J. Mol. Biol. 31:349-370.

20

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The term DNA "derivative" means a DNA polynucleotide which comprises a DNA sequence (or a fragment, or variant thereof) corresponding to the coding sequence of the induced/up-regulated gene and an additional DNA sequence which is not naturally associated with the DNA sequence corresponding to the coding sequence. The comments on peptide derivative *supra* also apply to DNA "derivative". A "derivative" may, for example, include two or more coding sequences of a mycobacterial operon that is induced during nutrient-starvation. Thus, depending on the presence or absence of a non-coding region between the coding sequences, the expression product/s of such a "derivative" may be a fusion protein, or separate peptide products encoded by the individual coding regions.

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The above terms DNA "fragment", "variant", and "derivative" have in common with each other that the resulting peptide products have cross-reactive antigenic properties which are substantially the same as those of the corresponding wild-type peptide. Preferably all of the peptide products of the above DNA molecule embodiments of the present invention bind to an antibody which also binds to the wild-type peptide. Alternatively, all of the above peptide products are capable of inducing a "recall response" of a T lymphocyte which

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has been previously exposed to an antigenic component of a mycobacterial infection.

5 The promoter and polyadenylation signal are preferably selected so as to ensure that the gene is expressed in a eukaryotic cell. Strong promoters and polyadenylation signals are preferred.

10 In a related aspect, the present invention provides an isolated RNA molecule which is encoded by a DNA sequence of the present invention, or a fragment or variant or derivative of said DNA sequence.

15 An "isolated" RNA is an RNA which is substantially separated from other mycobacterial components that naturally accompany the sequences of interest, eg., ribosomes, polymerases, and other mycobacterial polynucleotides such as DNA and other chromosomal sequences.

The above RNA molecule may be introduced directly into a host cell as, for example, a component of a vaccine.

20 Alternatively the RNA molecule may be incorporated into an RNA vector prior to administration.

25 The polynucleotide sequences (DNA and RNA) of the present invention include a nucleic acid sequence which has been removed from its naturally occurring environment, and recombinant or cloned DNA isolates and chemically synthesized analogues or analogues biologically synthesized by heterologous systems.

30 The term "recombinant" as used herein intends a polynucleotide of genomic, cDNA, semisynthetic, or synthetic origin which, by virtue of its origin or manipulation: (1) is not associated with all or a portion of a polynucleotide with which it is associated in nature; or (2) is linked to a polynucleotide other than that to which it is linked in nature; and (3) does not occur in nature. This artificial combination is often accomplished by either chemical synthesis means, 35 or by the artificial manipulation of isolated segments of nucleic acids, eg., by genetic engineering techniques. Such is usually done to replace a codon with a redundant codon encoding the same or a conservative amino acid, while

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typically introducing or removing a sequence recognition site. Alternatively, it is performed to join together nucleic acid segments of desired functions to generate a desired combination of functions.

5 In embodiments of the invention the polynucleotides may encode a peptide (or fragment, variant, or derivative) which is induced or up-regulated under nutrient-starving conditions. A nucleic acid is said to "encode" a peptide if, in its native state or when manipulated, it can be transcribed and/or translated to produce the peptide (or fragment, variant or derivative thereof). The anti-sense
10 strand of such a nucleic acid is also said to encode the peptide (or fragment, variant, or derivative).

Also contemplated within the invention are expression vectors comprising the polynucleotide of interest. Expression vectors generally are replicable
15 polynucleotide constructs that encode a peptide operably linked to suitable transcriptional and translational regulatory elements. Examples of regulatory elements usually included in expression vectors are promoters, enhancers, ribosomal binding sites, and transcription and translation initiation and termination sequences. These regulatory elements are operably linked to the
20 sequence to be translated. A nucleic acid sequence is operably linked when it is placed into a functional relationship with another nucleic acid sequence. For instance, a promoter is operably linked to a coding sequence if the promoter affects its transcription or expression. Generally, operably linked means that the DNA sequences being linked are contiguous and, where necessary to join two
25 protein coding regions, contiguous and in reading frame. The regulatory elements employed in the expression vectors containing a polynucleotide encoding a virulence factor are functional in the host cell used for expression.

The polynucleotides of the present invention may be prepared by any means
30 known in the art. For example, large amounts of the polynucleotides may be produced by replication in a suitable host cell. The natural or synthetic DNA fragments coding for a desired fragment will be incorporated into recombinant nucleic acid constructs, typically DNA constructs, capable of introduction into and replication in a prokaryotic or eukaryotic cell. Usually the DNA constructs
35 will be suitable for autonomous replication in a unicellular host, such as yeast or bacteria, but may also be intended for introduction to and integration within the genome of a cultured insect, mammalian, plant or other eukaryotic cell lines.

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The polynucleotides of the present invention may also be produced by chemical synthesis, e.g., by the phosphoramidite method or the triester method, and may be performed on commercial automated oligonucleotide synthesizers. A double-stranded fragment may be obtained from the single stranded product of chemical synthesis either by synthesizing the complementary strand and annealing the strand together under appropriate conditions or by adding the complementary strand using DNA polymerase with an appropriate primer sequence.

DNA constructs prepared for introduction into a prokaryotic or eukaryotic host will typically comprise a replication system recognized by the host, including the intended DNA fragment encoding the desired peptide, and will preferably also include transcription and translational initiation regulatory sequences operably linked to the polypeptide encoding segment. Expression vectors may include, for example, an origin of replication or autonomously replicating sequence (ARS) and expression control sequences, a promoter, an enhancer and necessary processing information sites, such as ribosome-binding sites, RNA splice sites, polyadenylation sites, transcriptional terminator sequences, and mRNA stabilizing sequences. Secretion signals from polypeptides secreted from the host cell of choice may also be included where appropriate, thus allowing the protein to cross and/or lodge in cell membranes, and thus attain its functional topology or be secreted from the cell.

Appropriate promoter and other necessary vector sequences will be selected so as to be functional in the host, and may, when appropriate, include those naturally associated with mycobacterial genes. Promoters such as the trp, lac and phage promoters, tRNA promoters and glycolytic enzyme promoters may be used in prokaryotic hosts. Useful yeast promoters include the promoter regions for metallothionein, 3-phosphoglycerate kinase or other glycolytic enzymes such as enolase or glyceraldehyde-3-phosphate dehydrogenase, enzymes responsible for maltose and galactose utilization, and others.

Appropriate non-native mammalian promoters may include the early and late promoters from SV40 or promoters derived from murine moloney leukemia virus, mouse mammary tumour virus, avian sarcoma viruses, adenovirus II, bovine papilloma virus or polyoma. In addition, the construct may be joined to

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an amplifiable gene (e.g., DHFR) so that multiple copies of the gene may be made.

While such expression vectors may replicate autonomously, they may less preferably replicate by being inserted into the genome of the host cell.

5

Expression and cloning vectors will likely contain a selectable marker, a gene encoding a protein necessary for the survival or growth of a host cell transformed with the vector. The presence of this gene ensures the growth of only those host cells which express the inserts. Typical selection genes encode proteins that (a) confer resistance to antibiotics or other toxic substances, e.g. ampicillin, neomycin, methotrexate, etc.; (b) complement auxotrophic deficiencies; or (c) supply critical nutrients not available from complex media, e.g. the gene encoding D-alanine racemase for Bacilli. The choice of appropriate selectable marker will depend on the host cell.

15

The vectors containing the nucleic acids of interest can be transcribed *in vitro* and the resulting RNA introduced into the host cell (e.g., by injection), or the vectors can be introduced directly into host cells by methods which vary depending on the type of cellular host, including electroporation; transfection employing calcium chloride, rubidium chloride, calcium phosphate, DEAE-dextran, or other substances; microprojectile bombardment; lipofection; infection (where the vector is an infectious agent, such as a retroviral genome). The cells into which have been introduced nucleic acids described above are meant to also include the progeny of such cells.

25

Large quantities of the nucleic acids and peptides of the present invention may be prepared by expressing the nucleic acids or portions thereof in vectors or other expression vehicles in compatible prokaryotic or eukaryotic host cells. The most commonly used prokaryotic hosts are strains of *Escherichia coli*, although other prokaryotes, such as *Bacillus subtilis* or *Pseudomonas* may also be used.

30

Mammalian or other eukaryotic host cells, such as those of yeast, filamentous fungi, plant, insect, amphibian or avian species, may also be useful for production of the proteins of the present invention. Propagation of mammalian cells in culture is *per se* well known. Examples of commonly used mammalian host cell lines are VERO and HeLa cells, Chinese hamster ovary (CHO) cells, and WI38, BHK, and COS cell lines, although other cell lines may be

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appropriate, e.g., to provide higher expression, desirable glycosylation patterns.

Clones are selected by using markers depending on the mode of the vector construction. The marker may be on the same or a different DNA molecule, preferably the same DNA molecule. The transformant may be screened or, preferably, selected by any of the means well known in the art, e.g., by resistance to such antibiotics as ampicillin, tetracycline.

The polynucleotides of the invention may be inserted into the host cell by any means known in the art, including for example, transformation, transduction, and electroporation. As used herein, "recombinant host cells", "host cells", "cells", "cell lines", "cell cultures", and other such terms denoting microorganisms or higher eukaryotic cell lines cultured as unicellular entities refer to cells which can be, or have been, used as recipients for recombinant vector or other transfer DNA, and include the progeny of the original cell which has been transformed. It is understood that the progeny of a single parental cell may not necessarily be completely identical in morphology or in genomic or total DNA complement as the original parent, due to natural, accidental, or deliberate mutation. "Transformation", as used herein, refers to the insertion of an exogenous polynucleotide into a host cell, irrespective of the method used for the insertion, for example, direct uptake, transduction, f-mating or electroporation. The exogenous polynucleotide may be maintained as a non-integrated vector, for example, a plasmid, or alternatively, may be integrated into the host cell genome.

In one embodiment, a DNA plasmid or RNA vector may encode a component of the immune system which is specific to an immune response following challenge with a peptide, wherein said peptide is encoded by a mycobacterial gene that is induced or up-regulated during nutrient-starvation, and optionally oxygen starvation.

An example of such a component is an antibody to the peptide product of the induced or up-regulated gene. Thus, in one embodiment, the nucleic acid sequence (eg. DNA plasmid, or RNA vector) encodes the antibody in question.

An eighth aspect provides use of the aforementioned aspects of the present invention, namely a peptide or fragment or variant or derivative thereof, an

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inhibitor, an antibody, an attenuated mycobacterium, an attenuated microbial carrier, a DNA sequence that is the coding sequence of an induced or up-regulated mycobacterial gene or a fragment or variant or derivative of said coding sequence, a DNA plasmid comprising said DNA sequence, an RNA sequence encoded by said DNA sequence (including DNA fragment, variant, derivative), and/or an RNA vector comprising said RNA sequence, in the manufacture of a medicament for treating or preventing a mycobacterial infection.

The term "preventing" includes reducing the severity/intensity of, or initiation of, a mycobacterial infection.

The term "treating" includes post-infection therapy and amelioration of a mycobacterial infection.

In a related aspect, there is provided a method of treating or preventing a mycobacterial infection, comprising administration of a medicament (namely the aforementioned aspects of the present invention) selected from the group consisting of a peptide or fragment or variant or derivative thereof, an inhibitor, an antibody, an attenuated mycobacterium, an attenuated microbial carrier, a DNA sequence that is the coding sequence of an induced or up-regulated mycobacterial gene or a fragment or variant or derivative of said coding sequence, a DNA plasmid comprising said DNA sequence, an RNA sequence encoded by said DNA sequence, and/or an RNA vector comprising said RNA sequence, to a patient.

The immunogenicity of the epitopes of the peptides of the invention may be enhanced by preparing them in mammalian or yeast systems fused with or assembled with particle-forming proteins such as, for example, that associated with hepatitis B surface antigen. Vaccines may be prepared from one or more immunogenic peptides of the present invention.

Typically, such vaccines are prepared as injectables, either as liquid solutions or suspensions; solid forms suitable for solution in, or suspension in, liquid prior to injection may also be prepared. The preparation may also be emulsified, or the peptide encapsulated in liposomes. The active immunogenic ingredients are often mixed with excipients which are pharmaceutically acceptable and

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compatible with the active ingredient. Suitable excipients are, for example, water, saline, dextrose, glycerol, ethanol, or the like and combinations thereof. In addition, if desired, the vaccine may contain minor amounts of auxiliary substances such as wetting or emulsifying agents, pH buffering agents, and/or
5 adjuvants which enhance the effectiveness of the vaccine. Examples of adjuvants which may be effective include but are not limited to: aluminum hydroxide, N-acetyl-muramyl-L-threonyl-D-isoglutamine (thr-MDP), N-acetyl-nor-muramyl-L-alanyl-D-isoglutamine (CGP 11637, referred to as nor-MDP), N-acetylmuramyl-L-alanyl-D-isoglutaminyl-L-alanine-2-(1'-2'-dipalm
10 itoyl-sn -glycero-3-hydroxyphosphoryloxy)-ethylamine (CGP 19835A, referred to as MTP-PE), and RIBI, which contains three components extracted from bacteria, monophosphoryl lipid A, trehalose dimycolate and cell wall skeleton (MPL + TDM + CWS) in a 2% squalene/Tween 80 emulsion.

15 The vaccines are conventionally administered parenterally, by injection, for example, either subcutaneously or intramuscularly. Additional formulations which are suitable for other modes of administration include suppositories and, in some cases, oral formulations or formulations suitable for distribution as aerosols. For suppositories, traditional binders and carriers may include, for
20 example, polyalkylene glycols or triglycerides; such suppositories may be formed from mixtures containing the active ingredient in the range of 0.5% to 10%, preferably 1%-2%. Oral formulations include such normally employed excipients as, for example, pharmaceutical grades of mannitol, lactose, starch, magnesium stearate, sodium saccharine, cellulose, magnesium carbonate, and
25 the like. These compositions take the form of solutions, suspensions, tablets, pills, capsules, sustained release formulations or powders and contain 10%-95% of active ingredient, preferably 25%-70%.

The peptides may be formulated into the vaccine as neutral or salt forms.
30 Pharmaceutically acceptable salts include the acid addition salts (formed with free amino groups of the peptide) and which are formed with inorganic acids such as, for example, hydrochloric or phosphoric acids, or with organic acids such as acetic, oxalic, tartaric, maleic, and the like. Salts formed with the free carboxyl groups may also be derived from inorganic bases such as, for example,
35 sodium, potassium, ammonium, calcium, or ferric hydroxides, and such organic bases as isopropylamine, trimethylamine, 2-ethylamino ethanol, histidine, procaine, and the like.

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5 The vaccines are administered in a manner compatible with the dosage formulation, and in such amount as will be prophylactically and/or therapeutically effective. The quantity to be administered, which is generally in the range of 5 micrograms to 250 micrograms of antigen per dose, depends on the subject to be treated, capacity of the subject's immune system to synthesize antibodies, and the degree of protection desired. Precise amounts of active ingredient required to be administered may depend on the judgment of the practitioner and may be peculiar to each subject.

10 The vaccine may be given in a single dose schedule, or preferably in a multiple dose schedule. A multiple dose schedule is one in which a primary course of vaccination may be with 1-10 separate doses, followed by other doses given at subsequent time intervals required to maintain and or re-enforce the immune response, for example, at 1-4 months for a second dose, and if needed, a subsequent dose(s) after several months. The dosage regimen will also, at least in part, be determined by the need of the individual and be dependent upon the judgment of the practitioner.

20 In addition, the vaccine containing the immunogenic mycobacterial antigen(s) may be administered in conjunction with other immunoregulatory agents, for example, immunoglobulins, as well as antibiotics.

25 The medicament may be administered by conventional routes, eg. intravenous, intraperitoneal, intranasal routes.

30 The outcome of administering antibody-containing compositions may depend on the efficiency of transmission of antibodies to the site of infection. In the case of a mycobacterial respiratory infection (eg. a *M. tuberculosis* infection), this may be facilitated by efficient transmission of antibodies to the lungs.

35 In one embodiment the medicament may be administered intranasally (i.n.). This mode of delivery corresponds to the route of delivery of a *M. tuberculosis* infection and, in the case of antibody delivery, ensures that antibodies are present at the site of infection to combat the bacterium before it becomes intracellular and also during the period when it spreads between cells.

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An intranasal composition may be administered in droplet form having approximate diameters in the range of 100-5000 μm , preferably 500-4000 μm , more preferably 1000-3000 μm . Alternatively, in terms of volume, the droplets would be in the approximate range of 0.001-100 μl , preferably 0.1-50 μl , more preferably 1.0-25 μl .

Intranasal administration may be achieved by way of applying nasal droplets or via a nasal spray.

In the case of nasal droplets, the droplets may typically have a diameter of approximately 1000-3000 μm and/or a volume of 1-25 μl .

In the case of a nasal spray, the droplets may typically have a diameter of approximately 100-1000 μm and/or a volume of 0.001-1 μl .

It is possible that, following i.n. delivery of antibodies, their passage to the lungs is facilitated by a reverse flow of mucosal secretions, although mucociliary action in the respiratory tract is thought to take particles within the mucus out of the lungs. The relatively long persistence in the lungs' lavage, fast clearance from the bile and lack of transport to the saliva of some antibodies suggest the role of mucosal site specific mechanisms.

In a different embodiment, the medicament may be delivered in an aerosol formulation. The aerosol formulation may take the form of a powder, suspension or solution.

The size of aerosol particles is one factor relevant to the delivery capability of an aerosol. Thus, smaller particles may travel further down the respiratory airway towards the alveoli than would larger particles. In one embodiment, the aerosol particles have a diameter distribution to facilitate delivery along the entire length of the bronchi, bronchioles, and alveoli. Alternatively, the particle size distribution may be selected to target a particular section of the respiratory airway, for example the alveoli.

The aerosol particles may be delivered by way of a nebulizer or nasal spray.

In the case of aerosol delivery of the medicament, the particles may have

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diameters in the approximate range of 0.1-50 μm , preferably 1-25 μm , more preferably 1-5 μm .

5 The aerosol formulation of the medicament of the present invention may optionally contain a propellant and/or surfactant.

10 By controlling the size of the droplets which are to be administered to a patient to within the defined range of the present invention, it is possible to avoid/minimise inadvertent antigen delivery to the alveoli and thus avoid alveoli-associated pathological problems such as inflammation and fibrotic scarring of the lungs.

15 I.n. vaccination engages both T and B cell mediated effector mechanisms in nasal and bronchus associated mucosal tissues, which differ from other mucosae-associated lymphoid tissues.

20 The protective mechanisms invoked by the intranasal route of administration may include: the activation of T lymphocytes with preferential lung homing; upregulation of co-stimulatory molecules, eg. B7.2; and/or activation of macrophages or secretory IgA antibodies.

25 Intranasal delivery of antigens may facilitate a mucosal antibody response is invoked which is favoured by a shift in the T cell response toward the Th2 phenotype which helps antibody production. A mucosal response is characterised by enhanced IgA production, and a Th2 response is characterised by enhanced IL-4 production.

30 Intranasal delivery of mycobacterial antigens allows targeting of the antigens to submucosal B cells of the respiratory system. These B cells are the major local IgA-producing cells in mammals and intranasal delivery facilitates a rapid increase in IgA production by these cells against the mycobacterial antigens.

35 In one embodiment administration of the medicament comprising a mycobacterial antigen stimulates IgA antibody production, and the IgA antibody binds to the mycobacterial antigen. In another embodiment, a mucosal and/or Th2 immune response is stimulated.

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In another embodiment monoclonal antibodies, in particular, may be used to raise anti-idiotypic antibodies. Anti-idiotypic antibodies are immunoglobulins which carry an "internal image" of the antigen of the infectious agent against which protection is desired. These anti-idiotypic antibodies may also be useful for treatment, vaccination and/or diagnosis of mycobacterial infections.

According to a ninth aspect of the present invention, the peptides (including fragments, variants, and derivatives thereof) of the present invention and antibodies which bind thereto are useful in immunoassays to detect the presence of antibodies to mycobacteria, or the presence of the virulence associated antigens in biological samples. Design of the immunoassays is subject to a great deal of variation, and many formats are known in the art. The immunoassay may utilize at least one epitope derived from a peptide of the present invention. In one embodiment, the immunoassay uses a combination of such epitopes. These epitopes may be derived from the same or from different bacterial peptides, and may be in separate recombinant or natural peptides, or together in the same recombinant peptides.

An immunoassay may use, for example, a monoclonal antibody directed towards a virulence associated peptide epitope(s), a combination of monoclonal antibodies directed towards epitopes of one mycobacterial antigen, monoclonal antibodies directed towards epitopes of different mycobacterial antigens, polyclonal antibodies directed towards the same antigen, or polyclonal antibodies directed towards different antigens. Protocols may be based, for example, upon competition, or direct reaction, or sandwich type assays. Protocols may also, for example, use solid supports, or may be by immunoprecipitation. Most assays involve the use of labelled antibody or polypeptide; the labels may be, for example, enzymatic, fluorescent, chemiluminescent, radioactive, or dye molecules. Assays which amplify the signals from the probe are also known; examples of which are assays which utilize biotin and avidin, and enzyme-labelled and mediated immunoassays, such as ELISA assays.

Typically, an immunoassay for an antibody(s) to a peptide, will involve selecting and preparing the test sample suspected of containing the antibodies, such as a biological sample, then incubating it with an antigenic (i.e., epitope-containing) peptide(s) under conditions that allow antigen-antibody

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complexes to form, and then detecting the formation of such complexes. The immunoassay may be of a standard or competitive type.

5 The peptide is typically bound to a solid support to facilitate separation of the sample from the peptide after incubation. Examples of solid supports that can be used are nitrocellulose (e.g., in membrane or microtiter well form), polyvinyl chloride (e.g., in sheets or microtiter wells), polystyrene latex (e.g., in beads or microtiter plates, polyvinylidene fluoride (known as Immulon), diazotized paper, nylon membranes, activated beads, and Protein A beads. For example, 10 Dynatech Immulon microtiter plates or 60 mm diameter polystyrene beads (Precision Plastic Ball) may be used. The solid support containing the antigenic peptide is typically washed after separating it from the test sample, and prior to detection of bound antibodies.

15 Complexes formed comprising antibody (or, in the case of competitive assays, the amount of competing antibody) are detected by any of a number of known techniques, depending on the format. For example, unlabelled antibodies in the complex may be detected using a conjugate of antixenogeneic Ig complexed with a label, (e.g., an enzyme label).

20 In immunoassays where the peptides are the analyte, the test sample, typically a biological sample, is incubated with antibodies directed against the peptide under conditions that allow the formation of antigen-antibody complexes. It may be desirable to treat the biological sample to release putative bacterial components prior to testing. Various formats can be employed. For example, 25 a "sandwich assay" may be employed, where antibody bound to a solid support is incubated with the test sample; washed; incubated with a second, labelled antibody to the analyte, and the support is washed again. Analyte is detected by determining if the second antibody is bound to the support. In a competitive 30 format, a test sample is usually incubated with antibody and a labelled, competing antigen is also incubated, either sequentially or simultaneously.

Also included as an embodiment of the invention is an immunoassay kit comprised of one or more peptides of the invention, or one or more antibodies 35 to said peptides, and a buffer, packaged in suitable containers.

As used herein, a "biological sample" refers to a sample of tissue or fluid

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isolated from an individual, including but not limited to, for example, plasma, serum, spinal fluid, lymph fluid, the external sections of the skin, respiratory, intestinal, and genitourinary tracts, tears, saliva, milk, blood cells, tumours, organs, and also samples of in vitro cell culture constituents (including but not limited to conditioned medium resulting from the growth of cells in cell culture medium, putatively virally infected cells, recombinant cells, and cell components).

In a related diagnostic assay, the present invention provides nucleic acid probes for detecting a mycobacterial infection.

Using the polynucleotides of the present invention as a basis, oligomers of approximately 8 nucleotides or more can be prepared, either by excision from recombinant polynucleotides or synthetically, which hybridize with the mycobacterial sequences, and are useful in identification of mycobacteria. The probes are a length which allows the detection of the induced or up-regulated sequences by hybridization. While 6-8 nucleotides may be a workable length, sequences of 10-12 nucleotides are preferred, and at least about 20 nucleotides appears optimal. These probes can be prepared using routine methods, including automated oligonucleotide synthetic methods. For use as probes, complete complementarity is desirable, though it may be unnecessary as the length of the fragment is increased.

For use of such probes as diagnostics, the biological sample to be analyzed, such as blood or serum, may be treated, if desired, to extract the nucleic acids contained therein. The resulting nucleic acid from the sample may be subjected to gel electrophoresis or other size separation techniques; alternatively, the nucleic acid sample may be dot blotted without size separation. The probes are usually labeled. Suitable labels, and methods for labeling probes are known in the art, and include, for example, radioactive labels incorporated by nick translation or kinasing, biotin, fluorescent probes, and chemiluminescent probes. The nucleic acids extracted from the sample are then treated with the labeled probe under hybridization conditions of suitable stringencies.

The probes may be made completely complementary to the virulence encoding polynucleotide. Therefore, usually high stringency conditions are desirable in order to prevent false positives. The stringency of hybridization is determined

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by a number of factors during hybridization and during the washing procedure, including temperature, ionic strength, length of time, and concentration of formamide.

It may be desirable to use amplification techniques in hybridization assays.

5 Such techniques are known in the art and include, for example, the polymerase chain reaction (PCR) technique.

10 The probes may be packaged into diagnostic kits. Diagnostic kits include the probe DNA, which may be labelled; alternatively, the probe DNA may be unlabeled and the ingredients for labelling may be included in the kit in separate containers. The kit may also contain other suitably packaged reagents and materials needed for the particular hybridization protocol, for example, standards, as well as instructions for conducting the test.

15 In a preferred embodiment, a peptide (or fragment or variant or derivative) of the present invention is used in a diagnostic assay to detect the presence of a T-lymphocyte which T lymphocyte has been previously exposed to an antigenic component of a mycobacterial infection in a patient.

20 In more detail, a T-lymphocyte which has been previously exposed to a particular antigen will be activated on subsequent challenge by the same antigen. This activation provides a means for identifying a positive diagnosis of mycobacterial infection. In contrast, the same activation is not achieved by a T-lymphocyte which has not been previously exposed to the particular antigen.

25 The above "activation" of a T-lymphocyte is sometimes referred to as a "recall response" and may be measured, for example, by determining the release of interferon (eg. IFN- γ) from the activated T-lymphocyte. Thus, the presence of a mycobacterial infection in a patient may be determined by the release of a minimum concentration of interferon from a T-lymphocyte after a defined time period following *in vitro* challenge of the T-lymphocyte with a peptide (or
30 fragment or variant or derivative) of the present invention.

35 In use, a biological sample containing T-lymphocytes is taken from a patient, and then challenged with a peptide (or fragment, variant, or derivative thereof) of the present invention.

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The above T-lymphocyte diagnostic assay may include an antigen presenting cell (APC) expressing at least one major histocompatibility complex (MHC) class II molecule expressed by the patient in question. The APC may be inherently provided in the biological sample, or may be added exogenously. In one
5 embodiment, the T-lymphocyte is a CD4 T-lymphocyte.

Brief mention is now made to the Figures of the present application, in which:-

Fig. 1 illustrates the viable counts for *M. tuberculosis* during culture under
10 batch fermentation conditions at a DOT of 50 % air saturation (37 °C); and

Fig. 2 illustrates the concentration of glycerol (as the primary carbon and energy source during culture of *M. tuberculosis* under batch fermentation conditions at a DOT of 50 % air saturation (37 °C).
15

Fig. 3 illustrates the DOT within the medium of the mycobacterial culture described in Example 18.

Fig. 4 illustrates the viable counts for *M. tuberculosis* during the batch
20 fermentation conditions of Example 18 (ie. carbon-starvation, and oxygen limiting conditions).

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Example 1 - culture of mycobacteria

Two alternative mycobacterial culture methods have been employed to study genes which are up-regulated or induced during mycobacterial latency.

5

Model 1 - *in vitro* model of mycobacterial persistence under aerobic, nutrient-starved conditions**Materials and Methods**

10

Strain

Studies were performed with *M. tuberculosis* strain H37Rv (NCTC cat. no. 7416) - a representative strain of *M. tuberculosis*. Stock cultures were grown on Middlebrook 7H10 + OADC for 3 weeks at $37 \pm 2^\circ\text{C}$.

15

Culture Medium

20

Persistence cultures were established in Middlebrook 7H9 medium supplemented with Middlebrook ADC enrichment, 0.2% Tween 80 and 0.2% glycerol (Table 1). The medium was prepared with high quality water from a Millipore water purification system and filter sterilised by passage through a 0.1 μm pore size cellulose acetate membrane filter capsule (Sartorius Ltd). The pH was adjusted to 6.6 with concentrated hydrochloric acid.

25

Middlebrook 7H10 + OADC agar was used to prepare inoculum cultures, enumerate the number of culturable bacteria in samples, and to assess culture purity.

Culture system

30

We previously developed a process for the culture of mycobacteria under controlled and defined conditions - patent application No. PCT/GB00/00760 (WO00/52139). We used this culture system operated as a batch fermenter for the following studies of mycobacterial persistence.

35

Culture experiments were performed in a one litre glass vessel operated at a working volume of 750 ml. The culture was agitated by a magnetic bar placed in the culture vessel coupled to a magnetic stirrer positioned beneath the vessel. Culture conditions were continuously monitored by an Anglicon Microlab Fermentation System (Brighton Systems, Newhaven), linked to sensor

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probes inserted into the culture through sealed ports in the top plate. The oxygen concentration was monitored with a galvanic oxygen electrode (Uniprobe, Cardiff) and was controlled through sparging the culture with a mixture of air and oxygen free-nitrogen. Temperature was monitored by an Anglicon temperature probe, and maintained by a heating pad positioned beneath the culture vessel. Culture pH was measured using an Ingold pH electrode (Mettler-Toledo, Leicester).

Inoculation and culture

The vessel was filled with 750 ml of sterile culture medium and parameters were allowed to stabilise at $37\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, $\text{pH } 6.9 \pm 0.3$ and a dissolved oxygen tension of approximately 70 % air saturation. A dense inoculum suspension was prepared by resuspending Middlebrook agar cultures, grown at $37\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 3 weeks, in sterile deionised water. The inoculum was aseptically transferred to the culture vessel, to provide an initial culture turbidity of approximately 0.25 at 540 nm.

The culture were maintained at $37\text{ }^{\circ}\text{C}$ with an agitation rate of 500 to 750 rpm. The dissolved oxygen tension was maintained between 50 - 70% air saturation with the aid of culture sparging. The initial culture pH was set at approximately 6.7 and was monitored through-out the experiment.

The culture was maintained for 50 days and samples were removed regularly to monitor growth and survival, nutrient utilisation and gene expression.

Growth and survival

Bacterial growth and survival was assessed by determining the number of viable cells in the culture system at specific time points. This was achieved by preparing a decimal dilution series of the sample in sterile water and plating 100 μl aliquots onto Middlebrook 7H10 + OADC plates. The plates were incubated at $37\text{ }^{\circ}\text{C}$ for up to 4 weeks before enumerating the number of colonies formed.

Nutrient utilisation

Glycerol is the primary carbon and energy source present in Middlebrook 7H9 medium with ADC, 0.2 % Tween and 0.2 % Glycerol. The rate at which glycerol was utilised was determined using the Glycerol Determination Kit Cat. No. 148 270 Boehringer Mannheim.

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Microarray experiments

RNA was extracted from culture samples collected at different time points during the experiment. A fluorescently-labelled cDNA was then transcribed from each sample of RNA. The cDNA was labelled by the incorporation of either Cy3 or Cy5 labelled dCTP (Dyes are supplied by Amersham Pharmacia Biotech).

Whole *M. tuberculosis* genome arrays were prepared from *M. tuberculosis* genomic DNA using ORF-specific primers. PCR products corresponding to each ORF were spotted in a grid onto a standard glass microscope slide using a BioRobotics microgrid robot (MWG Biotech) at a resolution of >4000 spots/cm².

In each microarray experiment a whole genome array was hybridised with labelled cDNA from one culture sample (Test sample). Each array was also hybridised with control DNA incorporating a different Cy dye and prepared from DNA extracted from *M. tuberculosis* strain H37Rv (control sample).

Each array was scanned at two different wavelengths corresponding to the excitation maxima of each dye and the intensity of the emitted light was recorded. The ration of the intensity values for the test and control samples was determined for each array.

The slides were scanned using an Affymetrix 428 scanner. The raw data was initially analysed by ImaGene software. The scanned images were then transferred to another software package known as GeneSpring to analyse the expression of each gene.

Results

After inoculation the culture entered exponential growth and continued to grow exponentially until 10 days after inoculation (see Fig. 1). Cessation of exponential growth coincided with depletion of the primary carbon and energy source - glycerol (see Fig. 2). As the culture entered stationary phase, viability started to decline and continued to decline steadily over the duration of the study. After 40 days in stationary phase, approximately 1% of the culture was still culturable on Middlebrook agar.

The gene expression profiles for samples collect at day 5 and day 50 were

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compared. Three arrays were prepared for each sample and the ratio of the intensity values for the test and control samples was determined for each array.

Two different approaches were used to analyse the data:-

5

1. The ratio values for the 3 arrays prepared for each sample were averaged and compared. Genes which produced intensity ratios that were 3-fold higher on day 50 than on day 5 were selected.

10

2. Data from each array was treated as a separate data set and self-organising maps were used to select all the genes that were consistently up-regulated in all 3 arrays at day 50 relative to day 5.

15

The two data sets were then compared and those genes that were at least 1.5-fold, preferably at least 3-fold up-regulated at day 50, relative to exponential growth at day 5, and which were consistently up-regulated in all 3 arrays (experiments) were selected. The identified sequences (protein, followed by nucleic acid) are presented in Table 2.

20

Model 2 - *in vitro* model of mycobacterial persistence under low oxygen, and nutrient-starved conditions

25

A second model which simulated low-oxygen availability and nutrient depletion has also been developed. This model was established as outlined for Model 1 above, but with the following modifications.

30

After inoculation, the dissolved oxygen tension (DOT) of the culture was maintained at approximately 40% air saturation at 37 °C until the culture had entered early exponential growth. The DOT was then lowered in increments down to 1% air saturation over a six day period. The culture was then maintained at a DOT of 0 - 5% until 50 days after inoculation. Samples were collected for analysis, and the identified sequences (protein, followed by nucleic acid) are presented in Table 2.

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Table 1 - liquid medium formulation for persistence cultures - Middlebrook 7H9 medium supplemented with ADC, 0.2% Tween 80 and 0.2% Glycerol

<u>Composition per litre</u>		
5	Na ₂ HPO ₄	2.5 g
	KH ₂ PO ₄	1.0 g
	Monosodium glutamate	0.5 g
	(NH ₄) ₂ SO ₄	0.5 g
10	Sodium citrate	0.1 g
	MgSO ₄ .7H ₂ O	0.05 g
	Ferric ammonium citrate	0.04 g
	CuSO ₄ .5H ₂ O	1.0 mg
	Pyridoxine	1.0 mg
15	ZnSO ₄ .7H ₂ O	1.0 mg
	Biotin	0.5 mg
	CaCl ₂ .2H ₂ O	0.5 mg
	Middlebrook ADC enrichment	100 ml
20	Glycerol	2.0 ml
	Tween 80	2.0 ml
Middlebrook ADC enrichment - per 100 ml		
25	Bovine serum albumin	5.0 g
	Glucose	2.0 g
	Catalase	3.0 mg

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Example 2 - RNA extraction from *M. tuberculosis* for microarray analysis**Materials and Methods**

Trizol (Life Technologies)- formulation of phenol and guanidine thiocyanate.

5

GTC lysis solution containing: 5 M guanidine thiocyanate, 0.5 % N-lauryl sarcosine, 25 mM tri-sodium citrate, 0.1 M 2-mercaptoethanol, and 0.5 % Tween 80.

10

Chloroform

Isopropanol

3M sodium acetate

70 % Ethanol

microfuge

15

ribolyser

Sterile plasticware-Falcon tubes, screw capped eppendorfs, gilson tips –all RNase free

20

Glassware – baked at 160 °C for at least 16 hours

Method

Steps performed at Containment level 3; within a Class III microbiological safety cabinet.

25

Remove 10 or 20 ml of culture (10^9 /ml) and immediately add this to 4 volumes of GTC lysis buffer in a plastic specimen pot. Seal the pot tightly.

30

Incubate the cells in GTC lysis buffer for 1 hour at room temperature. Surface decontaminate the plastic pot with 5 % Hycolin for 5 minutes. Transfer the sample to the pass box and place it into a plastic carry tin with a sealable lid. Close the container securely and transport it to a non-toxic cabinet CL3 cabinet.

35

Equally distribute the lysis mixture between Falcon tubes. Place these tubes into centrifuge buckets and seal the buckets tightly. Surface-decontaminate the buckets for 5 minutes with 5 % Hycolin. Then transfer them to the centrifuge (Baird and Tatlock Mark IV refrigerated bench-top centrifuge). Spin the tubes at

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3,000 rpm for 30 minutes.

Return the unopened buckets to the cabinet. Remove the centrifuge tubes and pour the supernatant into a waste bottle for GTC lysis buffer.

5

Resuspend each pellet in 1 ml of Trizol (formulation of phenol and GTC cat no. 15596-026). The manufacturers guidelines recommend lysing cells by repetitive pipetting. Although this action alone will not lyse *M. tuberculosis*, it is important to completely resuspend the pellet in Trizol.

10

Transfer 1 ml of cells into a FastRNA tube and ribolyse it at power setting 6.5 for 45 seconds.

Leave the tube to incubate at room temperature for 5 minutes.

15

Remove the aqueous layer from the tube and add this to 200 μ l of chloroform in a screw-capped eppendorf tube. Shake each tube vigorously for about 15 seconds. Incubate for 2-3 minutes at room temperature.

20

Spin the tube at 13,000 rpm for 15 minutes. Following centrifugation, the liquid separates into red phenol/chloroform phase, an interface, and a clear aqueous phase.

25

Carefully remove the aqueous phase and transfer it to a fresh eppendorf tube containing 500 μ l of chloroform/isoamyl alcohol (24:1). Spin the tubes at 13,000 rpm for 15 minutes.

Transfer the aqueous phase to an eppendorf tube containing 50 μ l of sodium acetate and 500 μ l of isopropanol.

30

Surface decontaminate the eppendorf tube with 5% Hycolin for 5 minutes. Remove the tube from the CL3 laboratory and continue with the procedure in laboratory 157.

35

Steps performed at Containment level 2:

Precipitate the RNA at -70 °C for at least 30 minutes-can do this step overnight.

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Spin the precipitated RNA down at 13,000 rpm for 10 minutes. Remove the supernatant and wash the pellet in 70 % ethanol. Repeat centrifugation.

5 Remove the 70 % ethanol and air-dry the pellet. Dissolve the pellet in RNase free water.

Freeze the RNA at -70 °C to store it.

10 **Example 3 - isolation of genomic DNA from *Mycobacterium tuberculosis* grown in chemostat culture. DNA then used to generate Cy3 or Cy5 labelled DNA for use as a control in microarray experiments.**

Materials and Methods

Beads 0.5 mm in diameter
15 Bead beater
Bench top centrifuge
Platform rocker
Heat block
Falcon 50 ml centrifuge tubes
20 Sorvall RC-5C centrifuge
250 ml polypropylene centrifuge pots.
Screw capped eppendorf tubes
Pipettes 1 ml, 200 µl, 10 ml, 5 ml

25 Breaking buffer
50 mM Tris HCl pH 8.0
10 mM EDTA
100 mM NaCl

30 Procedure

Mechanical disruption of *M. tuberculosis* cells

* 150 ml of chemostat cells (O.D of 2.5 at 540 nm) are spun down at 15,000 rpm for 15 minutes in 250 ml polypropylene pots using centrifuge Sorvall RC-5C.
35 * The supernatant is discarded.
* Cells are re-suspended in 5 ml of breaking buffer in a 50 ml Falcon tube and centrifuged at 15,000 rpm for a further 15 minutes.

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- * The supernatant is removed and additional breaking buffer is added at a volume of 5 ml. Beads are used to disrupt the cells. These are used at a quantity of 1 ml of beads for 1 ml of cells. Place the sample into the appropriate sized chamber. Place in the bead beater and secure the outer unit (containing ice) and process at the desired speed for 30 seconds.
- * Allow the beads to settle for 10 minutes and transfer cell lysate to a 50 ml Falcon centrifuge tube
- * Wash beads with 2-5 ml of breaking buffer by pipetting washing buffer up and down over the beads.
- * Add this washing solution to the lysate in the falcon tube

Removal of proteins and cellular components

- * Add 0.1 volumes of 10% SDS and 0.01 volumes proteinase K.
- * Mix by inversion and heat at 55 °C in a heat block for 2-3 hours
- * The resulting mix should be homogenous and viscous. Additional SDS may be added to assist here to bring the concentration up to 0.2 %
- * Add an equal volume of phenol/chloroform/Isoamyl alcohol in the ratio: 25/24/1.
- * Gently mix on a platform rocker until homogenous
- * Spin down at 3,000 rpm for 20 minutes
- * Remove the aqueous phase and place in a fresh tube
- * Extract the aqueous phase with an equal volume of chloroform to remove traces of cell debris and phenol. Chloroform extractions may need to be repeated to remove all the debris.
- * Precipitate the DNA with 0.3 M sodium acetate and an equal volume of isopropanol.
- * Spool as much DNA as you can with a glass rod
- * Wash the spooled DNA in 70 % ethanol followed by 100 % ethanol
- * Leave to air dry
- * Dissolve the DNA in sterile deionised water (500 µl)
- * Allow DNA to dissolve at 4 °C for approximately 16 hours.
- * Add RNase 1 (500U) to the dissolved DNA
- * Incubate for 1 hour at 37 °C.
- * Re-extract with an equal volume of phenol/chloroform followed by a chloroform extraction and precipitate as before
- * Spin down the DNA at 13,000 rpm
- * Remove the supernatant and wash the pellet in 70% ethanol

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- * Air dry
- * Dissolve in 200-500 μ l of sterile water.

Example 4 - preparation of Cy3 or Cy5 labelled DNA from DNA

5

a) Prepare one Cy3 or one Cy5 labelled DNA sample per microarray slide.

Each sample:

DNA	2-5 μ g
Random primers (3 μ g/ μ l)	1 μ l
10 H ₂ O	to 41.5 μ l

Heat at 95 °C for 5 min, snap cool on ice and briefly centrifuge.

Add to each:

15 10 x REact 2 buffer	5 μ l
dNTPs (5mM dA/G/TTP, 2 mM dCTP).....	1 μ l
Cy3 OR Cy5 dCTP.....	1.5 μ l
Klenow (5U/ μ l)	1 μ l
Incubate at 37 °C in dark for 90 min.	

20

b) Prehybridise slide

Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the labelling reaction to equilibrate.

Prehybridisation: 20 x SSC.....	8.75 ml (3.5 x SSC)
25 20% SDS	250 μ l (0.1% SDS)
BSA (100 mg/ml).....	5 ml (10 mg/ml)
H ₂ O	to 50 ml

Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in 400 ml propan-2-ol for 1 min and centrifuge slide in 50 ml centrifuge tube at 1,500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation (<1h).

c) Purify Cy3/Cy5 labelled DNA - Qiagen MinElute Purification

- * Combine Cy3 and Cy5 labelled DNA samples in single tube and add 500 μ l Buffer PB.

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- * Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 500 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 250 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.
- * Place the MinElute column into a fresh 1.5 ml tube.
- * Add 10.5 μ l H₂O to the centre of the membrane and allow to stand for 1 min.
- * Centrifuge at 13,000 rpm for 1 min.

15 **Example 5 - preparation of Cy3 or Cy5 label cDNA from RNA**

a) Prepare one Cy3 and one Cy5 labelled cDNA sample per microarray slide

Each sample:

RNA	2-10 μ g
20 Random primers (3 μ g/ μ l)	1 μ l
H ₂ O	to 11 μ l

Heat at 95 °C for 5min, snap cool on ice and briefly centrifuge.

Add to each: 5 $\times$ First Strand Buffer	5 μ l
25 DTT (100 mM).....	2.5 μ l
dNTPs (5 mM dA/G/TTP, 2 mM dCTP).....	2.3 μ l
Cy3 OR Cy5 dCTP.....	1.7 μ l
SuperScript II (200 U/ μ l).....	2.5 μ l

- 30 Incubate at 25 °C in dark for 10 min followed by 42 °C in dark for 90 min.

b) Prehybridise slide

Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the labelling

- 35 reaction to equilibrate.

Prehybridisation:

20 x SSC 8.75 ml (3.5 x SSC)

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20% SDS 250 μ l (0.1 % SDS)
 BSA (100 mg/ml)..... 5 ml (10 mg/ml)
 H₂O to 50 ml

- 5 Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in 400 ml propan-2-ol for 1 min and centrifuge slide in 50 ml centrifuge tube at 1500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation (< 1h).
- 10 c) Purify Cy3/Cy5 labelled cDNA - Qiagen MinElute Purification
- * Combine Cy3 and Cy5 labelled DNA samples in single tube and add 250 μ l Buffer PB.
 - * Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.
 - 15 * Discard flow-through and place MinElute column back into same collection tube.
 - * Add 500 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
 - * Discard flow-through and place MinElute column back into same collection tube.
 - * Add 250 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
 - 20 * Discard flow-through and place MinElute column back into same collection tube.
 - * Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.
 - * Place the MinElute column into a fresh 1.5 ml tube.
 - * Add 10.5 μ l H₂O to the centre of the membrane and allow to stand for 1 min.
 - 25 * Centrifuge at 13,000 rpm for 1 min.

Example 6 - hybridise slide with Cy3/Cy5 labelled cDNA

- Place the prehybridise microarray slide in the hybridisation cassette and add two
- 30 15 ml aliquots of H₂O to the wells in the cassette. Mix resuspended Cy3/Cy5 labelled cDNA sample with hybridisation solution.

Hybridisation: Cy3/Cy5 labelled cDNA sample.....10.5 ml
 20xSSC 3.2 ml (4 x SSC)
 35 2% SDS.....2.3 ml (0.3% SDS)

Heat hybridisation solution at 95 °C for 2 min. Do not snap cool on ice but allow

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to cool slightly and briefly centrifuge. Pipette the hybridisation solution onto the slide at the edge of the arrayed area avoiding bubble formation. Using forceps carefully drag the edge of a cover slip along the surface of the slide towards the arrayed area and into the hybridisation solution at the edge of the array. Carefully lower the cover slip down over the array avoiding any additional movement once in place. Seal the hybridisation cassette and submerge in a water bath at 60 °C for 16-20 h.

Wash slide.

10

Remove microarray slide from hybridisation cassette and initially wash slide carefully in staining trough of Wash A to remove cover slip. Once cover slip is displaced place slide(s) in slide rack and continue agitating in Wash A for a further 2 min.

15

Wash A: 20xSSC.....20 ml (1 x SSC)
 20% SDS.....1 ml (0.05% SDS)
 H₂O.....to 400 ml

20 Transfer slide(s) to a clean slide rack and agitate in first trough of Wash B for 2 min. Wash in second trough of Wash B with agitation for 2 min.

Wash B (x2): 20xSSC.....1.2 ml (0.06 x SSC)
 H₂O.....to 400 ml

25

Place slide into a 50 ml centrifuge tube and centrifuge at 1500 rpm for 5 mins to dry slide, and then scan fluorescence using a ScanArray 3000 dual-laser confocal scanner and analyse data.

30 Example 7 - preparation of the arrays

PCR-amplified products are generated from *M. tuberculosis* genomic DNA using ORF-specific primers. Each gene of the genome is represented. These are spotted in a grid onto a standard glass microscope slide using a BioRobotics microgrid robot (MWG Biotech) at a resolution of >4000 spots/cm².

35

Example 8 - scanning and analysis of data

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The slides were scanned using an Affymetrix 428 scanner.

Dual fluorescence is used, allowing simultaneous detection of two cDNA samples. The output of the arrays is read using a confocal laser scanner (Affymetrix 428 scanner from MWG Biotech). More detailed information can be found web site
5 www.sghms.ac.uk/depts/medmicro/bugs; Mujumdar, R.B. (1993) Bioconjugate Chemistry, 4(2), pp.105-111; Yu, H. (1994) Nucl. Acids Res. 22, pp.3226-3232; and Zhu, Z. (1994) Nucl. Acids Res. 22, pp. 3418-3422.

10 The raw data were initially analysed in software known as ImaGene, which was supplied with the scanner. The scanned images were then transferred to another software package known as GeneSpring. This is a very powerful tool, which draws information from many databases allowing the complete analysis of the expression of each gene.

15

Example 9 - delete one or more of the genes from *M. tuberculosis* in order to attenuate its virulence while retaining immunogenicity

20 One or more genes that are identified may be disrupted using allelic exchange. In brief, the gene of interest is cloned with 1-2 kb of flanking DNA either side and is inactivated by deletion of part of the coding region and insertion of an antibiotic resistance marker, such as hygromycin.

25 The manipulated fragment is then transferred to a suitable suicide vector e.g. pPR23 and is transformed into the wild-type parent strain of *M. tuberculosis*. Mutants are recovered by selecting for antibiotic resistant strains. Genotypic analysis (Southern Blotting with a fragment specific to the gene of interest) is performed on the selected strains to confirm that the gene has been disrupted.

30 The mutant strain is then studied to determine the effect of the gene disruption on the phenotype. In order to use it as a vaccine candidate it would be necessary to demonstrated attenuated virulence. This can be done using either a guinea pig or mouse model of infection. Animals are infected with the mutant strain and the progression of disease is monitored by determining the bacterial load in different
35 organs, in particular the lung and spleen, at specific time points post infection, typically up to 16 weeks.

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Comparison is made to animals infected with the wild-type strain which should have a significantly higher bacterial load in the different organs. Long-term survival studies and histopathology can also be used to assess virulence and pathogenicity.

5

Once attenuated virulence has been established, protection and immunogenicity studies can be performed to assess the potential of the strain as a vaccine. Suitable references for allelic exchange and preparation of TB mutants are McKinney et al., 2000 and Pelicic et al., 1997, [1, 2].

10

Example 10 - select one or more of the genes identifiable by the present invention, which encode proteins that are immunogenic, and put them into BCG or an attenuated strain of *M. tuberculosis* to enhance its overall immunogenicity

15

The gene of interest is amplified from the *M. tuberculosis* genome by PCR. The amplified product is purified and cloned into a plasmid (pMV306) that integrates site specifically into the mycobacterial genome at the attachment site (attB) for mycobacteriophage L5 [3].

20

BCG is transformed with the plasmid by electroporation, which involves damaging the cell envelope with high voltage electrical pulses, resulting in uptake of the DNA. The plasmid integrates into the BCG chromosome at the attB site generating stable recombinants. Recombinants are selected and are checked by PCR or Southern blotting to ensure that the gene has been integrated. The recombinant strain is then used for protection studies.

25

Example 11 - Use of recombinant carriers such as attenuated salmonella and the Vaccinia virus to express and present TB genes.

30

One of the best examples of this type of approach is the use of Modified Vaccinia virus Ankara (MVA) [4]. The gene of interest is cloned into a vaccinia virus shuttle vector, e.g. pSC11. Baby Hamster Kidney (BHK) cells are then infected with wild-type MVA and are transfected with the recombinant shuttle vector. Recombinant virus is then selected using a suitable selection marker and viral plaques, selected and purified.

35

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Recombinant virus is normally delivered as part of a prime-boost regime where animals are vaccinated initially with a DNA vaccine encoding the TB genes of interest under the control of a constitutive promoter. The immune response is boosted by administering recombinant MVA carrying the genes of interest to the animals at least 2 weeks later.

Example 12 - Sub-unit vaccines containing a single peptide/protein or a combination of proteins

To prepare sub-unit vaccines with one or more peptides or proteins it is first of all necessary to obtain a supply of protein or peptide to prepare the vaccine. Up to now, this has mainly been achieved in mycobacterial studies by purifying proteins of interest from TB culture. However, it is becoming more common to clone the gene of interest and produce a recombinant protein.

The coding sequence for the gene of interest is amplified by PCR with restriction sites inserted at the N terminus and C terminus to permit cloning in-frame into a protein expression vector such as pET-15b. The gene is inserted behind an inducible promoter such as lacZ. The vector is then transformed into *E. coli* which is grown in culture. The recombinant protein is over-expressed and is purified.

One of the common purification methods is to produce a recombinant protein with an N-terminal His-tag. The protein can then be purified on the basis of the affinity of the His-tag for metal ions on a Ni-NTA column after which the His-tag is cleaved. The purified protein is then administered to animals in a suitable adjuvant [5].

Example 13 - Plasmid DNA vaccines carrying one or more of the identified genes

DNA encoding a specific gene is amplified by PCR, purified and inserted into specialised vectors developed for vaccine development, such as pVAX1. These vectors contain promoter sequences, which direct strong expression of the introduced DNA (encoding candidate antigens) in eukaryotic cells (e.g. CMV or SV40 promoters), and polyadenylation signals (e.g. SV40 or bovine growth hormone) to stabilise the mRNA transcript.

The vector is transformed into *E. coli* and transformants are selected using a

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marker, such as kanamycin resistance, encoded by the plasmid. The plasmid is then recovered from transformed colonies and is sequenced to check that the gene of interest is present and encoded properly without PCR generated mutations.

5

Large quantities of the plasmid is then produced in *E. coli* and the plasmid is recovered and purified using commercially available kits (e.g. Qiagen Endofree-plasmid preparation). The vaccine is then administered to animals for example by intramuscular injection in the presence or absence of an adjuvant.

10

Example 14 - Preparation of DNA expression vectors

DNA vaccines consist of a nucleic acid sequence of the present invention cloned into a bacterial plasmid. The plasmid vector pVAX1 is commonly used in the preparation of DNA vaccines. The vector is designed to facilitate high copy number replication in *E. coli* and high level transient expression of the peptide of interest in most mammalian cells (for details see manufacturers protocol for pVAX1 (catalog No. V260-20 www.invitrogen.com) .

20

The vector contains the following elements:-

- * Human cytomegalovirus immediate-early (CMV) promoter for high-level expression in a variety of mammalian cells

- * T7 promoter/priming site to allow *in vitro* transcription in the sense orientation and sequencing through the insert

25

- * Bovine growth hormone (BGH) polyadenylation signal for efficient transcription termination and polyadenylation of mRNA

- * Kanamycin resistance gene for selection in *E. coli*

- * A multiple cloning site

- * pUC origin for high-copy number replication and growth in *E. coli*

30

- * BGH reverse priming site to permit sequencing through the insert

Vectors may be prepared by means of standard recombinant techniques which are known in the art, for example Sambrook et al., (1989). Key stages in preparing the vaccine are as follows:

35

- * The gene of interest is ligated into pVAX1 via one of the multiple cloning sites

- * The ligation mixture is then transformed into a competent *E. coli* strain (e.g.

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TOP10) and LB plates containing 50µg/ml kanamycin are used to select transformants.

* Clones are selected and may be sequenced to confirm the presence and orientation of the gene of interest.

5 * Once the presence of the gene has been verified, the vector can be used to transfect a mammalian cell line to check for protein expression. Methods for transfection are known in the art and include, for example, electroporation, calcium phosphate, and lipofection.

10 * Once peptide expression has been confirmed, large quantities of the vector can be produced and purified from the appropriate cell host, e.g. *E. coli*.

pVAX1 does not integrate into the host chromosome. All non-essential sequences have been removed to minimise the possibility of integration. When constructing a specific vector, a leader sequence may be included to direct secretion of the encoded protein when expressed inside the eukaryotic cell.

Other examples of vectors that have been used are V1Jns.tPA and pCMV4 (Lefevre *et al.*, 2000 and Vordermeier *et al.*, 2000).

20 Expression vectors may be used that integrate into the genome of the host, however, it is more common and more preferable to use a vector that does not integrate. The example provided, pVAX1, does not integrate. Integration would lead to the generation of a genetically modified host which raises other issues.

25 **Example 15 - RNA vaccine**

As discussed on page 15 of US patent US5,783,386, one approach is to introduce RNA directly into the host.

30 Thus, the vector construct (Example 10) may be used to generate RNA *in vitro* and the purified RNA then injected into the host. The RNA would then serve as a template for translation in the host cell. Integration would not occur.

Another option is to use an infectious agent such as the retroviral genome carrying RNA corresponding to the gene of interest. Here you will get integration into the host genome

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Another option is the use of RNA replicon vaccines which can be derived from virus vectors such as Sindbis virus or Semliki Forest virus. These vaccines are self-replicating and self-limiting and may be administered as either RNA or DNA which is then transcribed into RNA replicons *in vivo*. The vector eventually causes lysis of the transfected cells thereby reducing concerns about integration into the host genome. Protocols for RNA vaccine construction are detailed in Cheng *et al.*, (2001).

Example 16 - Diagnostic assays based on assessing T cell responses

For a diagnostic assay based on assessing T cell responses it would be sufficient to obtain a sample of blood from the patient. Mononuclear cells (monocytes, T and B lymphocytes) can be separated from the blood using density gradients such as Ficoll gradients.

Both monocytes and B-lymphocytes are both able to present antigen, although less efficiently than professional antigen presenting cells (APCs) such as dendritic cells. The latter are more localised in lymphoid tissue.

The simplest approach would be to add antigen to the separated mononuclear cells and incubate for a week and then assess the amount of proliferation. If the individual had been exposed to the antigen previously through infection, then T-cell clones specific to the antigen should be more prevalent in the sample and should respond.

It is also possible to separate the different cellular populations should it be desired to control the ratio of T cells to APC's.

Another variation of this type of assay is to measure cytokine production by the responding lymphocytes as a measure of response. The ELISPOT assay described below in Example 17 is a suitable example of this variation.

Example 17 - detection of latent mycobacteria

A major problem for the control of tuberculosis is the presence of a large reservoir of asymptomatic individuals infected with tubercle bacilli. Dormant bacilli are more resistant to front-line drugs.

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The presence of latent mycobacteria-associated antigen may be detected indirectly either by detecting antigen specific antibody or T-cells in blood samples.

The following method is based on the method described in Lalvani *et al.* (2001) in which a secreted antigen, ESAT-6, was identified as being expressed by members of the *M. tuberculosis* complex but is absent from M. Bovis BCG vaccine strains and most environmental mycobacteria. 60 - 80% of patients also have a strong cellular immune response to ESAT-6. An *ex-vivo* ELISPOT assay was used to detect ESAT-6 specific T cells.

As applied to the present invention:

A 96 well plate is coated with cytokine (e.g. interferon- γ , IL-2) -specific antibody. Peripheral blood monocytes are then isolated from patient whole blood and are applied to the wells.

Antigen (ie. one of the peptides, fragments, derivatives or variants of the present invention) is added to stimulate specific T cells that may be present and the plates are incubated for 24h. The antigen stimulates cytokine production which then binds to the specific antibody.

The plates are washed leaving a footprint where antigen-specific T cells were present.

A second antibody coupled with a suitable detection system, e.g. enzyme, is then added and the number of spots are enumerated after the appropriate substrate has been added.

The number of spots, each corresponding to a single antigen-specific T cell, is related to the total number of cells originally added.

The above Example also describes use of an antigen that may be used to distinguish TB infected individuals from BCG vaccinated individuals. This could be used in a more discriminative diagnostic assay.

Example 18 -*in vitro* model for mycobacterial persistence under the joint conditions of carbon-starvation and oxygen-limitation (a variation on Examples 1-7)

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Materials and Methods

Strain

Studies were performed with *M. tuberculosis* strain H37Rv (NCTC cat. No. 7416) - a representative strain of *M. tuberculosis*. Stock cultures were grown on
5 Middlebrook 7H10 + OADC for 3 weeks at 37 ± 2 °C.

Culture Medium

Persistence cultures were established in Middlebrook 7H9 medium supplemented with Middlebrook ADC enrichment, 0.2 % Tween 80 and 0.2 % glycerol (see
10 below). The medium was prepared with high quality water from a Millipore water purification system and filter sterilised by passage through a 0.1 µm pore size cellulose acetate membrane filter capsule (Sartorius Ltd). The pH was adjusted to 6.6 with concentrated hydrochloric acid.

15 Middlebrook 7H10 + OADC agar was used to prepare inoculum cultures, enumerate the number of culturable bacteria in samples, and to assess culture purity.

Culture system

20 The culture system described in WO00/52139, operated as a batch fermenter, was employed for this Example.

Culture experiments were performed in a one litre glass vessel operated at a working volume of 750 ml. The culture was agitated by a magnetic bar placed in
25 the culture vessel coupled to a magnetic stirrer positioned beneath the vessel. Culture conditions were continuously monitored by an Anglicon Microlab Fermentation System (Brighton Systems, Newhaven), linked to sensor probes inserted into the culture through sealed ports in the top plate. The oxygen concentration was monitored with a galvanic oxygen electrode (Uniprobe, Cardiff)
30 and was controlled through sparging the culture with a mixture of air and oxygen free-nitrogen. Temperature was monitored by an Anglicon temperature probe, and maintained by a heating pad positioned beneath the culture vessel. Culture pH was measured using an Ingold pH electrode (Mettler-Toledo, Leicester).

Inoculation and culture

35 The vessel was filled with 750 ml of sterile culture medium and parameters were allowed to stabilise at 37 °C $\pm$ 2 °C, pH 6.9 ± 0.3 and a dissolved oxygen

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tension of approximately 70 % air saturation. A dense inoculum suspension was prepared by resuspending Middlebrook agar cultures, grown at 37 ± 2 °C for 3 week, in sterile deionised water. The inoculum was aseptically transferred to the culture vessel, to provide an initial culture turbidity of approximately 0.25 at 540 nm. The culture was maintained at 37 °C with an agitation rate of 500 to 750 rpm.

After inoculation, the dissolved oxygen tension (DOT) of the culture was maintained at approximately 40% air saturation at 37 °C until the culture had entered early exponential growth. The DOT was then lowered in increments down to 1 % air saturation over a six day period (Fig. 3). The culture was then maintained at a DOT of 0 - 5 % until 50 days after inoculation and samples were removed regularly to monitor growth and survival, nutrient utilisation and gene expression.

Growth and survival

Bacterial growth and survival was assessed by determining the number of viable cells in the culture system at specific time points. This was achieved by preparing a decimal dilution series of the sample in sterile water and plating 100(µl aliquots onto Middlebrook 7H10 + OADC plates. The plates were incubated at 37 °C for up to 4 weeks before enumerating the number of colonies formed.

Nutrient utilisation

Glycerol is the primary carbon and energy source present in Middlebrook 7H9 medium with ADC, 0.2 % Tween and Glycerol. The rate at which glycerol was utilised was determined using the Glycerol Determination Kit Cat. No. 148 270 Boehringer Mannheim.

Microarray experiments

RNA was extracted from culture samples collected at different time points during the experiment. A fluorescently-labelled cDNA was then transcribed from each sample of RNA. The cDNA was labelled by the incorporation of either Cy3 or Cy5 labelled dCTP (Dyes are supplied by Amersham Pharmacia Biotech).

Whole *M. tuberculosis* genome arrays were prepared from *M. tuberculosis* genomic DNA using ORF-specific primers. PCR products corresponding to each ORF were spotted in a grid onto a standard glass microscope slide using a BioRobotics microgrid robot (MWG Biotech) at a resolution of > 4000 spots/cm².

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Arrays were supplied by Dr P Butcher, St George's Hospital Medical School London.

5 In each microarray experiment a whole genome array was hybridised with labelled cDNA from one culture sample (Test sample). Each array was also hybridised with control DNA incorporating a different Cy dye and prepared from DNA extracted from *M. tuberculosis* strain H37Rv (control sample). Each array was scanned, using an Affymetrix 428 scanner, at two different wavelengths corresponding to the excitation maxima of each dye and the intensity of the emitted light was recorded. The raw data was processed by ImaGene software before performing comparative analysis using GeneSpring.

Results

15 Analysis of viable count data indicated that the culture grew exponentially until 10 to 12 days post infection (Fig. 4). As the culture entered stationary phase, viability started to decline and continued to decline steadily over the duration of the study. After 40 days in stationary phase, approximately 0.1 % of the culture was still culturable on Middlebrook agar. The rate of glycerol utilisation was slower than observed in the culture established under aerobic conditions, indicating that the metabolic activity of the low-oxygen culture was restricted by limited oxygen availability. Nevertheless, the principal carbon and energy source was depleted within 15 days after inoculation (Fig. 2).

25 Samples were collected for microarray analysis as outlined. The gene expression profiles for samples collected at day 5 and 50 were compared. Three arrays were prepared for each sample and the test data was normalised against the control data on each chip. The normalised data for each set of arrays was then averaged and the two data sets were compared. Those genes that were expressed at least 1.5-fold, preferably at least 5-fold higher at day 50 relative to day 5 were selected. The gene list was then added to those genes identified under "nutrient-starving" conditions, and the complete set listed in Table 2.

Liquid medium formulation for persistence cultures - Middlebrook 7H9 medium supplemented with ADC, 0.2 % Tween 80 and 0.2 % Glycerol

35

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Composition per litre:

	Na ₂ HPO ₄	2.5 g
	KH ₂ PO ₄	1.0 g
5	Monosodium glutamate	0.5 g
	(NH ₄) ₂ SO ₄	0.5 g
	Sodium citrate	0.1 g
	MgSO ₄ .7H ₂ O	0.05 g
	Ferric ammonium citrate	0.04 g
10	CuSO ₄ .5H ₂ O	1.0 mg
	Pyridoxine	1.0 mg
	ZnSO ₄ .7H ₂ O	1.0 mg
	Biotin	0.5 mg
	CaCl ₂ .2H ₂ O	0.5 mg
15	Middlebrook ADC enrichment	100 ml
	Glycerol	2.0 ml
	Tween 80	2.0 ml
20	Middlebrook ADC enrichment - per 100 ml	
	Bovine serum albumin	5.0 g
	Glucose	2.0 g
	Catalase	3.0 mg

25

Microarray protocols1. RNA extraction from *M. tuberculosis* for microarray analysis

30 Materials and Methods

* Trizol (Life Technologies) - formulation of phenol and guanidine thiocyanate.
 * GTC lysis solution containing: 5 M guanidine thiocyanate, 0.5 % N-lauryl sarcosine, 25 mM tri-sodium citrate, 0.1 M 2-mercaptoethanol, and 0.5 % Tween 80.

35

* Chloroform
 * Isopropanol
 * 3 M sodium acetate

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- * 70 % Ethanol
- * microfuge
- * ribolyser
- * Sterile plasticware-Falcon tubes, screw capped eppendorfs, gilson tips -all
- 5 RNase free
- * Glassware - baked at 160 °C for at least 16 hours

Method

- * Steps performed at Containment level 3; within a Class III microbiological safety
- 10 cabinet.
- * Remove 10 or 20 ml of culture (10^9 /ml) and immediately add this to 4 volumes of GTC lysis buffer in a plastic specimen pot. Seal the pot tightly.
- * Incubate the cells in GTC lysis buffer for 1 hour at room temperature. Surface decontaminate the plastic pot with 5 % Hycolin for 5 minutes. Transfer the
- 15 sample to the pass box and place it into a plastic carry tin with a sealable lid. Close the container securely and transport it to a non-toxic cabinet CL3 cabinet.
- * Equally distribute the lysis mixture between Falcon tubes. Place these tubes into centrifuge buckets and seal the buckets tightly. Surface-decontaminate the buckets for 5 minutes with 5 % Hycolin. Then transfer them to the centrifuge
- 20 (Baird and Tatlock Mark IV refrigerated bench-top centrifuge). Spin the tubes at 3,000 rpm for 30 minutes.
- * Return the unopened buckets to the cabinet. Remove the centrifuge tubes and pour the supernatant into a waste bottle for GTC lysis buffer.
- * Resuspend each pellet in 5 ml of Trizol (formulation of phenol and GTC cat No.
- 25 15596-026). The manufacturers guidelines recommend lysing cells by repetitive pipetting. Although this action alone will not lyse *M. tuberculosis*, it is important to completely resuspend the pellet in Trizol.
- * Transfer 1 ml of cells into each FastRNA tube and ribolyse them at power setting 6.5 for 45 seconds.
- 30 * Leave the tubes to incubate at room temperature for 5 minutes.
- * Remove the aqueous layer from each tube and add this to 200 µl of chloroform in a screw-capped eppendorf tube. Shake each tube vigorously for about 15 seconds. Incubate for 2-3 minutes at room temperature.
- * Spin the tubes at 13,000 rpm for 15 minutes. Following centrifugation, the
- 35 liquid separates into red phenol/chloroform phase, an interface, and a clear aqueous phase.
- * Carefully remove the aqueous phase and transfer it to fresh eppendorf tubes

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containing 500 µl of chloroform/isoamyl alcohol (24:1). Spin the tubes at 13,000 rpm for 15 minutes.

* Transfer the aqueous phase to eppendorf tubes containing 50 µl of sodium acetate and 500 µl of isopropanol.

5 * Surface decontaminate the eppendorf tubes with 5% Hycolin for 5 minutes. Remove the tubes from the CL3 laboratory and continue with the procedure in laboratory 157.

* Steps performed at Containment level 2:

* Precipitate the RNA at -70 °C for at least 30 minutes (optionally overnight).

10 * Spin the precipitated RNA down at 13,000 rpm for 10 minutes. Remove the supernatant and wash the pellet in 70 % ethanol. Repeat centrifugation.

* Remove the 70 % ethanol and air-dry the pellet. Dissolve the pellet in RNase free water.

* Freeze the RNA at -70 °C to store it.

15

2. Isolation of genomic DNA from *Mycobacterium tuberculosis* grown in chemostat culture. DNA then used to generate Cy3 or Cy5 labelled DNA for use as a control in microarray experiments

20 Materials and Methods

Beads 0.5 mm in diameter

Bead beater

Bench top centrifuge

Platform rocker

25 Heat block

Falcon 50 ml centrifuge tubes

Sorvall RC-5C centrifuge

250 ml polypropylene centrifuge pots.

Screw capped eppendorf tubes

30 Pipettes 1 ml, 200 µl, 10 ml, 5 ml

Breaking buffer

50 mM Tris HCL pH 8.0

10 mM EDTA

35 100 mM NaCl

Procedure

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Mechanical disruption of Mtb cells

- * 150 ml of chemostat cells (O.D of 2.5 at 540 nm) are spun down at 15,000 rpm for 15 minutes in 250 ml polypropylene pots using centrifuge Sorvall RC-5C.
- 5 * The supernatant is discarded.
- * Cells are re-suspended in 5 ml of breaking buffer in a 50 ml Falcon tube and centrifuged at 15,000 rpm for a further 15 minutes.
- * The supernatant is removed and additional breaking buffer is added at a volume of 5 ml. Beads are used to disrupt the cells. These are used at a quantity of 1ml
- 10 of beads for 1 ml of cells. Place the sample into the appropriate sized chamber. Place in the bead beater and secure the outer unit (containing ice) and process at the desired speed for 30 seconds.
- * Allow the beads to settle for 10 minutes and transfer cell lysate to a 50 ml Falcon centrifuge tube
- 15 * Wash beads with 2-5 ml of breaking buffer by pipetting washing buffer up and down over the beads.
- * Add this washing solution to the lysate in the falcon tube

Removal of proteins and cellular components.

- 20 * Add 0.1volumes of 10 % SDS and 0.01 volumes proteinase K.
- * Mix by inversion and heat at 55 °C in a heat block for 2-3 hours
- * The resulting mix should be homogenous and viscous. If it isn't then add more SDS to bring the concentration up to 0.2 %
- 25 * Add an equal volume of phenol/chloroform/Isoamyl alcohol in the ratio: 25/24/1.
- * Gently mix on a platform rocker until homogenous
- * Spin down at 3,000 rpm for 20 minutes
- * Remove the aqueous phase and place in a fresh tube
- * Extract the aqueous phase with an equal volume of chloroform to remove
- 30 traces of cell debris and phenol. Chloroform extractions may need to be repeated to remove all the debris.
- * Precipitate the DNA with 0.3 M sodium acetate and an equal volume of isopropanol.
- * Spool as much DNA as you can with a glass rod
- 35 * Wash the spooled DNA in 70 % ethanol followed by 100 % ethanol
- * Leave to air dry
- * Dissolve the DNA in sterile deionised water (500 µl)

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- * Allow DNA to dissolve at 4 °C for approximately 16 hours.
- * Add RNase 1 (500U) to the dissolved DNA
- * Incubate for 1 hour at 37 °C.
- * Re-extract with an equal volume of phenol/chloroform followed by a chloroform
- 5 extraction and precipitate as before
- * Spin down the DNA at 13,000 rpm
- * Remove the supernatant and wash the pellet in 70 % ethanol
- * Air dry
- * Dissolve in 200-500 µl of sterile water.

10

3. Preparation of Cy3 or Cy5 labelled DNA from DNA

- a) Prepare one Cy3 or one Cy5 labelled DNA sample per microarray slide.
- Each sample: DNA 2-5 µg
- 15 Random primers (3 µg/µl) 1 µl
- H₂O to 41.5 µl
- Heat at 95 °C for 5min, snap cool on ice and briefly centrifuge.
- Add to each: 10*REact 2 buffer 5 µl
- dNTPs (5mM dA/G/TTP, 2mM dCTP)..... 1 µl
- 20 Cy3 OR Cy5 dCTP..... 1.5 µl
- Klenow (5U/µl) 1 µl
- Incubate at 37 °C in dark for 90 min.
- b) Prehybridise slide
- 25 Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the
- labelling reaction to equilibrate.
- Prehybridisation: 20*SSC..... 8.75 ml (3.5*SSC)
- 20% SDS 250 µl (0.1 % SDS)
- BSA (100 mg/ml)..... 5 ml (10 mg/ml)
- 30 H₂O to 50 ml

- Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C
- for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in
- 400 ml propan-2-ol for 1 min and centrifuge slide in 50 ml centrifuge tube at
- 35 1,500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation
- (<1h).

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c) Purify Cy3/Cy5 labelled DNA - Qiagen MinElute Purification

- * Combine Cy3 and Cy5 labelled DNA samples in single tube and add 500 μ l Buffer PB.
- * Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 500 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Add 250 μ l Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
- * Discard flow-through and place MinElute column back into same collection tube.
- * Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.
- * Place the MinElute column into a fresh 1.5 ml tube.
- * Add 10.5 μ l H₂O to the centre of the membrane and allow to stand for 1 min.
- * Centrifuge at 13,000 rpm for 1 min.

4. Preparation of Cy3 or Cy5 label cDNA from RNA

- a) Prepare one Cy3 and one Cy5 labelled cDNA sample per microarray slide.
- Each sample: RNA 2-10 μ g
- Random primers (3 μ g/ μ l) 1 μ l
- H₂O to 11 μ l
- Heat at 95 °C for 5 min, snap cool on ice and briefly centrifuge.
- Add to each: 5*First Strand Buffer 5 μ l
- DTT (100 mM)..... 2.5 μ l
- dNTPs (5 mM dA/G/TTP, 2 mM dCTP).... 2.3 μ l
- Cy3 OR Cy5 dCTP..... 1.7 μ l
- SuperScript II (200 U/ μ l)..... 2.5 μ l
- Incubate at 25 °C in dark for 10 min followed by 42 °C in dark for 90 min.
- b) Prehybridise slide
- Mix the prehybridisation solution in a Coplin jar and incubate at 65 °C during the labelling reaction to equilibrate.
- Prehybridisation:
- 20*SSC..... 8.75 ml (3.5*SSC)
- 20 % SDS 250 μ l (0.1 % SDS)

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BSA (100 mg/ml)..... 5 ml (10 mg/ml)
 H₂O to 50 ml

- Incubate the microarray slide in the pre-heated prehybridisation solution at 65 °C
- 5 for 20 min. Rinse slide thoroughly in 400 ml H₂O for 1 min followed by rinse in 400 ml propan-2-ol for 1 min and centrifuge slide in 50 ml centrifuge tube at 1500 rpm for 5 min to dry. Store slide in dark, dust-free box until hybridisation (< 1h).
- 10 c) Purify Cy3/Cy5 labelled cDNA - Qiagen MinElute Purification
- * Combine Cy3 and Cy5 labelled DNA samples in single tube and add 250 µl Buffer PB.
 - * Apply to MinElute column in collection tube and centrifuge at 13,000 rpm for 1 min.
 - 15 * Discard flow-through and place MinElute column back into same collection tube.
 - * Add 500 µl Buffer PE to MinElute column and centrifuge at 13,000 rpm for 1 min.
 - * Discard flow-through and place MinElute column back into same collection tube.
 - * Add 250 µl Buffer PE to MinElute column and centrifuge at 13,000 rpm for 20 1min.
 - * Discard flow-through and place MinElute column back into same collection tube.
 - * Centrifuge at 13,000 rpm for an additional 1 min to remove residual ethanol.
 - * Place the MinElute column into a fresh 1.5 ml tube.
 - * Add 10.5 µl H₂O to the centre of the membrane and allow to stand for 1 min.
 - 25 * Centrifuge at 13,000 rpm for 1 min.

5. Hybridise slide with Cy3/Cy5 labelled cDNA/DNA

- Place the prehybridise microarray slide in the hybridisation cassette and add two
- 30 15 µl aliquots of H₂O to the wells in the cassette. Mix resuspended Cy3/Cy5 labelled cDNA sample with hybridisation solution.

- Hybridisation: Cy3/Cy5 labelled cDNA sample.....10.5 µl
- 20xSSC 3.2 µl (4xSSC)
- 35 2% SDS.....2.3 µl (0.3% SDS)

Heat hybridisation solution at 95 °C for 2 min. Do NOT snap cool on ice but allow

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- to cool slightly and briefly centrifuge. Pipette the hybridisation solution onto the slide at the edge of the arrayed area avoiding bubble formation. Using forceps carefully drag the edge of a cover slip along the surface of the slide towards the arrayed area and into the hybridisation solution at the edge of the array. Carefully
- 5 lower the cover slip down over the array avoiding any additional movement once in place. Seal the hybridisation cassette and submerge in a water bath at 65 °C for 16-20 hours.

10 Wash slide

Remove microarray slide from hybridisation cassette and initially wash slide carefully in staining trough of Wash A preheated to 65 °C to remove cover slip. Once cover slip is displaced place slide(s) in slide rack and continue agitating in Wash A for a further 2 min.

15

Wash A: 20xSSC.....20 ml (1xSSC)
20% SDS.....1 ml (0.05% SDS)
H₂O.....to 400 ml

- 20 Transfer slide(s) to a clean slide rack and agitate in first trough of Wash B for 2 min. Wash in second trough of Wash B with agitation for 2 min.

Wash B (x2): 20xSSC.....1.2 ml (0.06xSSC)
H₂O.....to 400 ml

25

Place slide into a 50 ml centrifuge tube and centrifuge at 1500 rpm for 5 mins to dry slide and then scan fluorescence.

Table 2.
Genes induced or up-regulated under nutrient-starving conditions, or under nutrient-starving and oxygen-limiting conditions.

Gene	Assigned function	SEQ. ID. NO.
5Rv0021c	2-nitropropane dioxygenase	1, 2
Rv0029		3, 4
Rv0076c	peptide with a membrane-spanning domain at its C-terminus	5, 6
Rv0111	acetyltransferase	7, 8
Rv0161	oxidoreductase	9, 10
10Rv0212c	transcriptional regulator	11, 12
Rv0228	acyl transferase	13, 14
Rv0260c	two-component response regulator	15, 16
Rv0311		17, 18
Rv0322	UDP-glucose dehydrogenase	19, 20
15Rv0325		21, 22
Rv0389	phosphoribosylglycinamide formyltransferase	23, 24
Rv0390		25, 26
Rv0395		27, 28
Rv0480c		29, 30
20Rv493c		31, 32
Rv0534c	1,4-dihydroxy-2-naphthoate octaprenyl	33, 34
Rv0557		35, 36
Rv0614		37, 38
Rv0621	peptide containing a membrane-spanning region	39, 40
25Rv0622	peptide containing a membrane-spanning region	41, 42
Rv0697	gmc-type oxidoreductase	43, 44
Rv0698		45, 46
Rv0736		47, 48
Rv0751c	3-hydroxyisobutyrate dehydrogenase; methylmalonate semialdehyde dehydrogenase	49, 50
30Rv0775		51, 52

Gene	Assigned function	SEQ. ID. NO.
Rv0776c		53, 54
Rv0785	dehydrogenase	55, 56
Rv0790c		57, 58
Rv0794c	mercuric reductase; glutathione reductase; dihydrolipoamide dehydrogenase	59, 60
5 Rv0795	transposase	61, 62
Rv0836c		63, 64
Rv0837c		65, 66
Rv0840c	proline iminopeptidase; prolyl aminopeptidase	67, 68
Rv0849	integral membrane transport protein; quinolone efflux pump	69, 70
10 Rv0917	glycine betaine transporter	71, 72
Rv978c		73, 74
Rv1051c		75, 76
Rv1056		77, 78
Rv1089		79, 80
15 Rv1146	membrane protein	81, 82
Rv1147	phosphatidylethanolamine N-methyltransferase	83, 84
Rv1370c	transposase	85, 86
Rv1371	membrane protein	87, 88
Rv1372	chalcone synthase 2	89, 90
20 Rv1373	sulfotransferase	91, 92
Rv1429		93, 94
Rv1455		95, 96
Rv1482c		97, 98
Rv1496		99, 100
25 Rv1526c	glycosyl transferase	101, 102
Rv1528c	PKS-associated protein	103, 104
Rv1552	fumarate reductase flavoprotein	105, 106
Rv1569	8-amino-7-oxononanoate synthase; aminotransferase class-II pyridoxal-phosphate	107, 108

Gene	Assigned function	SEQ. ID. NO.
Rv1573	phage phiRv1 protein	109, 110
Rv1577c	bacteriophage HK97 prohead protease; phage phiRv1 protein	111, 112
Rv1670		113, 114
Rv1725c		115, 116
5Rv1730	penicillin-binding protein	117, 118
Rv1763	transposase	119, 120
Rv1765c		121, 122
Rv1777	cytochrome p450	123, 124
Rv1806		125, 126
10Rv1866	fatty acyl-CoA racemase	127, 128
Rv1917c		129, 130
Rv1939	nitrotriacetate monooxygenase	131, 132
Rv2013	transposase	133, 134
Rv2027c	histidine kinase response regulator	135, 136
15Rv2086	transposase	137, 138
Rv2087	transposase	139, 140
Rv2089c	pepQ; peptidase	141, 142
Rv2091c	peptide containing a transmembrane region	143, 144
Rv2093c	TatC component of twin-arginine translocation protein export system	145, 146
20Rv2105	transposase	147, 148
Rv2168c	transposase	149, 150
Rv2242		151, 152
Rv2282c	LysR transcription regulator	153, 154
Rv2292c		155, 156
25Rv2310	excisionase	157, 158
Rv2322c	ornithine aminotransferase	159, 160
Rv2323c		161, 162
Rv2332	malate oxidoreductase	163, 164
Rv2400c	thiosulphate-binding protein	165, 166
30Rv2414c		167, 168
Rv2437		169, 170

Gene	Assigned function	SEQ. ID. NO.
Rv2478c		171, 172
Rv2486	enoyl-CoA hydratase	173, 174
Rv2505c	acyl-CoA synthetase	175, 176
Rv2529	methyltransferase	177, 178
5 Rv2596		179, 180
Rv2847c	multifunctional enzyme; siroheme synthase	181, 182
Rv3635	transmembrane protein	183, 184
Rv2643	membrane protein	185, 186
Rv2648	transposase	187, 188
10 Rv2655c		189, 190
Rv2684	transmembrane protein; arsenical pump	191, 192
Rv2687c	regulatory protein	193, 194
Rv2690c	transport protein; permease	195, 196
Rv2800	glutaryl 7-aca acylase	197, 198
15 Rv2812	transposase	199, 200
Rv2813	secretion pathway protein	201, 202
Rv2835c	sn-glycerol-3-phosphate transport system permease protein	203, 204
Rv2874	integral membrane protein	205, 206
Rv2877c	mercury resistance protein	207, 208
20 Rv2943	transposase	209, 210
Rv2998		211, 212
Rv3015c		213, 214
Rv3022c		215, 216
Rv3039c	enoyl-CoA hydratase/isomerase	217, 218
25 Rv3061c	acyl-CoA dehydrogenase	219, 220
Rv3064c		221, 222

Gene	Assigned function	SEQ. ID. NO.
Rv3097c	esterase; lipase	223, 224
Rv3107c	dehydrogenase	225, 226
Rv3162c		227, 228
Rv3178		229, 230
5 Rv3184	transposase	231, 232
Rv3315c	cytidine deaminase	233, 234
Rv3322c	methytransferase	235, 236
Rv3351c		237, 238
Rv3352c	oxidoreductase	239, 240
10 Rv3373	enoyl-CoA hydratase (crotonase)	241, 242
Rv3439c		243, 244
Rv3446c		245, 246
Rv3447c	membrane protein	247, 248
Rv3450c		249, 250
15 Rv3467		251, 252
Rv3505	acyl-CoA dehydrogenase	253, 254
Rv3540c	lipid-transfer protein	255, 256
Rv3546	acetyl-CoA C-acetyltransferase	257, 258
Rv3550	enoyl-CoA hydratase/isomerase	259, 260
20 Rv3552		261, 262
Rv3565	aminotransferase	263, 264
Rv3569c	hydrolase	265, 266
Rv3606c	2- amino-4-hydroxy-6-hydroxymethylidihydropterine pyrophosphokinase	267, 268
Rv3637	transposase	269, 270
25 Rv3660c		271, 272
Rv3745c		273, 274
Rv3903c		275, 276
Rv0039c		277, 278
Rv0903c		279, 280
30 Rv2745c		281, 282

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References:

1. McKinney, J.D., et al., Persistence of *Mycobacterium tuberculosis* in macrophages and mice requires the glyoxylate shunt enzyme isocitrate lyase [see
5 comments]. Nature, 2000. 406(6797): p. 735-8.

2. Pelicic, V., et al., Efficient allelic exchange and transposon mutagenesis in *Mycobacterium tuberculosis*. Proc Natl Acad Sci U S A, 1997. 94(20): p.
10955-60.

3. Lee, M.H., et al., Site-specific integration of mycobacteriophage L5: integration- proficient vectors for *Mycobacterium smegmatis*, *Mycobacterium tuberculosis*, and bacille Calmette-Guerin. Proc Natl Acad Sci U S A, 1991. 88(8):
p. 3111-5.

4. McShane, H., et al., Enhanced immunogenicity of CD4(+) t-cell responses and protective efficacy of a DNA-modified vaccinia virus Ankara prime-boost vaccination regimen for murine tuberculosis. Infect Immun, 2001. 69(2): p. 681-6.

5. Movahedzadeh, F., M.J. Colston, and E.O. Davis, Characterization of *Mycobacterium tuberculosis* LexA: recognition of a Cheo (Bacillus-type SOS) box. Microbiology, 1997. 143(Pt 3): p. 929-36.

Additional References:

Cunningham, A. F. and C. L. Spreadbury. 1998. Mycobacterial stationary phase induced by low oxygen tension: cell wall thickening and localization of the 16-kilodalton alpha-crystallin homolog. J. Bacteriol. 180:801-808.

Lalvani, A. et al., 2001. Enhanced contact tracing and spatial tracking of *Mycobacterium tuberculosis* infection by enumeration of antigen-specific T cells. The Lancet 357:2017-2021.

-77-

Rook, G. A. W. and B. R. Bloom. 1994. Mechanisms of pathogenesis in tuberculosis, pp 460-485. In B. R. Bloom (ed), Tuberculosis- pathogenesis, protection and control. ASM Press, Washington DC.

- 5 Wayne, L. G. 1994. Dormancy of *Mycobacterium tuberculosis* and latency of disease. Eur. J. Clin. Microbiol. Infect. Dis. 13:908-914.

Wayne, L. G. and L. G. Hayes. 1996. An in vitro model for sequential study of shift-down of *Mycobacterium tuberculosis* through two stages of non-replicating
10 persistence. Infect. Immun. 64:2062-2069.

Wayne, L. G. and K. Lin. 1982. Glyoxylate metabolism and adaptation of *Mycobacterium tuberculosis* to survival under anaerobic conditions. Infect. Immun. 37:1042-1049.

15

Sambrook, J., E. F. Fritsch, and T. Maniatis. 1989. Molecular cloning: a laboratory manual, 2nd ed. Cold Spring Harbour Laboratory Press, Cold Spring Harbour, N. Y.

- 20 Lefever, P., O. Denis, L. De Wit, A. Tanghe, P. Vandenbussche, J. Content, and K. Huygen. 2000. Cloning of the gene encoding a 22-kilodalton cell surface antigen of *Mycobacterium bovis* BCG and analysis of its potential for DNA vaccination against tuberculosis. Infection and Immunity. 68:1040-1047.

- 25 Vordermeire, H. M., P. J. Cockle, A. O. Whelan, S. Rhodes, M. A. Chambers, D. Clifford, K. Huygen, R. Tascon, D. Lowrie, M. J. Colston, and R. G. Hewinson. 2000. Effective DNA vaccination of cattle with the mycobacterial antigens MPB83 and MPB70 does not compromise the specificity of the comparative intradermal tuberculin skin test. Vaccine. 19:1246-1255.

- 30 Cheng, W., C. Hung, C. Chai, K. Hsu, L. He, C. Rice, M. Ling, and T. Wu. 2001. Enhancement of Sindbis virus self-replicating RNA vaccine potency by linkage of *Mycobacterium tuberculosis* heat shock protein 70 gene to an antigen. J. Immunol. 166:6218-6226.

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Claims

1. An isolated mycobacterial peptide, or a fragment or derivative or variant of said peptide, wherein the peptide is encoded by a mycobacterial gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

2. An isolated mycobacterial peptide according to Claim 1, or a fragment or variant or derivative thereof, wherein the peptide is selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, and 281.

3. A method of identifying a mycobacterial gene the expression of which is induced or up-regulated during mycobacterial latency, said method comprising:-

culturing a first mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation;

culturing a second mycobacterium under culture conditions that are not nutrient-starving and which support exponential growth of the second mycobacterium;

obtaining first and second mRNA populations from said first and second mycobacteria, respectively wherein said first mRNA population is obtained from the

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first mycobacterium which has been cultured under nutrient-starving conditions obtainable by batch fermentation of the first mycobacterium for at least 20 days post-inoculation, and wherein said second mRNA is obtained from the second mycobacterium which has been cultured under conditions that are not nutrient-starving and which support exponential growth of said second mycobacterium;

preparing first and second cDNA populations from said first and second mRNA populations, respectively, during which cDNA preparation a detectable label is introduced into the cDNA molecules of the first and second cDNA populations;

isolating corresponding first and second cDNA molecules from the first and second cDNA populations, respectively;

comparing relative amounts of label or corresponding signal emitted from the label present in the isolated first and second cDNA molecules;

identifying a greater amount of label or signal provided by the isolated first cDNA molecule than that provided by the isolated second cDNA molecule; and

identifying the first cDNA and the corresponding mycobacterial gene that is induced or up-regulated during culture of a mycobacterium under latency conditions.

4. A method according to Claim 3, wherein the corresponding first and second cDNA molecules are isolated from the first and second cDNA populations, respectively, by hybridisation thereof to an array plate containing immobilised amplified DNA sequences that have been generated from mycobacterial genomic DNA, said immobilised sequences being representative of each known gene of the mycobacterial genome, and each representative sequence having been immobilised at an identified location on the plate.

5. A method according to Claim 3 or Claim 4, wherein the first mycobacterium is harvested at least 30, preferably at least 40 days post-inoculation.

6. A method according to any of Claims 3-5, wherein the culture conditions are carbon-starving to the growth of the mycobacteria.

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7. A method according to any of Claims 3-6, wherein the first mycobacterium is cultured under culture conditions defined by a dissolved oxygen tension of less than 10 %, preferably less than 7%, more preferably less than 5 %, air saturation when measured at 37 °C, and wherein the first mycobacterium is harvested under said culture conditions.

8. A method according to any of Claims 3-7, wherein a relative induction or up-regulation is identified by a relative 3-fold, preferably a relative 4-fold increase in the amount of label or signal provided by the isolated first cDNA molecule over that provided by the isolated second cDNA molecule.

9. An inhibitor of a mycobacterial peptide, wherein the peptide is encoded by a mycobacterial gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium, wherein the inhibitor is capable of preventing or inhibiting the mycobacterial peptide from exerting its native biological effect.

10. An inhibitor according to Claim 9, wherein the inhibitor is capable of inhibiting a protein selected from the group consisting of:- 2-nitropropane dioxygenase, acetyltransferase, oxidoreductase, transcriptional regulator, acyl transferase, UDP-glucose dehydrogenase, phosphoribosylglycinamide formyltransferase, 1,4-dihydroxy-2-naphthoate octaprenyl, gmc-type oxidoreductase, 3-hydroxyisobutyrate dehydrogenase, methylmalonate semialdehyde dehydrogenase, dehydrogenase, mercuric reductase, glutathione reductase, dihydrolipoamide, transposase, proline iminopeptidase, prolyl aminopeptidase, quinolone efflux pump, glycine betaine transporter, phosphatidylethanolamine N-methyltransferase, chalcone synthase 2, sulfotransferase, glycosyl transferase, fumarate reductase flavoprotein, 8-amino-7-oxononanoate synthase, aminotransferase class-II pyridoxal-phosphate, bacteriophage HK97 prohead protease, penicillin-binding protein, fatty acyl-CoA racemase, nitrilotriacetate monooxygenase, histidine kinase response regulator,

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peptidase, LysR transcription regulator, excisionase, ornithine aminotransferase, malate oxidoreductase, thiosulphate binding protein, enoyl-CoA hydratase, acyl-CoA synthetase, methyltransferase, siroheme synthase, permease, glutaryl 7-acylase, sn-glycerol-3-phosphate transport system permease, enoyl-CoA
 5 hydratase/isomerase, acyl-CoA dehydrogenase, esterase, lipase, cytidine deaminase, crotonase, lipid-transfer protein, acetyl-CoA C-acetyltransferase, aminotransferase, hydrolase, and 2-amino-4-hydroxy-6-hydroxymethyldihydropterine pyrophosphokinase.

10 11. An inhibitor according to Claim 9 or Claim 10, selected from the group consisting of:- an antibiotic capable of targeting the induced or up-regulated mycobacterial gene, or the gene product thereof; and an antisense or triplex-forming nucleic acid sequence which is complementary to at least part of the inducible or up-regulatable gene.

15

12. An antibody which binds to a peptide encoded by a mycobacterial gene, or to a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch
 20 fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

13. An antibody according to Claim 12, wherein the peptide is selected from the
 25 group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165,
 30 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, and 281.

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14. An attenuated mycobacterium in which a gene has been modified thereby rendering the mycobacterium substantially non-pathogenic, wherein the gene is a gene the expression of which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions
5 being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

15. An attenuated mycobacterium according to Claim 14, wherein the gene to be
10 modified has a wild-type coding sequence corresponding to one of the group consisting of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136,
15 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282.

20

16. An attenuated microbial carrier, comprising a mycobacterial peptide encoded by a gene, or a fragment or variant or derivative of said peptide, the expression of which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable
25 by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

17. An attenuated microbial carrier, according to Claim 16 wherein the peptide is
30 selected from the group consisting of SEQ ID NO: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127,

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5 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277,
279, and 281.

18. An attenuated microbial carrier according to Claim 16 or 17, wherein the
attenuated microbial carrier is attenuated salmonella, attenuated vaccinia virus,
10 attenuated fowlpox virus, or attenuated *M. bovis* (eg. BCG strain).

19. A DNA plasmid comprising a promoter, a polyadenylation signal, and DNA
sequence that is the coding sequence of a mycobacterial gene or a fragment or
derivative or variant of said coding sequence, the expression of which gene is
15 induced or up-regulated under culture conditions that are nutrient-starving and
which maintain mycobacterial latency, said conditions being obtainable by batch
fermentation of a mycobacterium for at least 20 days post-inoculation, when
compared with culture conditions that are not nutrient-starving and which support
exponential growth of said mycobacterium, wherein the promoter and
20 polyadenylation signal are operably linked to the DNA sequence.

20. A DNA plasmid according to Claim 19, wherein the DNA sequence is selected
from the group consisting of SEQ ID NO: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22,
24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62,
25 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100,
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30 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250,
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and 282.

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21. A DNA plasmid according to Claim 19 or 20, wherein the promoter is selected from the group consisting of CMV and SV40 promoters, and/or the polyadenylation signal is selected from SV40 and bovine growth hormone polyadenylation signals.

5 22. An isolated RNA sequence that is encoded by a DNA sequence, wherein the DNA sequence is the coding sequence of a mycobacterial gene or a fragment or variant or derivative of said DNA coding sequence, which gene is induced or up-regulated during culture of a mycobacterium under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being
10 obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium.

23. An RNA vector comprising the RNA sequence of Claim 22 and an integration
15 site for a chromosome of a host cell.

24. Use of a peptide or fragment or variant or derivative according to Claim 1 or Claim 2; an inhibitor according to any of Claims 9-11; an antibody according to Claim 12 or 13; an attenuated mycobacterium according to Claim 14 or 15; an
20 attenuated microbial carrier according to any of Claims 16-18; a DNA sequence that is the coding sequence of a mycobacterial gene or a fragment or variant or derivative of said coding sequence, which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium
25 for at least 20 days post-inoculation, when compared with culture conditions that are not nutrient-starving and which support exponential growth of said mycobacterium; a DNA plasmid according to any of Claims 19-21; an RNA sequence according to Claim 22; and/or an RNA vector according to Claim 23; in the manufacture of a medicament for treating or preventing a mycobacterial
30 infection.

25. A method of treating or preventing a mycobacterial infection, by administering to a patient a peptide or fragment or variant or derivative according to Claim 1 or

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Claim 2; an inhibitor according to any of Claims 9-11; an antibody according to Claim 12 or 13; an attenuated mycobacterium according to Claim 14 or 15; an attenuated microbial carrier according to any of Claims 16-18; a DNA sequence that is the coding sequence of a mycobacterial gene or a fragment or variant or
5 derivative of said coding sequence, which gene is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation when compared with culture conditions that are not nutrient-starving and which support exponential growth of said
10 mycobacterium; a DNA plasmid according to any of Claims 19-21; an RNA sequence according to Claim 22; and/or an RNA vector according to Claim 23.

26. Use of a peptide or fragment or variant or derivative according to Claim 1 or 2; or an antibody according to Claim 12 or 13; or a polynucleotide probe comprising at
15 least 8 nucleotides wherein said probe binds to at least part of a mycobacterial gene which is induced or up-regulated under culture conditions that are nutrient-starving and which maintain mycobacterial latency, said conditions being obtainable by batch fermentation of a mycobacterium for at least 20 days post-inoculation when compared with culture conditions that are not nutrient-starving and which
20 support exponential growth of said mycobacterium; in the manufacture of a diagnostic reagent for identifying a mycobacterial infection.

27. An isolated peptide, an inhibitor, an antibody, an attenuated mycobacterium, an attenuated microbial carrier, an isolated RNA molecule, an RNA vector, or a DNA
25 plasmid substantially as hereinbefore described with reference to the Examples.

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Fig. 1

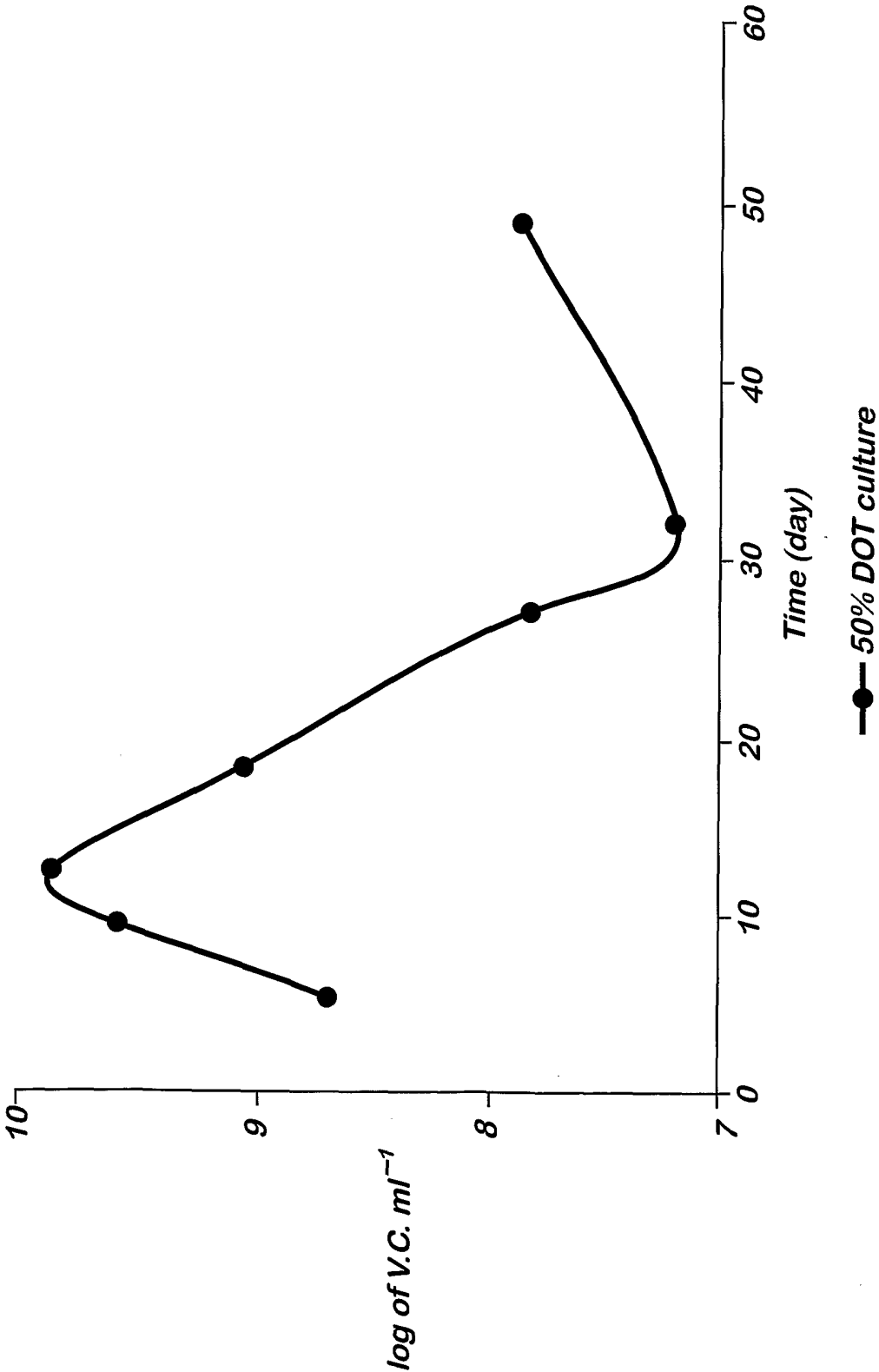
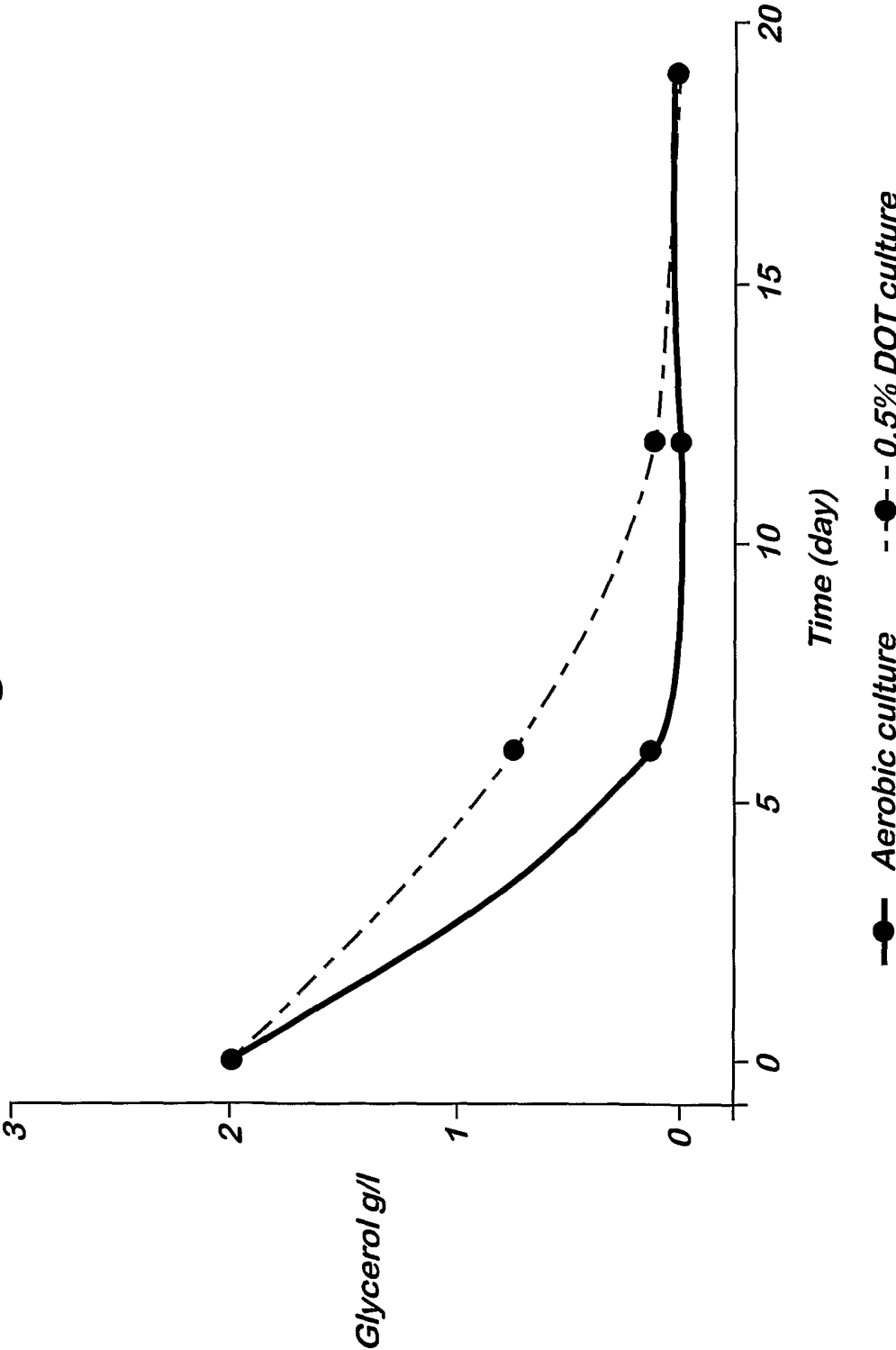
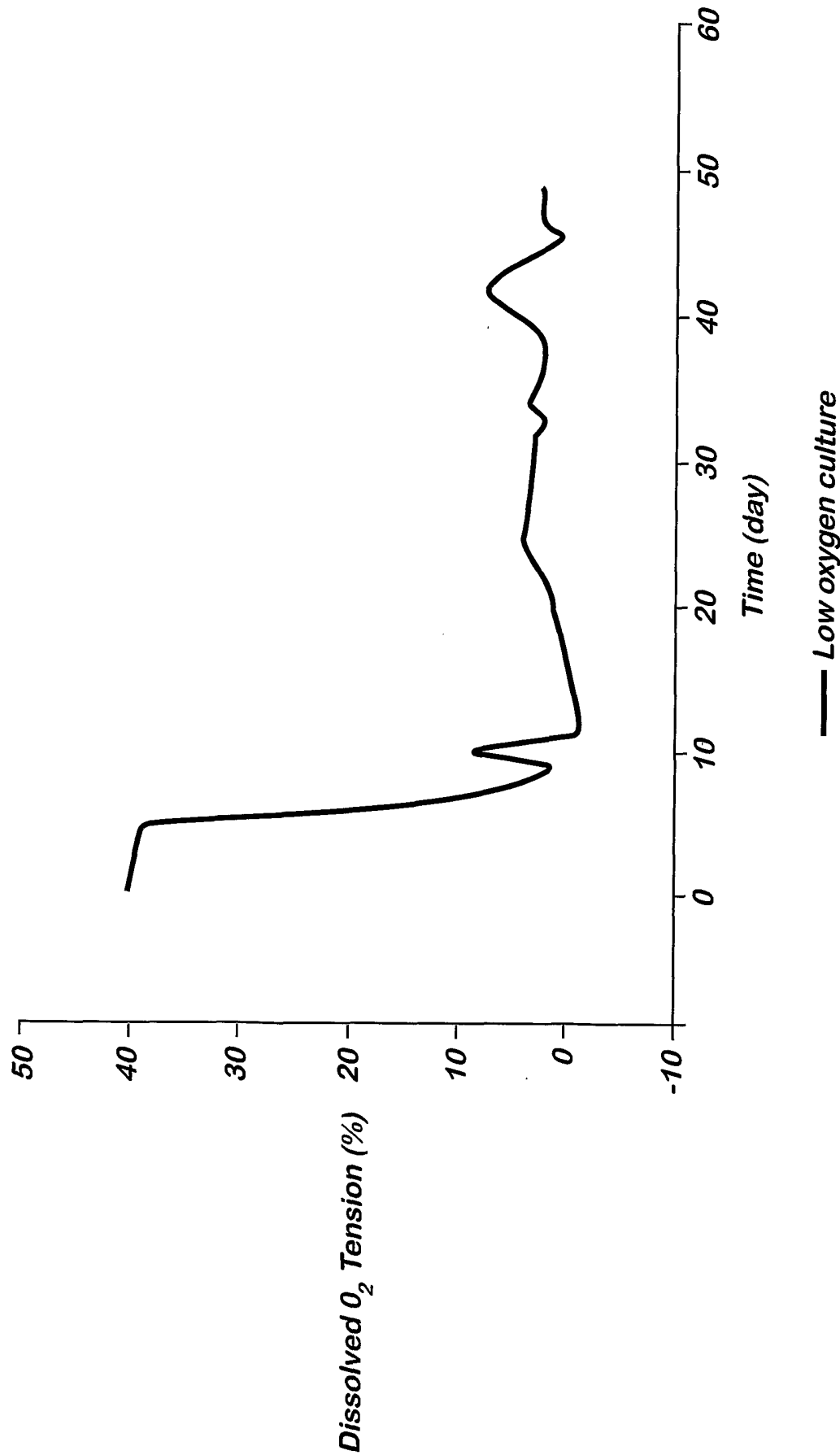


Fig. 2



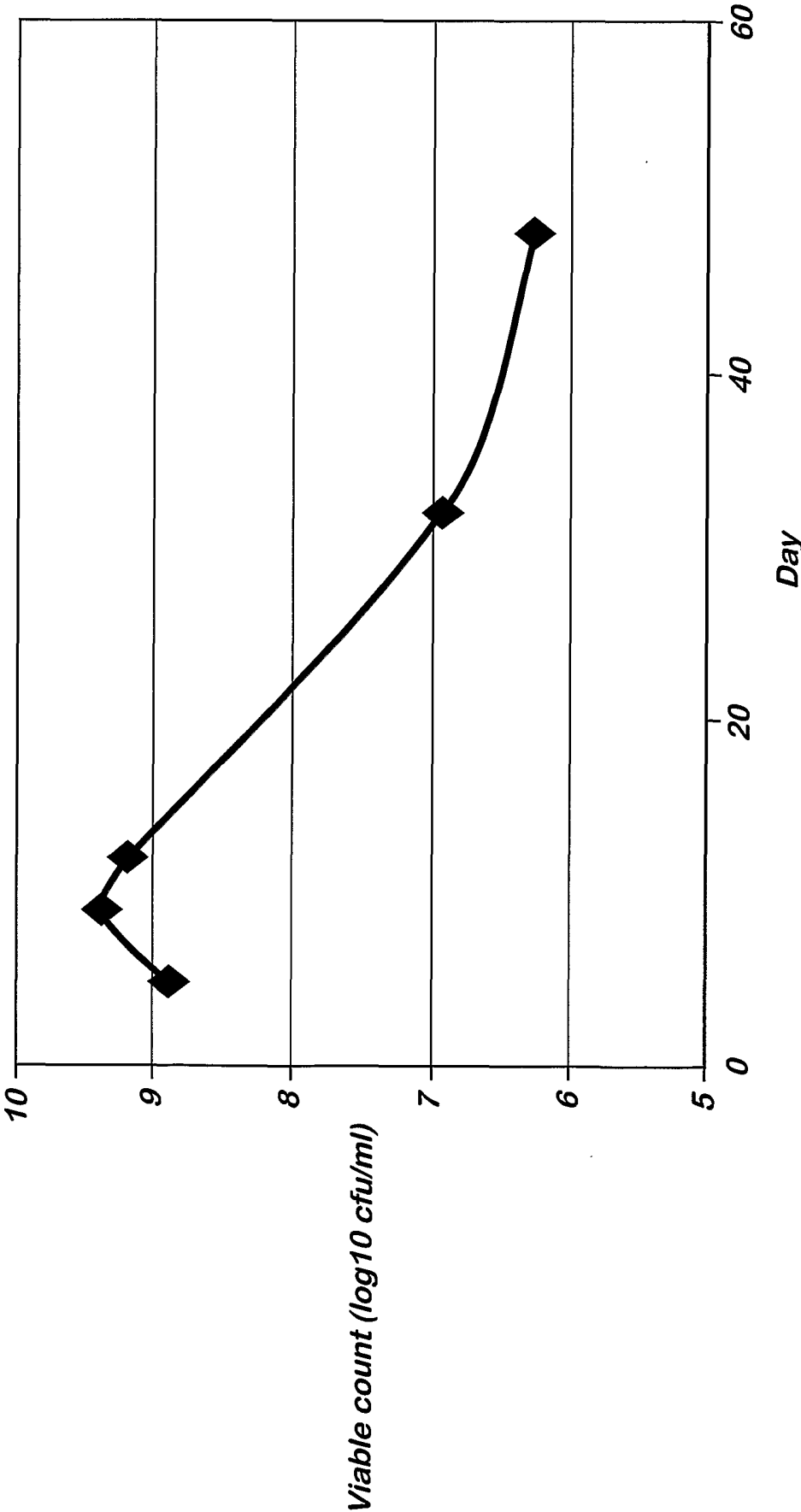
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Fig. 3



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Fig. 4



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Marsh, Philip

Hampshire, Toby

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aacgccatgt tacataacgc cattagccaa cactcgaacg tcggaatgat cgacctcaac 1920
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gatggtgttc atctcaccca ggaaggcgtg aagtggctga taccgtggct tgaggattcg 2040
gtgcgggtcg ccagt 2055

```

<210> 9

<211> 449

<212> PRT

<213> Mycobacterium tuberculosis

<400> 9

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Met Leu Thr Ser Leu Val Ser Ala Val Gly Ser His His Val Thr Thr
1           5           10           15

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```

Asp Pro Asp Val Leu Ala Gly Arg Ser Val Asp His Thr Gly Arg Tyr
20           25           30

```

```

Arg Gly Arg Ala Ser Ala Leu Val Arg Pro Gly Ser Ala Glu Glu Val
35           40           45

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Ala Glu Val Leu Arg Val Cys Arg Asp Ala Gly Ala Tyr Val Thr Val
 50 55 60

Gln Gly Gly Arg Thr Ser Leu Val Ala Gly Thr Val Pro Glu His Asp
 65 70 75 80

Asp Val Leu Leu Ser Thr Glu Arg Leu Cys Val Val Ser Asp Val Asp
 85 90 95

Thr Val Glu Arg Arg Ile Glu Ile Gly Ala Gly Val Thr Leu Ala Ala
 100 105 110

Val Gln His Ala Ala Ser Thr Ala Gly Leu Val Phe Gly Val Asp Leu
 115 120 125

Ser Ala Arg Asp Thr Ala Thr Val Gly Gly Met Ala Ser Thr Asn Ala
 130 135 140

Gly Gly Leu Arg Thr Val Arg Tyr Gly Asn Met Gly Glu Gln Val Val
 145 150 155 160

Gly Leu Asp Val Ala Leu Pro Asp Gly Thr Val Leu Arg Arg His Ser
 165 170 175

Arg Val Arg Arg Asp Asn Thr Gly Tyr Asp Leu Pro Ala Leu Phe Val
 180 185 190

Gly Ala Glu Gly Thr Leu Gly Val Ile Thr Ala Leu Asp Leu Arg Leu
 195 200 205

His Pro Thr Pro Ser His Arg Val Thr Ala Val Cys Gly Phe Ala Glu
 210 215 220

Leu Ala Ala Leu Val Asp Ala Gly Arg Met Phe Arg Asp Val Glu Gly
 225 230 235 240

Ile Ala Ala Leu Glu Leu Ile Asp Gly Arg Ala Ala Ala Leu Thr Arg
 245 250 255

Glu His Leu Gly Val Arg Pro Pro Val Glu Ala Asp Trp Leu Leu Leu
 260 265 270

Val Glu Leu Ala Ala Asp His Asp Gln Thr Asp Arg Leu Ala Asp Leu
 275 280 285

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Leu Gly Gly Ala Arg Met Cys Gly Glu Pro Ala Val Gly Val Asp Ala
 290 295 300

Ala Ala Gln Gln Arg Leu Trp Arg Thr Arg Glu Ser Leu Ala Glu Val
 305 310 315 320

Leu Gly Val Tyr Gly Pro Pro Leu Lys Phe Asp Val Ser Leu Pro Leu
 325 330 335

Ser Ala Ile Ser Gly Phe Ala Arg Asp Ala Val Ala Leu Val His Arg
 340 345 350

His Val Pro Asp Ser Pro Glu Ala Leu Pro Leu Leu Phe Gly His Ile
 355 360 365

Gly Glu Gly Asn Leu His Leu Asn Val Leu Arg Cys Pro Pro Asp Arg
 370 375 380

Glu Pro Ala Leu Tyr Ala Lys Met Met Gly Leu Ile Ala Glu Cys Gly
 385 390 395 400

Gly Asn Val Ser Ser Glu His Gly Val Gly Ser Arg Lys Arg Ala Tyr
 405 410 415

Leu Gly Met Ser Arg Gln Ala Asn Asp Val Ala Ala Met Arg Arg Val
 420 425 430

Lys Ala Ala Leu Asp Pro Thr Gly Tyr Leu Asn Ala Ala Val Leu Phe
 435 440 445

Asp

<210> 10

<211> 1347

<212> DNA

<213> Mycobacterium tuberculosis

<400> 10

atgctaacca gcttggtgag tgcggtcgga tcgcatcacg tcaccaccga ccctgacgtg

60

-15-

ctggccggcc gcagcgtcga ccacaccggc cgctatcggg gccggggccag cgcgctggtg 120
cgggccggct cggctgaaga ggtcgccgaa gtgctgcggg tgtgccggga cgctggagcc 180
tatgtcacccg ttcaaggcgg ccgcacctca ctggtggcgg gcaccgttcc cgaacacgac 240
gacgtgctgc tgtctaccga acggctttgc gtcgtcagcg atgtcgatac cgttgagcgc 300
cgaatcgaga tcggtgccgg ggtcacactg gccgcggtgc agcacgccgc gtcaacggct 360
gggctggtgt tcggcggtga tttgtcggcc cgggataccg cgaccgtcgg tggcatggcc 420
tcgacgaacg ccggcggtatt gcgcacggtc cgttacggca acatgggcga gcaggttgtc 480
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gacaacaccg gctacgacct gccgcgctg ttcgtcgggg ccgaaggcac cctggggggtt 600
atcacgcgcg tggatctgcg gctgcacccc acccgtcgc atcgggtgac agccgtgtgc 660
gggttcgccg agctggcagc gctggtcgat gccggccgaa tgttccgcga cgtggagggc 720
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gttcgcccc ccgtcgaggc tgactggttg ctattggtgg aactggccgc cgaccacgat 840
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ggtaacgtca gttcagaaca tgggggtgggc agccgcaagc gtgcctacct gggaatgtcc 1260
cggcaggcca acgacgtcgc cgcgatgcgg agggtaagg cggcggttga cccgaccggg 1320
taccttaacg ccgcggtctt gttcgac 1347

<210> 11

<211> 323

<212> PRT

<213> Mycobacterium tuberculosis

<400> 11

Val Thr His Gly Met Val Leu Gly Lys Phe Met Pro Pro His Ala Gly

1	5												10				15			
His	Val	Tyr	Leu	Cys	Glu	Phe	Ala	Arg	Arg	Trp	Val	Asp	Glu	Leu	Thr					
			20					25					30							
Ile	Val	Val	Gly	Ser	Thr	Ala	Ala	Glu	Pro	Ile	Pro	Gly	Ala	Gln	Arg					
		35					40					45								
Val	Ala	Trp	Met	Arg	Glu	Leu	Phe	Pro	Phe	Asp	Arg	Val	Val	His	Leu					
	50					55					60									
Ala	Asn	Glu	Asn	Pro	Gln	Arg	Pro	Trp	Glu	His	Pro	Asp	Phe	Trp	Asp					
65					70					75					80					
Ile	Trp	Lys	Ala	Ser	Leu	Gln	Gly	Val	Leu	Ala	Thr	Arg	Pro	Asp	Phe					
				85					90					95						
Val	Phe	Gly	Ala	Glu	Pro	Tyr	Asn	Ala	Asp	Phe	Ala	Gln	Val	Leu	Gly					
			100					105					110							
Ala	Arg	Phe	Val	Ala	Val	Asp	His	Gly	Arg	Thr	Val	Val	Pro	Val	Thr					
		115					120					125								
Ala	Thr	Asp	Ile	Arg	Ala	Asp	Pro	Leu	Gly	His	Trp	Gln	His	Ile	Pro					
	130					135					140									
Arg	Cys	Val	Arg	Pro	Ala	Phe	Val	Lys	Arg	Val	Ser	Ile	Ile	Gly	Pro					
145					150					155					160					
Glu	Ser	Thr	Gly	Lys	Thr	Thr	Leu	Ala	Gln	Ala	Val	Ala	Glu	Lys	Leu					
				165					170					175						
Arg	Thr	Lys	Trp	Val	Pro	Glu	Arg	Ala	Lys	Met	Leu	Arg	Glu	Leu	Asn					
			180					185					190							
Gly	Gly	Ser	Leu	Ile	Gly	Leu	Glu	Trp	Ala	Glu	Ile	Val	Arg	Gly	Gln					
		195					200					205								
Ile	Ala	Ser	Glu	Glu	Ala	Leu	Ala	Arg	Asp	Ala	Asp	Arg	Val	Leu	Ile					
	210					215					220									
Cys	Asp	Thr	Asp	Pro	Leu	Ala	Thr	Thr	Val	Trp	Ala	Glu	Phe	Leu	Ala					
225					230					235					240					

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Gly Gly Cys Pro Gln Glu Leu Arg Asp Leu Ala Arg Arg Pro Tyr Asp
 245 250 255

Leu Thr Leu Leu Thr Thr Pro Asp Val Pro Trp Asp Ala Asp Asp Gly
 260 265 270

Arg Cys Val Pro Gly Ala Arg Gly Thr Phe Phe Ala Arg Cys Glu Gln
 275 280 285

Ala Leu Arg Ala Ala Gly Arg Ser Phe Val Val Ile Thr Gly Gly Trp
 290 295 300

Glu Glu Arg Leu Ser Val Ser Leu Arg Ala Val Glu Glu Leu Val Arg
 305 310 315 320

Ala Arg Arg

<210> 12

<211> 969

<212> DNA

<213> Mycobacterium tuberculosis

<400> 12

gtgacacacg gaatggtgct cggcaagttc atgccgcccc atgcgggaca cgtctacctt 60
 tgcgagttcg cgcggcgatg ggtggatgag ctgaccatcg tcgtcggatc aacggcagca 120
 gagccgattc cgggcgcccc gcgcgttgca tggatgcggg agctgttccc cttcgatcgc 180
 gtggtccatc tggccaacga gaaccgcag cgcctgtggg agcaccgcga cttctgggac 240
 atctggaagg cgagcctgca gggcgtgctg gcaaccgcgc ccgacttcgt cttcgggtgcc 300
 gagccctaca acgcggaactt tgcccaggtc ctcggagcgc gtttcgtggc ggtcgatcac 360
 ggtcgcaccg tcgttcccgt gactgcaacc gacatccgcg cggacccgct tggccactgg 420
 caacacatcc cacggtgctg gcggccggcc ttcgtcaaac gcgtgagcat catcggaacc 480
 gaatccaccg ggaagaccac gctggcacag gcggttgccg aaaagctccg aacgaagtgg 540
 gtcccggagc gggcgaaaat gttgcgggag ctcaatggcg gctcactgat aggactggag 600
 tgggcccga aa tcgttcgcgg acagatcgcg tcggaggaag ccttggctcg tgacgccgat 660
 cgcgtcctga tctgcgacac ggatccgctc gcgacgaccg tgtgggcccga gttcctggcg 720

-18-

```

ggcggctgcc cgcaagagct ccgtgatcta gctcggcgctc cctacgatct cacactgctc      780
accacgcccg atgtgccctg ggacgccgac gacggacgct gtgtccccgg cgcacgcggt      840
acctttttcg cccgctgcga gcaggctctc cgcgccgcgg gacgatcatt cgtgggtgatc      900
acggggcggtt gggaagagag gctttcggtg tctttgcgcg ctgtcgaaga acttgtgcgt      960
gcccgcgcgc                                         969

```

<210> 13

<211> 407

<212> PRT

<213> Mycobacterium tuberculosis

<400> 13

```

Met Gly Pro Ala Asp Glu Ser Gly Ala Pro Ile Arg Pro Gln Thr Pro
1           5           10           15

```

```

His Arg His Thr Val Leu Val Thr Asn Gly Gln Val Val Gly Gly Thr
          20           25           30

```

```

Arg Gly Phe Leu Pro Ala Val Glu Gly Met Arg Ala Cys Ala Ala Val
          35           40           45

```

```

Gly Val Val Val Thr His Val Ala Phe Gln Thr Gly His Ser Ser Gly
50           55           60

```

```

Val Gly Gly Arg Leu Phe Gly Arg Phe Asp Leu Ala Val Ala Val Phe
65           70           75           80

```

```

Phe Ala Val Ser Gly Phe Leu Leu Trp Arg Gly His Ala Ala Ala Ala
          85           90           95

```

```

Arg Asp Leu Arg Ser His Pro Arg Thr Gly Pro Tyr Leu Arg Ser Arg
          100          105          110

```

```

Val Ala Arg Ile Met Pro Ala Tyr Val Val Ala Val Val Val Ile Leu
          115          120          125

```

```

Ser Leu Leu Pro Asp Ala Asp His Ala Ser Leu Thr Val Trp Leu Ala
          130          135          140

```

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Asn Leu Thr Leu Thr Gln Ile Tyr Val Pro Leu Thr Leu Thr Gly Gly
 145 150 155 160

Leu Thr Gln Met Trp Ser Leu Ser Val Glu Val Ala Phe Tyr Ala Ala
 165 170 175

Leu Pro Val Leu Ala Leu Leu Gly Arg Arg Ile Pro Val Gly Ala Arg
 180 185 190

Val Pro Ala Ile Ala Ala Leu Ala Ala Leu Ser Trp Ala Trp Gly Trp
 195 200 205

Leu Pro Leu Asp Ala Gly Ser Gly Ile Asn Pro Leu Thr Trp Pro Pro
 210 215 220

Ala Phe Phe Ser Trp Phe Ala Ala Gly Met Leu Leu Ala Glu Trp Ala
 225 230 235 240

Tyr Ser Pro Val Gly Leu Pro His Arg Trp Ala Arg Arg Arg Val Ala
 245 250 255

Met Ala Val Thr Ala Leu Leu Gly Tyr Leu Val Ala Ala Ser Pro Leu
 260 265 270

Ala Gly Pro Glu Gly Leu Val Pro Gly Thr Ala Ala Gln Phe Ala Val
 275 280 285

Lys Thr Ala Met Gly Ser Leu Val Ala Phe Ala Leu Val Ala Pro Leu
 290 295 300

Val Leu Asp Arg Pro Asp Thr Ser His Arg Leu Leu Gly Ser Pro Ala
 305 310 315 320

Met Val Thr Leu Gly Arg Trp Ser Tyr Gly Leu Phe Ile Trp His Leu
 325 330 335

Ala Ala Leu Ala Met Val Phe Pro Val Ile Gly Ala Phe Pro Phe Thr
 340 345 350

Gly Arg Met Pro Thr Val Leu Val Leu Thr Leu Ile Phe Gly Phe Ala
 355 360 365

Ile Ala Ala Val Ser Tyr Ala Leu Val Glu Ser Pro Cys Arg Glu Ala
 370 375 380

-20-

Leu Arg Arg Trp Glu Arg Arg Asn Glu Pro Ile Ser Val Gly Glu Leu
 385 390 395 400

Gln Ala Asp Ala Ile Ala Pro
 405

<210> 14

<211> 1221

<212> DNA

<213> Mycobacterium tuberculosis

<400> 14

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atggggcccg cggacgaatc ggggtgcaccg attcgcccgc aaacacctca caggcacact      60
gtgttggtga ccaacggcca ggtggtgggt gggaccctgt gctttctgcc cgccgtcgag      120
ggaatgcgcg catgcgcggc cgtcggcgtc gtggtcactc acgtcgcgtt ccagaccggg      180
cactctagcg gtgtggggcg gcggctgttc ggccgcttcg atctggcggt ggcggtgttc      240
ttcgccgtgt cgggattctt gttgtggcgc ggacacgccg cagcggcgcg agatctgcgg      300
tcacaccgcg gaaccgggtc gtatctgcga tcgcgggttg cgcgcatcat gccggcctat      360
gtggtggcgg tggtcgtcat cctgtccctg ctgcccgcgc cggatcatgc cagcctgacc      420
gtgtggctgg ccaacctgac gtcacccag atctatgtgc cgctgaccct gaccggcggc      480
ctgaccagga tgtggagcct gtccgtggag gtgcgcttct atgcggcgct gccggtctta      540
gcgttgctgg gccgccgaat tccggtcggt gcccgagtgc cggcgatcgc ggcgctggcg      600
gcgctcagct gggcggtggg ctggctcccg ttggacgccg ggtcggggat caaccgcttg      660
acctggccgc cggcgcttct ctcgtggttc gccgcgggaa tgttgctggc ggagtgggcc      720
tacagcccgg tcgggttgcc gcatcggtgg gcgcgccgcc gcgtggcgat ggcggttacc      780
gcgctgctgg gttacctggt ggcggcctcg ccgttggcgg gtccggaggg cctggttccg      840
ggcacggcgg cacaattcgc ggtgaagacc gcgatgggct cgctggtagc gttcgcgctg      900
gtggcgccgc tgggtgctgga ccggcccgc acgtcgcacc ggctgctggg cagccccgcg      960
atggtgaccc tgggcccgtt gtcctatggc ctgttcatct ggcatctggc cgcgctggcc     1020
atggtgtttc ccgtgatcgg agcgttcccg ttaccgggc gaatgccgac ggtgctggtg     1080
ttgacgctga tcttcggttt cgcgatcgcc gcggtcagct acgccctggt cgagtcgccc     1140

```

-21-

tgccgggaag cgttgccgcg ctgggagcgc cgcaacgaac ccatatcggt cggcgaactt 1200
 caggcggacg cgattgcacc c 1221

<210> 15

<211> 381

<212> PRT

<213> Mycobacterium tuberculosis

<400> 15

Met Ala Gln Ala His Ser Ala Pro Leu Thr Gly Tyr Arg Ile Ala Val
 1 5 10 15

Thr Ser Ala Arg Arg Ala Glu Glu Leu Cys Ala Leu Leu Arg Arg Gln
 20 25 30

Gly Ala Glu Val Cys Ser Ala Pro Ala Ile Lys Met Ile Ala Leu Pro
 35 40 45

Asp Asp Asp Glu Leu Gln Asn Asn Thr Glu Ala Leu Ile Ala Asp Pro
 50 55 60

Pro Asp Ile Leu Val Ala His Thr Gly Ile Gly Phe Arg Gly Trp Leu
 65 70 75 80

Ala Ala Ala Glu Gly Trp Gly Leu Ala Asn Glu Leu Leu Glu Ser Leu
 85 90 95

Ser Ser Ala Arg Ile Ile Ser Arg Gly Pro Lys Ala Thr Gly Ala Leu
 100 105 110

Arg Ala Ala Gly Leu Arg Glu Glu Trp Ser Pro Asp Ser Glu Ser Ser
 115 120 125

His Glu Val Leu Glu Tyr Leu Leu Glu Ser Gly Val Ser Arg Thr Arg
 130 135 140

Ile Ala Val Gln Leu His Gly Ala Ala Asp Ser Trp Asp Pro Phe Pro
 145 150 155 160

Glu Phe Leu Gly Gly Leu Arg Phe Ala Gly Ala Gln Val Val Pro Ile

175

<211> 1143

-23-

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 16

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cgcgccgaag agctgtgcgc attgcttcgc cgccagggcg ccgaggtctg tagtgcccca      120
gcgatcaaga tgatcgcgct tcccgcgcgc gatgaactgc agaacaacac cgagggcggtg      180
atcgccgacc cgcctgacat tctggtcgcc cacaccggca tcggatttcg cggctgggtg      240
gccgcggccg aggggtgggg gctggccaac gagctcctgg aatcgttgtc gtcggcccgg      300
atcatctccc gcggaccaa ggcaactggt gcgctgcgtg ccgccggcct gcgtgaagag      360
tggtcccccg actctgaatc gtcgcatgaa gtgctggaat atctgctcga atcggggggtg      420
tcccgtagcg gtattgccgt ccagctgcac ggtgccgccg acagctggga cccgtttccg      480
gaatttctgg gcgggttacg tttcgccggc gcgcaagtgg tgccgatccg ggtttaccgg      540
tggaagccgg cgccactagg cggcgtgttc gaccatttag tcaccgggat cgcgcgacga      600
caattcgacg cggtcacctt cacgtcggca cctgccgcag ccgcggtgct agaacgcagc      660
cgtgaattgg atatcgagga ccaactgttg gctgcgctgc gtaccgacgt gcacgcgatg      720
tgtgtcggcc cggtaacttc gcggccgttg atccgaaagg gcgtcccgcg gtcggctccc      780
gagcgaatgc ggttgggagc cttagccgcg cacattgccg aggagctgcc gctgctgggt      840
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gatgattcgg tgaagccact atcgccgtcc ggaatggcga ttttgcgcgc gttggtacat      960
cgccccggcg gcgtcgtctc tcgtggcgac ttgctacgcg tcctaccggg cgacggcagc     1020
gacaccacag ccgtggacac cgccgtcctg cggctacgaa cggctctggg cgacaagaac     1080
atcgtggcaa cagtggtgaa acgtggctac cgtctcgccg ttgacagccg gcacgatgac     1140
gta                                                                    1143
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<210> 17

<211> 409

<212> PRT

<213> *Mycobacterium tuberculosis*

-24-

<400> 17

Met Ser Gln Ser Arg Tyr Ala Gly Leu Ser Arg Ser Glu Leu Ala Val
 1 5 10 15

Leu Leu Pro Glu Leu Leu Leu Ile Gly Gln Leu Ile Asp Arg Ser Gly
 20 25 30

Met Ala Trp Cys Ile Gln Ala Phe Gly Arg Gln Glu Met Leu Gln Ile
 35 40 45

Ala Ile Glu Glu Trp Ala Gly Ala Ser Pro Ile Tyr Thr Lys Arg Met
 50 55 60

Gln Lys Ala Leu Asn Phe Glu Gly Asp Asp Val Pro Thr Ile Phe Lys
 65 70 75 80

Gly Leu Gln Leu Asp Ile Gly Ala Pro Pro Gln Phe Met Asp Phe Arg
 85 90 95

Phe Thr Leu His Asp Arg Trp His Gly Glu Phe His Leu Asp His Cys
 100 105 110

Gly Ala Leu Leu Asp Val Glu Pro Met Gly Asp Asp Tyr Val Val Gly
 115 120 125

Met Cys His Thr Ile Glu Asp Pro Thr Phe Asp Ala Thr Ala Ile Ala
 130 135 140

Thr Asn Pro Arg Ala Gln Val Arg Pro Ile His Arg Pro Pro Arg Lys
 145 150 155 160

Pro Ala Asp Arg His Pro His Cys Ala Trp Thr Val Ile Ile Asp Glu
 165 170 175

Ser Tyr Pro Glu Ala Glu Gly Ile Pro Ala Leu Asp Ala Val Arg Glu
 180 185 190

Thr Lys Ala Ala Thr Trp Glu Leu Asp Asn Val Asp Ala Ser Asp Asp
 195 200 205

Gly Leu Val Asp Tyr Ser Gly Pro Leu Val Ser Asp Leu Asp Phe Gly
 210 215 220

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Ala Phe Ser His Ser Ala Leu Val Arg Met Ala Asp Glu Val Cys Leu
 225 230 235 240

Gln Met His Leu Leu Asn Leu Ser Phe Ala Ile Ala Val Arg Lys Arg
 245 250 255

Ala Lys Ala Asp Ala Gln Leu Ala Ile Ser Val Asn Thr Arg Gln Leu
 260 265 270

Ile Gly Val Ala Gly Leu Gly Ala Glu Arg Ile His Arg Ala Met Ala
 275 280 285

Leu Pro Gly Gly Ile Glu Gly Ala Leu Gly Val Leu Glu Leu His Pro
 290 295 300

Leu Leu Asn Pro Ala Gly Tyr Val Leu Ala Glu Thr Ser Pro Asp Arg
 305 310 315 320

Leu Val Val His Asn Ser Pro Ala His Ala Asp Gly Ala Trp Ile Ser
 325 330 335

Leu Cys Thr Pro Ala Ser Val Gln Pro Leu Gln Ala Ile Ala Thr Ala
 340 345 350

Val Asp Pro His Leu Lys Val Arg Ile Ser Gly Thr Asp Thr Asp Trp
 355 360 365

Thr Ala Glu Leu Ile Glu Ala Asp Ala Pro Ala Ser Glu Leu Pro Glu
 370 375 380

Val Leu Val Ala Lys Val Ser Arg Gly Ser Val Phe Gln Phe Glu Pro
 385 390 395 400

Arg Arg Ser Leu Pro Leu Thr Val Lys
 405

<210> 18

<211> 1227

<212> DNA

<213> Mycobacterium tuberculosis

-26-

<400> 18
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 ctgttggtga tcggccagct gatcgaccga tcgggcattg cctggtgtat acaggcattc 120
 ggccgcccagg agatgctgca gatcgccatc gaggagtggg cgggcgcccag cccgatctac 180
 accaagcgca tgcaaaaggc gctgaacttc gagggcgacg acgtgcccac catcttcaag 240
 gggctacagc tcgacatcgg cgcgcgcgcg caattcatgg acttccgttt caccctgcac 300
 gaccgctggc acggcgagtt tcacctgcac cactgcggtg cgctgctcga cgtggagccg 360
 atgggcgcgc actacgtcgt cggcatgtgc cacaccatcg aagatccgac gttcgacgcc 420
 accgcgatcg cgaccaaccc gcgcgcgcgc gtgcgccccca tccaccggcc gcccgcgaag 480
 ccggccgacc ggcatccgca ctgtgcgtgg accgtcatca tcgacgagtc ctatcccagag 540
 gctgagggta ttccggcgct ggacgcggtc cgtgaaacca aagctgccac ctgggaatta 600
 gacaacgtcg atgcgtctga cgacgggctg gtggactatt cgggtccgct ggtgtccgac 660
 ctggacttcg gggcgttctc gcattccgca ctggtgcgga tggccgatga ggtctgcctg 720
 caaatgcacc tgctgaatct gtcgttcgcc attgccgtgc ggaaacgggc caaagccgat 780
 gctcaactgg ccatttcggt gaacacccgc cagttgatcg gagtggccgg gctgggcgca 840
 gaacgcattc accgtgcgat ggctttaccc ggcggaatcg aaggcgcggt aggtgtgctg 900
 gagctacacc cgctgctcaa cccggccggt tacgtgctgg ccgaaacgtc gccggaccgt 960
 ctggtggtgc acaactcgcc agcccacgcc gacggcgccct ggatttcggt gtgcacaccg 1020
 gcatccgtgc agccgttgca ggccatcgcc accgctgtag acccgcatct gaaggttcgg 1080
 atcagcggga cggacaccga ctggaccgcg gaactcatcg aggccgatgc cccagcgagc 1140
 gaactgccgg aggtgttggt agccaaggtc agtcgcggat cggctcttcca gttcgagccg 1200
 aggcgctcac tgccgttgac cgtgaaa 1227

<210> 19

<211> 443

<212> PRT

<213> Mycobacterium tuberculosis

<400> 19

Val Arg Cys Ser Val Phe Gly Thr Gly Tyr Leu Gly Ala Thr His Ala
 1 5 10 15

-27-

Val Gly Met Ala Gln Leu Gly His Glu Val Val Gly Val Asp Ile Asp
 20 25 30

Pro Gly Lys Val Ala Lys Leu Ala Gly Gly Asp Ile Pro Phe Tyr Glu
 35 40 45

Pro Gly Leu Arg Lys Leu Leu Thr Asp Asn Leu Ala Ala Gly Arg Leu
 50 55 60

Arg Phe Thr Thr Asp Tyr Asp Met Ala Ala Asp Phe Ala Asp Val His
 65 70 75 80

Phe Leu Gly Val Gly Thr Pro Gln Lys Ile Gly Glu Tyr Gly Ala Asp
 85 90 95

Leu Arg His Val His Ala Val Ile Asp Ala Leu Val Pro Arg Leu Val
 100 105 110

Arg Ala Ser Ile Leu Val Gly Lys Ser Thr Val Pro Val Gly Thr Ala
 115 120 125

Ala Glu Leu Gly His Arg Ala Gly Ala Leu Ala Pro Arg Gly Val Asp
 130 135 140

Val Glu Ile Ala Trp Asn Pro Glu Phe Leu Arg Glu Gly Phe Ala Val
 145 150 155 160

His Asp Thr Leu Asn Pro Asp Arg Ile Val Leu Gly Val Gln Asp Asp
 165 170 175

Ser Thr Arg Ala Glu Val Ala Val Arg Glu Leu Tyr Ala Pro Leu Leu
 180 185 190

Ala Ala Gly Val Pro Phe Leu Val Thr Asp Leu Gln Thr Ala Glu Leu
 195 200 205

Val Lys Val Ser Ala Asn Ala Phe Leu Ala Thr Lys Ile Ser Phe Ile
 210 215 220

Asn Ala Ile Ser Glu Val Cys Glu Ala Ala Gly Ala Asp Val Ser Gln
 225 230 235 240

Leu Ala Asp Ala Leu Gly Tyr Asp Pro Arg Ile Gly Arg Gln Cys Leu

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	245		250		255										
Asn	Ala	Gly	Leu	Gly	Phe	Gly	Gly	Gly	Cys	Leu	Pro	Lys	Asp	Ile	Arg
		260						265					270		
Ala	Phe	Met	Ala	Arg	Ala	Gly	Glu	Leu	Gly	Ala	Asp	Gln	Ala	Leu	Thr
		275					280					285			
Phe	Leu	Arg	Glu	Val	Asp	Ser	Ile	Asn	Met	Arg	Arg	Arg	Thr	Lys	Met
		290				295					300				
Val	Glu	Leu	Ala	Thr	Thr	Ala	Cys	Gly	Gly	Ser	Leu	Leu	Gly	Ala	Asn
305					310					315					320
Ile	Ala	Val	Leu	Gly	Ala	Ala	Phe	Lys	Pro	Glu	Ser	Asp	Asp	Val	Arg
			325						330					335	
Asp	Ser	Pro	Ala	Leu	Asn	Val	Ala	Gly	Gln	Leu	Gln	Leu	Asn	Gly	Ala
			340					345					350		
Thr	Val	His	Val	Tyr	Asp	Pro	Lys	Ala	Leu	Asp	Asn	Ala	His	Arg	Leu
		355					360					365			
Phe	Pro	Thr	Leu	Asn	Tyr	Ala	Val	Ser	Val	Ala	Glu	Ala	Cys	Glu	Arg
		370				375					380				
Ala	Asp	Ala	Val	Leu	Val	Leu	Thr	Glu	Trp	Arg	Glu	Phe	Ile	Asp	Leu
385				390						395					400
Glu	Pro	Ala	Asp	Leu	Ala	Asn	Arg	Val	Arg	Ala	Arg	Val	Ile	Val	Asp
			405						410					415	
Gly	Arg	Asn	Cys	Leu	Asp	Val	Thr	Arg	Trp	Arg	Arg	Ala	Gly	Trp	Arg
		420						425					430		
Val	Phe	Arg	Leu	Gly	Val	Pro	Arg	Leu	Gly	His					
		435				440									

<210> 20

<211> 1329

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 20
 gtgcatgca gcgctcttcgg cactgggtat ctgggtgccca cccacgccgt cggatatggcg 60
 caactgggac acgaggtcgt cggggtcgat atcgatcccg gtaaggctgc caagctcgcc 120
 gggggtgaca ttccgttcta cgaacccggc ctgcgaaagc tggtgactga taacctggct 180
 gccggccgct tgcggttcac caccgactac gacatggcgg ccgatttcgc cgacgtgcat 240
 ttcttggggg tgggcacgcc gcaaaagata ggcaatatg gcgccgacct gcggcatgtc 300
 cagcccgctca tcgatgcgct ggtgccgct ctggtcaggg cgtcgattct ggtcggcaag 360
 tcgacagtcc cagtgggcac cgcagccgaa ctgggacatc gggccggtgc actggcacc 420
 cggggagtcg acgtggaaat tgcctggaat ccggaattcc tgcgcgaggg cttcgcggtg 480
 cagcacacc tcaacccga ccgtatcgtc cttgggttac aagatgattc gacgcgcgcc 540
 gaggtagccg tccgcgagct gtacgcgcgc ctgctggcag cgggcgtgcc gtttctgggtg 600
 accgatctgc agaccgcgga gttggtcaag gtatccgccca atgcctttct ggcgaccaag 660
 atttcgttta tcaatgcgat ctccgaagtg tgcgaggcgg cgggtgccga cgtagccag 720
 ctggccgatg cgctcgata cgaccgcgg atcggacgcc aatgcctcaa cgcgggcttg 780
 ggtttcggcg gcggtctgctt gcccaaggac atccgcgctt tcatggcccg cgcggcgaa 840
 ctgggagccg accaggcgctt gacgttcctg cgtgaagtgg acagcatcaa catgcgccgg 900
 cgcaccaaga tgggtggaact ggccaccacc gcatgcggtg gctcgttgct ggcgcgcaat 960
 attgcggtgc tcggcgcggc gttcaaacc gaatccgatg acgtgcgcga ttgcgccgcc 1020
 ctcaatgtgg cgggccagct gcagctcaac ggcgccacgg tccacgtgta cgatccaaag 1080
 gccttgagaca acgcccaccg actgttcctt acctggaact atgcggtttc ggtagcgag 1140
 gcctgcgagc gcgcggacgc cgtgttggtg cttaccgaat ggcgggagtt catcgatctc 1200
 gaaccgcgtg atctagccaa ccgggtgcgg gcccggtga tcgtggacgg ccgcaactgc 1260
 ctgcagctga cccgctggcg gcgggcaggc tggcgggtgt tccggctggg agtgccgcga 1320
 ttagggcac 1329

<210> 21

<211> 74

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 21

Val Gly Pro Lys Gly Ser Leu Arg Leu Val Lys Arg Gln Pro Glu Leu
 1 5 10 15

Leu Val Ala Gln His Glu His Trp Gln Asp Thr Tyr Arg Ala His Pro
 20 25 30

Val Leu Tyr Gly Thr Arg Pro Ser Glu Pro Gly Val Tyr Ala Ala Glu
 35 40 45

Val Phe Asn Ala Asp Gly Val Gln Arg Val Leu Glu Leu Ala Ala Gly
 50 55 60

His Gly Arg Asp Thr Leu Tyr Phe Ala Gly
 65 70

<210> 22

<211> 222

<212> DNA

<213> Mycobacterium tuberculosis

<400> 22

gtggggccga agggaagtct acgtttggtg aagcggcagc cagaactgct cgttgcccag 60
 catgaacact ggcaggacac ctaccgagcg catccggtgc tgtacggaac ccgcccgtca 120
 gagccggggg tatatgccgc cgaggtgttc aatgccgacg gcgtgcagcg ggtgctggag 180
 ttggcgggccg gtcattgggcg tgacaccctg tatttcgctg gc 222

<210> 23

<211> 419

<212> PRT

<213> Mycobacterium tuberculosis

<400> 23

Val Ile Asp Gly Trp Thr Glu Glu Gln His Glu Pro Thr Val Arg His
 1 5 10 15

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Glu Arg Pro Ala Ala Pro Gln Asp Val Arg Arg Val Met Leu Leu Gly
 20 25 30

Ser Ala Glu Pro Ser Arg Glu Leu Ala Ile Ala Leu Gln Gly Leu Gly
 35 40 45

Ala Glu Val Ile Ala Val Asp Gly Tyr Val Gly Ala Pro Ala His Arg
 50 55 60

Ile Ala Asp Gln Ser Val Val Val Thr Met Thr Asp Ala Glu Glu Leu
 65 70 75 80

Thr Ala Val Ile Arg Arg Leu Gln Pro Asp Phe Leu Val Thr Val Thr
 85 90 95

Ala Ala Val Ser Val Asp Ala Leu Asp Ala Val Glu Gln Ala Asp Gly
 100 105 110

Glu Cys Thr Glu Leu Val Pro Asn Ala Arg Ala Val Arg Cys Thr Ala
 115 120 125

Asp Arg Glu Gly Leu Arg Arg Leu Ala Ala Asp Gln Leu Gly Leu Pro
 130 135 140

Thr Ala Pro Phe Trp Phe Val Gly Ser Leu Gly Glu Leu Gln Ala Val
 145 150 155 160

Ala Val His Ala Gly Phe Pro Leu Leu Val Ser Pro Val Ala Gly Val
 165 170 175

Ala Gly Gln Gly Ser Ser Val Val Ala Gly Pro Asn Glu Val Glu Pro
 180 185 190

Ala Trp Gln Arg Ala Ala Gly His Gln Val Gln Pro Gln Thr Gly Gly
 195 200 205

Val Ser Pro Arg Val Cys Ala Glu Ser Val Val Glu Ile Glu Phe Leu
 210 215 220

Val Thr Met Ile Val Val Cys Ser Gln Gly Pro Asn Gly Pro Leu Ile
 225 230 235 240

Glu Phe Cys Ala Pro Ile Gly His Arg Asp Ala Asp Ala Gly Glu Leu
 245 250 255

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Glu Ser Trp Gln Pro Gln Lys Leu Ser Thr Ala Ala Leu Asp Ala Ala
 260 265 270

Lys Ser Ile Ala Ala Arg Ile Val Lys Ala Leu Gly Gly Arg Gly Val
 275 280 285

Phe Gly Val Glu Leu Met Ile Asn Gly Asp Glu Val Tyr Phe Ala Asp
 290 295 300

Val Thr Val Cys Pro Ala Gly Ser Ala Trp Val Thr Val Arg Ser Gln
 305 310 315 320

Arg Leu Ser Val Phe Glu Leu Gln Ala Arg Ala Ile Leu Gly Leu Ala
 325 330 335

Val Asp Thr Leu Met Ile Ser Pro Gly Ala Ala Arg Val Ile Asn Pro
 340 345 350

Asp His Thr Ala Gly Arg Ala Ala Val Gly Ala Ala Pro Pro Ala Asp
 355 360 365

Ala Leu Thr Gly Ala Leu Gly Val Pro Glu Ser Asp Val Val Ile Phe
 370 375 380

Gly Arg Gly Leu Gly Val Ala Leu Ala Thr Ala Pro Glu Val Ala Ile
 385 390 395 400

Ala Arg Glu Arg Ala Arg Glu Val Ala Ser Arg Leu Asn Val Pro Asp
 405 410 415

Ser Arg Glu

<210> 24

<211> 1257

<212> DNA

<213> Mycobacterium tuberculosis

<400> 24

gtgatcgacg gctggacgga agaacagcac gaacccaccg ttaggcatga ggcgccagca 60

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gctccccaag acgttcggcg ggtgatgttg ctgggttcgg ccgaacccag ccgggagctg      120
gcgatcgcg tgcagggctt gggcgcgag gtgatcgccg tcgacggcta tgcggcgcg      180
cctgcccacc ggatagccga ccagtcggtg gtggtcacca tgaccgatgc tgaagagctg      240
acggcggtga tccggcggt gcaaccggat ttcttgggtga cggtcaccgc cgcggtgtct      300
gtggatgctc tcgatgccgt cgagcaagcc gacggcgagt gcactgagct ggtgccgaac      360
gcccgcgccg tccgggtgcac ggccgaccgg gagggcctgc gccggctggc cgccgatcag      420
ctcggcctgc ccacagcccc gttctggttc gtcggatccc ttggcgaact tcaagcgggtg      480
gccgtccatg ctgggtttcc gttgctggtg agcccgggtg caggggtggc tggccaggggt      540
agctcgggtg tcgccgggccc caacgaggtc gagcccgccct ggcagcgcg cgcaggccat      600
caagtacagc cgcagactgg gggagtgagc ctcgggtgtg gcgccgagtc ggtggtcgag      660
atcgagtttt tggtcaccat gatcgttgtg tgcagtcagg gcccgaaacgg gccgctcatc      720
gagttctgtg cacctatcgg tcatcgcgac gccgatgccg gtgagttgga atcctggcaa      780
ccgcagaagc tgagcacggc ggcgctggac gcggccaagt cgatcgccgc gcgcacgctc      840
aaggcgctcg ggggacgcgg ggttttcggc gtcgaattga tgatcaacgg cgatgaggtg      900
tatttcgccg atgtcaccgt gtgtcctgcc gggagtgcct gggtcaccgt gcgcagccag      960
cggctttcgg tggtcgaact gcaggcccg gcgacccctg gtctggcggt ggacaccctg     1020
atgatctcgc cgggtgccgc gcgggtgatc aacccggacc acacggcagg ccgggcagcg     1080
gtcggcgccg caccacctgc cgatgcgctg accggtgcgc tcggtgtgcc ggaaagcgac     1140
gtcgtgatat tcggccgcgg gcttggggtg gcgctggcca ccgcacccga ggtggcaatc     1200
gcccgcgaa cgcgccgcga agttgcatct cggctaaatg tgccagactc acgcgag      1257

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<210> 25

<211> 140

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 25

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Val Ser Tyr Ala Gly Asp Ile Thr Pro Leu Gln Ala Trp Glu Met Leu
1           5           10           15

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Ser Asp Asn Pro Arg Ala Val Leu Val Asp Val Arg Cys Glu Ala Glu

```


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20	25	30
Trp Arg Phe Val Gly Val Pro Asp Leu Ser Ser Leu Gly Arg Glu Val		
35	40	45
Val Tyr Val Glu Trp Ala Thr Ser Asp Gly Thr His Asn Asp Asn Phe		
50	55	60
Leu Ala Glu Leu Arg Asp Arg Ile Pro Ala Asp Ala Asp Gln His Glu		
65	70	75 80
Arg Pro Val Ile Phe Leu Cys Arg Ser Gly Asn Arg Ser Ile Gly Ala		
85	90	95
Ala Glu Val Ala Thr Glu Ala Gly Ile Thr Pro Ala Tyr Asn Val Leu		
100	105	110
Asp Gly Phe Glu Gly His Leu Asp Ala Glu Gly His Arg Gly Ala Thr		
115	120	125
Gly Trp Arg Ala Val Gly Leu Pro Trp Arg Gln Gly		
130	135	140

<210> 26

<211> 420

<212> DNA

<213> Mycobacterium tuberculosis

<400> 26

gtgagctacg ccggagatat cagccactt caggcctggg agatgctcag cgataatccg	60
cgggcgggtcc tggtcgacgt gcgctgagag gcggaatggc gcttcgctcg tgtgcccgcac	120
ttgtcgagcc ttggtcgtga agtggctctat gtcgaatggg cgacgtccga cgggacgcac	180
aacgacaact tcctcgccga gttgcgggac cgcattcccgg cggacgctga tcagcacgag	240
cggcccgtta ttttcttgtg tcgctccggt aaccgctcca tcggcgcggc cgaggtcgcg	300
accgaggcgg gcatcacgcc ggcctataac gtgctggacg gcttcgaagg gcatctcgac	360
gctgaggggtc atcgaggcgc aacgggctgg cgggcgggtgg gactgccgtg gagacagggg	420

<210> 27

-35-

<211> 134

<212> PRT

<213> Mycobacterium tuberculosis

<400> 27

Met Asp Trp Met Pro Leu Gly Asp Tyr Glu Thr Phe Arg His Trp Ser
 1 5 10 15

Gly Lys Pro Arg Ala Trp Gly Pro Gln Glu Ser Gly Trp Arg Ala Trp
 20 25 30

Phe Gly Gly Lys Ile Val Asp Gly Leu Cys Glu Val Leu Asp Glu His
 35 40 45

Leu Ala Val Arg Arg Arg Gly Val Pro Ala Ala Ile Gly Cys Val Pro
 50 55 60

Trp Leu Ser Ser Glu Ala Val Ala Glu Thr Leu Leu Ala Leu Ser Val
 65 70 75 80

Phe Cys Val Val Ile Asp Lys Gly Thr Ser Phe Pro Ser Arg Leu Arg
 85 90 95

Asn Pro Asp Lys Gly Phe Pro Asn Val Ala Leu Leu Arg Leu Arg Asp
 100 105 110

Met Ala Pro Ser Glu His Gly Ser Arg Cys Ser Ser Ala Arg Gly Arg
 115 120 125

Leu Cys Leu Ser Met Ser
 130

<210> 28

<211> 402

<212> DNA

<213> Mycobacterium tuberculosis

<400> 28

atggattgga tgccgctcgg cgactacgag actttccggc attggtcg99 gaagccccgc 60

-36-

gcatgggggc cgcaagagtc ggggtggcgc gcgtgggttcg gcgggaagat agtcgatggg 120
 ctctgcgagg tactcgacga gcacctcgcg gtgcggcgctc gtggtgttcc agccgcgatac 180
 ggctgcgtgc cctggctgag tagcgaggcg gtcgccgaga cgctgctcgc attgagcgtc 240
 ttttgcgtgg tgatcgacaa gggaacctcg ttcccgctcg gactgcgtaa ccctgacaaa 300
 gggtttccca acgtcgccct attgcggctt cgcgacatgg cgccctccga gcatggctca 360
 cgctgctcct cggcccgtgg tcgtctatgc ctgagcatga gc 402

<210> 29

<211> 340

<212> PRT

<213> Mycobacterium tuberculosis

<400> 29

Val Pro Ala Cys Pro Ala Pro Ala Arg Ala Gly Thr Ala Arg Ser Ser
 1 5 10 15

Pro Gly Ala Ser Trp Ile Ala Arg Leu Leu Arg Ala Pro Val Arg Arg
 20 25 30

Ala Arg Arg Arg Ala Gln Ala Gly Leu Pro Gly Ser Cys Ala Arg Arg
 35 40 45

Cys Gly Ala Leu Val Ala Gly Pro Arg Leu Ala Arg Met Arg Ile Ala
 50 55 60

Leu Ala Gln Ile Arg Ser Gly Thr Asp Pro Ala Ala Asn Leu Gln Leu
 65 70 75 80

Val Gly Lys Tyr Ala Gly Glu Ala Ala Thr Ala Gly Ala Gln Leu Val
 85 90 95

Val Phe Pro Glu Ala Thr Met Cys Arg Leu Gly Val Pro Leu Arg Gln
 100 105 110

Val Ala Glu Pro Val Asp Gly Pro Trp Ala Asn Gly Val Arg Arg Ile
 115 120 125

Ala Thr Glu Ala Gly Ile Thr Val Ile Ala Gly Met Phe Thr Pro Thr

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130		135		140
Gly Asp Gly Arg Val Thr Asn Thr Leu Ile Ala Ala Gly Pro Gly Thr				
145		150		155 160
Pro Asn Gln Pro Asp Ala His Tyr His Lys Ile His Leu Tyr Asp Ala				
	165		170	175
Phe Gly Phe Thr Glu Ser Arg Thr Val Ala Pro Gly Arg Glu Pro Val				
	180		185	190
Val Val Val Val Asp Gly Val Arg Val Gly Leu Thr Val Cys Tyr Asp				
	195		200	205
Ile Arg Phe Pro Ala Leu Tyr Thr Glu Leu Ala Arg Arg Gly Ala Gln				
	210		215	220
Leu Ile Ala Val Cys Ala Ser Trp Gly Ser Gly Pro Gly Lys Leu Glu				
	225		230	235 240
Gln Trp Thr Leu Leu Ala Arg Ala Arg Ala Leu Asp Ser Met Ser Tyr				
	245		250	255
Val Ala Ala Ala Gly Gln Ala Asp Pro Gly Asp Ala Arg Thr Gly Val				
	260		265	270
Gly Ala Ser Ser Ala Ala Pro Thr Gly Val Gly Gly Ser Leu Val Ala				
	275		280	285
Ser Pro Leu Gly Glu Val Val Val Ser Ala Gly Thr Gln Pro Gln Leu				
	290		295	300
Leu Val Ala Asp Ile Asp Val Asp Asn Val Ala Ala Ala Arg Asp Arg				
	305		310	315 320
Ile Ala Val Leu Arg Asn Gln Thr Asp Phe Val Gln Ile Asp Lys Ala				
	325		330	335
Gln Ser Arg Gly				
	340			

<210> 30

<211> 1020

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<212> DNA

<213> Mycobacterium tuberculosis

<400> 30

```

gtgccagctt gcccggctcc tgcgcgcgcc ggtacggcgc gctcgtcgcc gggcgcaagc      60
tggattgccc ggctcctgcg cgcgccggtg cggcgcgctc gtcgccgggc gcaagctgga      120
ttgcccggct cctgcgcgcg ccggtgcggc gcgctcgtcg ccgggcctag gctggcgcgc      180
atgcgaatcg cgttggcgca aatccgcagc ggtaccgacc ccgccgcaa tctgcaactg      240
gtcggcaagt acgccggcga agccgccacc gcgggcgcac agctggtggt gtttcctgag      300
gcgaccatgt gccggctcgg tgtcccgtg cggcaggctc ccgagcccg cgcgggaccc      360
tgggcaaacg gagtccgacg gatcgcgacc gaggcgggca tcaccgtgat cgcgggcatg      420
ttcaccccg cgggcgacgg gcgggtaaca aacacgctga tcgcagccgg ccggggcacg      480
cccaatcagc cggacgcgca ctaccacaag atccacctct atgacgcggt cggcttcacc      540
gagtcacgta ccgtcgacc cgggcgcgaa ccggtggtag tcgtggtoga cggcgtgcgg      600
gtggggtttga ccgtttgcta cgacattcgc tttcccgccc ttataaccga gctggcgcgg      660
cgcgggggccc aactgatcgc ggtctgtgca tcctgggggt ccggtccggg caaactcgaa      720
cagtggacgt tgctggcccg cggccgggcg ctagactcca tgagttacgt cgcgcgggcc      780
ggccaagcag acccaggtga tgccgcacc ggcgtggggg cgagctcggc tgcaccgacc      840
ggggtaggcg gcagcctggt ggctcgccg ctaggcgagg tggtaggtgc agctggcacc      900
cagccgcaac tgctggtcgc cgacatcgat gtcgacaatg tggccgcggc tcgcgaccgc      960
attgcggtgc tacgcaacca gacagacttc gttcagatcg ataaggcaca atcgcgtggg     1020

```

<210> 31

<211> 329

<212> PRT

<213> Mycobacterium tuberculosis

<400> 31

```

Val Gly Glu Ser Thr Thr Gln Pro Ala Gly Gly Ala Ala Val Asp Asp
1           5           10           15

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Glu Thr Arg Ser Ala Ala Leu Pro Arg Trp Arg Gly Ala Ala Gly Arg
 20 25 30

Leu Glu Val Trp Tyr Ala Thr Leu Ser Asp Pro Leu Thr Arg Thr Gly
 35 40 45

Leu Trp Val His Cys Glu Thr Val Ala Pro Thr Thr Gly Gly Pro Tyr
 50 55 60

Ala His Gly Trp Val Thr Trp Phe Pro Pro Asp Ala Pro Pro Gly Thr
 65 70 75 80

Glu Arg Phe Gly Pro Gln Pro Ala Gln Pro Ala Ala Gly Pro Ala Trp
 85 90 95

Phe Asp Ile Ala Gly Val Arg Met Ala Pro Ala Glu Leu Thr Gly Arg
 100 105 110

Thr Arg Ser Leu Ala Trp Glu Leu Ser Trp Lys Asp Thr Ala Ala Pro
 115 120 125

Leu Trp Thr Phe Pro Arg Val Ala Trp Glu Arg Glu Leu Leu Pro Gly
 130 135 140

Ala Gln Val Val Ile Ala Pro Thr Ala Val Phe Ala Gly Ser Leu Ala
 145 150 155 160

Val Gly Glu Thr Thr His Arg Val Asp Ser Trp Arg Gly Ser Val Ala
 165 170 175

His Ile Tyr Gly His Gly Asn Ala Lys Arg Trp Gly Trp Ile His Ala
 180 185 190

Asp Leu Gly Asp Gly Asp Val Leu Glu Val Val Thr Ala Val Ser His
 195 200 205

Lys Pro Gly Leu Arg Arg Leu Ala Pro Leu Ala Phe Val Arg Phe Arg
 210 215 220

Ile Asp Gly Lys Asp Trp Pro Ala Ser Pro Leu Pro Ser Leu Arg Met
 225 230 235 240

Arg Thr Thr Leu Gly Val Arg His Trp Gln Leu Glu Gly Arg Ile Gly
 245 250 255

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Gly Arg Glu Ala Leu Ile Arg Val Asp Gln Pro Pro Glu Arg Cys Val
 260 265 270

Ser Leu Gly Tyr Thr Asp Pro Asp Gly Ala Lys Ala Val Cys Thr Asn
 275 280 285

Thr Glu Gln Ala Asp Ile His Ile Glu Leu Gly Gly Arg His Trp Ser
 290 295 300

Val Leu Gly Thr Gly His Ala Glu Val Gly Leu Arg Gly Thr Ala Ala
 305 310 315 320

Pro Ala Ile Lys Glu Gly Thr Pro Ala
 325

<210> 32

<211> 987

<212> DNA

<213> Mycobacterium tuberculosis

<400> 32

gtgggcgaat cgacaactca gccagcagga ggtgccgcag tggacgatga aacgcggctcg 60
 gcggccttgc cgcggtggcg cggcgcagcc gggcgccctgg aagtctggta tgcgactctg 120
 tcggatccac tgacgcgtac cggcctatgg gtgcactgtg agacgggtggc cccgacgacc 180
 ggcggggccct acgcgcacgg ctgggtgacc tggtttccac cggatgcccc gccgggcacc 240
 gagcgcttcg gccccagcc cgcccaaccc gcggccggcc ccgcctgggt cgacatcgcc 300
 ggtgtacgaa tggcgccagc ggagctgacc ggacgtaccc gatcaactcg atgggagctg 360
 tcctggaagg acaccgcggc gccactgtgg acgtttcctc gcgtggcctg ggagcgcgag 420
 ttgctgcccg gcgcccaggt ggtgatcgca cccacgcgcg tcttcgctgg ctccctggcc 480
 gtcggcgaaa ccaccaccg cgtcgacagc tggcgcgga gtgtggccca catctacgga 540
 catggcaatg ccaagcggcg gggatggatc catgccgatc tcggcgacgg cgacgtccta 600
 gaggtggtga ccgcggtatc acacaagccg ggcctacgca ggctcgcgcc gctagcgttc 660
 gttcgcttcc gcatcgacgg aaaggattgg cccgcaagtc ctttaccgtc gctgcgaatg 720
 cggacaacgc tcggcgctgcg gcactggcaa ctggaaggac gcatcggcgg ccgggaggcg 780

-41-

ctaataccggg tagaccagcc gccggagcgg tgcgtaagcc tgggatacac cgatcccgcac 840
 ggggcccaagg cgggtgtgcac caacaccgag caggccgaca tccacatcga gctcggcggc 900
 cggcactggt cgggtgctggg caccggacac gccgaagtcg gcctgcgggg aaccgcggca 960
 ccggctatca aggaaggac gccagca 987

<210> 33

<211> 292

<212> PRT

<213> Mycobacterium tuberculosis

<400> 33

Val Ala Ser Phe Ala Gln Trp Val Ser Gly Ala Arg Pro Arg Thr Leu
 1 5 10 15

Pro Asn Ala Ile Ala Pro Val Val Ala Gly Thr Gly Ala Ala Ala Trp
 20 25 30

Leu His Ala Ala Val Trp Trp Lys Ala Leu Leu Ala Leu Ala Val Ala
 35 40 45

Val Ala Leu Val Ile Gly Val Asn Tyr Ala Asn Asp Tyr Ser Asp Gly
 50 55 60

Ile Arg Gly Thr Asp Asp Asp Arg Val Gly Pro Val Arg Leu Val Gly
 65 70 75 80

Ser Arg Leu Ala Thr Pro Arg Ser Val Leu Thr Ala Ala Met Thr Ser
 85 90 95

Leu Ala Leu Gly Ala Leu Ala Gly Leu Val Leu Ala Leu Leu Ser Ala
 100 105 110

Pro Trp Leu Ile Ala Val Gly Ala Ile Cys Ile Ala Gly Ala Trp Leu
 115 120 125

Tyr Thr Gly Gly Ser Lys Pro Tyr Gly Tyr Ala Gly Phe Gly Glu Leu
 130 135 140

Ala Val Phe Val Phe Phe Gly Pro Val Ala Val Leu Gly Thr Gln Tyr

[illegible]

<211> 876

<212> DNA

<213> Mycobacterium tuberculosis

[illegible]

-43-

```

tcgcggctgg cgaccccgcg ctoggtgctg accgctgcca tgacgagcct ggcgctcgg 300
gcgctggccg ggctggtttt ggcgctgctc agcgcgcctg ggctgattgc ggtgggtgcg 360
atctgcatcg ccggggcctg gctctacacc ggcgggtcaa aaccctacgg ctatgcgggc 420
ttcggcgaac tggcgggtgtt tgtgttcttc gggccggctg ccgtgctcgg taccagtag 480
acgcaggcat tgcgggtgga ctgggtgggg ctggcacagg cggtagcaac gggtagcgtt 540
tcgtgctcgg tgctgggtggc caacaacctg cgcgacatcc ccaccgacgc gcgggcccgc 600
aagatcacgc tggcgggtgcg gctgggagac gcccggaacc ggatgcttta ccagggcctg 660
ctggcggctg ccgggggtgct gacgttcgtg ctaatgctgg ccacgcctg gtgtgtggtg 720
ggcttggtgg ccgcgccttt ggcgctgcgc gctgccggac cggtagcgtc cgggcgcggc 780
gggcgcgagc tgatcccggt actgcgtgac actgggctgg ccattgctgt gtgggcgttg 840
gcgggtggcgg gggcattggc gtttggtcag ttgagc 876

```

<210> 35

<211> 378

<212> PRT

<213> Mycobacterium tuberculosis

<400> 35

```

Val Cys Gly Val Arg Val Ala Ile Val Ala Glu Ser Phe Leu Pro Gln
1             5             10             15

```

```

Val Asn Gly Val Ser Asn Ser Val Val Lys Val Leu Glu His Leu Arg
20             25             30

```

```

Arg Thr Gly His Glu Ala Leu Val Ile Ala Pro Asp Thr Pro Pro Gly
35             40             45

```

```

Glu Asp Arg Ala Glu Arg Leu His Asp Gly Val Arg Val His Arg Val
50             55             60

```

```

Pro Ser Arg Met Phe Pro Lys Val Thr Thr Leu Pro Leu Gly Val Pro
65             70             75             80

```

```

Thr Phe Arg Met Leu Arg Ala Leu Arg Gly Phe Asp Pro Asp Val Val
85             90             95

```

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His Leu Ala Ser Pro Ala Leu Leu Gly Tyr Gly Gly Leu His Ala Ala
 100 105 110

Arg Arg Leu Gly Val Pro Thr Val Ala Val Tyr Gln Thr Asp Val Pro
 115 120 125

Gly Phe Ala Ser Ser Tyr Gly Ile Pro Met Thr Ala Arg Ala Ala Trp
 130 135 140

Ala Trp Phe Arg His Leu His Arg Leu Ala Asp Arg Thr Leu Ala Pro
 145 150 155 160

Ser Thr Ala Thr Met Glu Ser Leu Ile Ala Gln Gly Ile Pro Arg Val
 165 170 175

His Arg Trp Ala Arg Gly Val Asp Val Gln Arg Phe Ala Pro Ser Ala
 180 185 190

Arg Asn Glu Val Leu Arg Arg Arg Trp Ser Pro Asp Gly Lys Pro Ile
 195 200 205

Val Gly Phe Val Gly Arg Leu Ala Pro Glu Lys His Val Asp Arg Leu
 210 215 220

Thr Gly Leu Ala Ala Ser Gly Ala Val Arg Leu Val Ile Val Gly Asp
 225 230 235 240

Gly Ile Asp Arg Ala Arg Leu Gln Ser Ala Met Pro Thr Ala Val Phe
 245 250 255

Thr Gly Ala Arg Tyr Gly Lys Glu Leu Ala Glu Ala Tyr Ala Ser Met
 260 265 270

Asp Val Phe Val His Ser Gly Glu His Glu Thr Phe Cys Gln Val Val
 275 280 285

Gln Glu Ala Leu Ala Ser Gly Leu Pro Val Ile Ala Pro Asp Ala Gly
 290 295 300

Gly Pro Arg Asp Leu Ile Thr Pro His Arg Thr Gly Leu Leu Leu Pro
 305 310 315 320

Val Gly Glu Phe Glu His Arg Leu Pro Asp Ala Val Ala His Leu Val
 325 330 335

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His Glu Arg Gln Arg Tyr Ala Leu Ala Ala Arg Arg Ser Val Leu Gly
 340 345 350

Arg Ser Trp Pro Val Val Cys Asp Glu Leu Leu Gly His Tyr Glu Ala
 355 360 365

Val Arg Gly Arg Arg Thr Thr Gln Ala Ala
 370 375

<210> 36

<211> 1134

<212> DNA

<213> Mycobacterium tuberculosis

<400> 36

gtgtgtggcg tgcgcgttgc gatcgtcgcc gagtcgttcc tcccgcaggt gaacggcgctc	60
agcaactcgg tgggtcaagggt actcgaacat ctgcgtcgaa ccggtcatga agccctgggtg	120
atcgcgcccc acacgccgcc aggtgaagac cgcgccgagc gacttcacga cgggtgtccgg	180
gtgcaccggg tgccgtcgcg gatgttccca aaggtagacca cgttgccgct cggcggtgccc	240
accttccgaa tgctgagagc gctgcgcgga ttcgatccgg atgtcgtgca tctggcgctcg	300
ccggcgctgc ttggctacgg tggactccat gccgctcggc ggctaggggt gccacgggtc	360
gcgggtctacc aaaccgatgt tccgggtttc gcgtccagct acggcattcc gatgacagca	420
cgggcggcgt gggcatggtt ccgccacttg catcgctggt ctgaccgcac tctggcgccg	480
tccacagcga caatggaatc cttattgcc cagggcattc cgcgagtaca ccggtgggca	540
cgcgggggtgg acgtgcaacg ttctgcgccg tcggcgcgaa acgaggtgtt gaggcgacgg	600
tgggtcaccgg acggcaaacc catcgtcggc tttgtgggtc ggcttgctcc ggagaagcat	660
gtcgaccggc tcacgggtct ggccggcctcc ggccgcgtgc ggctgggtgat cgtcggcgac	720
ggcatcgacc gggcaagatt gcaatcagca atgccacag cggttttcac cggagcacgg	780
tatggcaaag agctcgccga ggcgtatgcc agcatggacg tcttcgtaca ttccggtgag	840
cacgagacgt tctgccaaagt cgtgcaggaa gcgctggcgt cggggctacc ggtgatcgct	900
ccggacgccg gcggaccgcg tgatctgata accccgcacc gcaccgggct gctgttgccg	960
gtcggcgagt tcgagcaccg gcttcctgac gccgtcgccc acctggtgca cgaacgccag	1020

-46-

cgctacgcgc tggccgcccg gcgcagtgtg ctggggccgca gttggccggg ggtctgcgat 1080
 gagctgctcg gccactacga ggcggtgcga ggtcggcgca cgacccaggc cgcg 1134

<210> 37

<211> 330

<212> PRT

<213> Mycobacterium tuberculosis

<400> 37

Leu Pro Ala Ile Pro Phe Gln Gly Glu Ala Arg Ala Gly Arg Arg Pro
 1 5 10 15

Gly Arg Pro Arg Arg Cys Pro Ala Gly Val Val Arg Cys Arg Pro Arg
 20 25 30

Ser Met Gly His Val Arg Pro Gly Phe Ser Pro Arg Leu Gly Ser His
 35 40 45

Arg Thr Leu Arg Pro Arg Trp Pro Pro Tyr Ala Ala Ala Ser Arg Gly
 50 55 60

Leu Thr Ser Gly Thr Ser Arg Trp Gly Trp Pro Arg Leu Gly Phe Gly
 65 70 75 80

Val Val Thr Ala Pro Thr Arg Trp Thr Leu Ala Asp Gly Arg Glu Leu
 85 90 95

Leu Phe Phe Ser Leu Pro Gly Pro Arg Thr Ser Gly Thr Ala Ala Glu
 100 105 110

Arg Val Ala Arg His Ala Gln Ala Gln Thr Phe Ala Gly Asp Ile Arg
 115 120 125

Gln Arg Ala Ile Gln Leu Val Val Ser Glu Gln Glu Val Ala Ser Lys
 130 135 140

Ile Thr Ala Ala Thr Ala Gly Ile Ala Thr Thr Thr Phe Pro Glu Thr
 145 150 155 160

Pro Ser Ile Asp Asp Thr Ile Ile Gly Asn Asp Asn Arg Asp Thr Gly

175

cqctgtccag caggcgtcgt gcgatgtcgt cctcgctcaa tgggccatgt tcggccagga 120

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```

ttctcgccac ggcttgggtc gcatcgaacg cttcggccac ggtggccacc ttatgccgcg      180
gccagccgag gcttgacgtc gggcaccagc cgatggggct ggctcgcct agggttcggc      240
gttgtgacgg cgccgacgcg gtggaccctg gccgacggac gtgagctgct gttcttttcg      300
ctgcccgggc cccgcaccag cggcaccgcc gcagaacggg tggctcgcca cgtcaagcg      360
caaacgttcg cggcgatat cgcgcagcgc gccatacagc tggctcgtgc cgaacaagaa      420
gtggcaagca aaatcaccgc cgctaccgcc ggaatcgcca ccaccacctt cccggaaaca      480
cccagcatcg acgacaccat catcggaac gacaaccgcg aactgggggt ccggttggtc      540
gacgtcaaac aagatggcgg cactagtccc ccgcccccat ttgcgccgtg ggacaccctt      600
gatggaacac cgccgccggg cactggccta agccctacgc tgcagcagat gatcctcggc      660
ggtgatccag ctaatctgac cggccagggt cttgcggaca acgtgcaacg gttcgtacag      720
tcgctgcccg caaacgacct caacacagcg tggttgcgcg gtcagggttc ggatctgcag      780
gcgcacgtcg ccgatattga gtacgccgcg acccattgca gcaccaacga ctggatcgac      840
cggaccgccc agttcgctc gggcgccata gtcttcagca tcggcgtgtt gaccgcagag      900
accggggcgg gggtcgtggc tgccgcggcc ggtggtgtcg gcgcggccac ggcgggcgtg      960
agtctttctac aatgcctggg ggggagcaag                                     990

```

<210> 39

<211> 354

<212> PRT

<213> Mycobacterium tuberculosis

<400> 39

```

Met Ala Gly Asp Arg Gly Ala Asp Pro Gly Pro Ala Asn Val Thr Pro
1           5           10           15

```

```

Gly Ala Asp Asp His Ala Gln His Ala Ser Pro Thr Val Leu Cys Pro
          20           25           30

```

```

Gln Gly His Val Asn Ala Trp Asp Tyr Arg Phe Cys Glu Arg Cys Gly
          35           40           45

```

```

Ser Pro Ile Gly Val Val Pro Trp Pro Ser Glu Glu Ser Gly Thr Arg
          50           55           60

```

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Gln Thr Ala Pro Ala Arg Ser Phe Val Pro Leu Val Val Leu Ala Ala
65 70 75 80

Thr Leu Leu Val Val Ala Val Val Val Thr Ala Val Gly Tyr Ala Val
85 90 95

Thr Arg Pro Ala Arg Asn Asp Arg Glu Glu Pro Ser Ser Ala Arg Gly
100 105 110

Ala Ala Thr Thr Gly Val Pro Phe Ala Gln Ala Glu Ala Ala Ser Cys
115 120 125

Pro Asp Asp Pro Val Leu Glu Ala Glu Ser Ile Asp Leu Thr Ser Asp
130 135 140

Gly Leu Ala Val Ser Ala Ala Phe Met Ser Ala Cys Ala Gly Gly Asp
145 150 155 160

Val Glu Ser Asn Ser Ala Leu Glu Val Thr Val Ala Asp Gly Arg Arg
165 170 175

Asp Val Ala Ala Gly Ser Phe Asp Phe Ser Ala Asp Pro Leu Arg Ile
180 185 190

Glu Pro Gly Val Pro Ala Arg Arg Thr Leu Val Phe Pro Pro Gly Met
195 200 205

Tyr Trp Arg Thr Pro Asp Met Leu Ser Gly Ala Pro Ala Leu Ala Ala
210 215 220

Thr Arg Lys Gly Arg Ser Asp Arg Ser Ala Ala Arg Gly Gly Ser Ala
225 230 235 240

Arg Thr Thr Met Val Ala Ala Ala Ser Ala Ala Pro Ala Tyr Gly Ser
245 250 255

Ile Asn Ala Val Ala Gly Ala Val Leu Val Glu Leu Arg Asp Ser Asp
260 265 270

Phe Pro Tyr Val Arg Val Gly Ile Ala Asn Arg Trp Val Pro Gln Val
275 280 285

Ser Ser Lys Arg Val Gly Leu Val Ala Ala Gly Lys Thr Trp Thr Ser
290 295 300

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Ala Asp Ile Leu Arg Asp His Leu Ala Leu Arg Gln Arg Phe Gly Gly
 305 310 315 320

Ala Arg Leu Val Trp Ser Gly His Trp Thr Thr Phe Ser Gly Pro Asp
 325 330 335

Phe Trp Val Thr Val Val Gly Pro Ala Gln Pro Thr Ala Ala Glu Ala
 340 345 350

Asn Arg

<210> 40

<211> 1062

<212> DNA

<213> Mycobacterium tuberculosis

<400> 40

atggcaggcg atcgaggcgc tgaccccggg ccggcgcaatg tgactccggg tgccgatgac	60
catgcacagc atgcgtcgcc gacggtgcta tgtccccagg gtcacgtgaa cgcattgggac	120
tacaggttct gtgagcgggtg cggctcgccg atcggcggtg tgccctggcc gtcggaggaa	180
tcaggcacac gccagacggc gcccgcgca tccttcgtcc cctcgtcgt cctcgcggcg	240
acgctgctcg tggtcgccgt cgtcgtgacg gccgtcggct acgcggtgac gcgaccggct	300
cgcaacgacc gtgaggagcc cagttccgcg cggggcgccg ccacgacggg tgtgccgttc	360
gcacaggccg aggccgcgag ttgccggac gatccgggtg ttgaagcgga gtcgatcgac	420
ctgacgtccg acgggcttgc ggtgagtgcc gcgttcattg cggcatgcgc cggcggcgat	480
gtcgagtcca actcggcgct cgaggtcacc gtcgccgacg gacggcgcca cgtggcgcc	540
ggaagcttcg acttctcgcc agatccgctg aggatcgagc ccggcggtgc cggccgtcga	600
accctggtct ttccgcccgg aatgtattgg cgaacgccc acatgttgtc cggcgaccg	660
gcattggcgg ccacacggaa gggcaggctc gatcgttcgg ccgcacgagg cggatcggca	720
cggacgacca tggtcgcggc cgcgtccgcg gcaccggctt acggcagcat caacgccgtt	780
gccggggcgg tgctggtgga gctacgtgac tcggacttcc cctacgtgcg agtcggtatc	840
gccaatcgtt ggggtgccga ggtgagttcg aagcgcgctg gcctggtcgc cgcggggaaa	900

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acgtggacga gcgccgatat tcttcgcgat cacctggccc tgcggcagcg gttcgggggc 960
 gccgcctgg tgtggtcggg gcactggacc accttcagcg gacccgattt ctgggtgacg 1020
 gtggttgggc cggcgcagcc caccgcagct gaggccaatc gc 1062

<210> 41

<211> 341

<212> PRT

<213> Mycobacterium tuberculosis

<400> 41

Met Thr Val Ser Arg Ser Ser Ser Ala Pro Ser Leu Ala Arg Arg Ala
 1 5 10 15

Arg Arg Cys Thr Gly Ser Asp Asp Ala Ala Met Ser Phe Cys Val Tyr
 20 25 30

Cys Gly Ala Glu Leu Ala Asp Pro Thr Arg Cys Gly Ala Cys Gly Ala
 35 40 45

Tyr Lys Ile Gly Ser Thr Trp His Arg Thr Thr Thr Pro Thr Val Gly
 50 55 60

Ala Ala Thr Thr Ala Thr Gly Trp Arg Pro Asp Pro Thr Gly Arg His
 65 70 75 80

Glu Gly Arg Tyr Phe Val Ala Gly Gln Pro Thr Asp Leu Val Arg Glu
 85 90 95

Gly Asp Ala Glu Ala Val Asp Pro Leu Gly Gln Gln Gln Leu Asp Gln
 100 105 110

Ser Gly Ala Val Gly Val Ser Pro Ser Ala Val Ser Gly Trp Val Arg
 115 120 125

Ser Gly His Arg Arg Leu Trp Trp Ala Leu Ala Gly Val Val Ala Phe
 130 135 140

Leu Gly Leu Val Gly Ala Gly Val Val Gly Thr Leu Phe Leu Asn Arg
 145 150 155 160

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Asp Arg Glu Ser Ile Asp Asp Lys Tyr Leu Ala Ala Leu Arg Arg Ser
 165 170 175

Gly Leu Thr Gly Glu Phe Asn Ser Asp Ala Asn Ala Ile Ala Arg Gly
 180 185 190

Lys Gln Val Cys Arg Gln Leu Gln Asp Gly Gly Glu Gln Gln Gly Met
 195 200 205

Pro Val Asp Gln Val Ala Val Gln Tyr Tyr Cys Pro Gln Phe Ser Asp
 210 215 220

Gly Phe His Ile Leu Glu Thr Ile Thr Val Thr Gly Ser Phe Thr Leu
 225 230 235 240

Lys Asp Glu Ser Pro Asn Val Tyr Ala Pro Ala Ile Thr Val Ser Gly
 245 250 255

Ser Gly Cys Ser Gly Ser Ala Gly Tyr Ala Asp Ile Asp Arg Gly Thr
 260 265 270

Gln Val Thr Val Lys Asn Gly Gln Gly Asp Ile Leu Ala Thr Ala Phe
 275 280 285

Leu Gln Ala Gly Gln Gly Gly Arg Phe Leu Cys Thr Phe Pro Phe Ser
 290 295 300

Phe Glu Ile Thr Glu Gly Glu Asp Arg Tyr Val Val Ser Val Ser Arg
 305 310 315 320

Arg Gly Glu Met Ser Tyr Ser Phe Ala Asp Leu Lys Ala Asn Gly Leu
 325 330 335

Ser Leu Val Leu Gly
 340

<210> 42

<211> 1023

<212> DNA

<213> Mycobacterium tuberculosis

-53-

<400> 42
 atgactgttt cggaagttc atcagcacc tcgttggcgc gaagggcacg acggtgtacc 60
 ggaagtgacg acgctgccat gagtttctgc gtgtattgcg gtgccgagct tgccgacccg 120
 accaggtgcg gggcgtgcgg cgcatacaag attggttcaa cctggcatcg gaccacgacg 180
 ccgacggtcg gcgccgcgac gacggcaacg ggatggcgac ccgatccac cggtcgccac 240
 gagggacgct acttcgtcgc cgggcagccg accgacctcg ttccgcgaggg cgacgccgaa 300
 gccgttgacc cacttgggtca gcagcagctg gatcagtcag gtgccgttg tggttcgccg 360
 tcagcgggtg cgggggtgggt gcgttctggg caccgtcgac tgtggtgggc gcttgccggc 420
 gtggtggcgt ttctcgggct ggtgggagcc ggtgtcgtcg ggacgctgtt cctgaatcga 480
 gaccgggagt ccatcgacga caagtacct gccgccttga ggcggtccg actcaccggt 540
 gagttcaact ccgacgcgaa cgccatcgcc cgcggcaagc aggtgtgccg ccagttgcaa 600
 gacggtggcg aacagcaggg gatgccggtc gatcaggtcg ccgtgcaata ctactgcccg 660
 cagttcagcg atggcttcca tatcctggaa accataactg tcaactggaag ttccaccctc 720
 aaggatgaat cgccaaacgt gtacgcaccg gcgatcaccg tgcggggtc cgggtgtca 780
 gggtcagccg gctacgccga catcgaccgg ggaacgcagg tgacggtgaa aaacggtcag 840
 ggggacatcc tggccacggc cttcctgcag gcgggtcagg gcggccgatt cttgtgcacc 900
 ttccctttct cgtttgaaat caccgagggc gaagaccgct acgtcgtgtc ggtcagtcgt 960
 cgaggcgaaa tgagttactc gttcgccgat ctgaaggcca atgggctatc gtcgtcttg 1020
 ggc 1023

<210> 43

<211> 479

<212> PRT

<213> Mycobacterium tuberculosis

<400> 43

Val Thr Ala Ala Val Arg His Ser Asp Val Leu Val Val Gly Ala Gly
 1 5 10 15

Ser Ala Gly Ser Val Val Ala Glu Arg Leu Ser Met Asp Ser Ser Cys
 20 25 30

Val	Val	Thr	Val	Leu	Glu	Ala	Gly	Pro	Gly	Leu	Ala	Asp	Pro	Gly	Leu
	35						40					45			
Leu	Ala	Gln	Thr	Ala	Asn	Gly	Leu	Gln	Leu	Pro	Ile	Gly	Ala	Gly	Ser
	50					55					60				
Pro	Leu	Val	Glu	Arg	Tyr	Arg	Thr	Arg	Leu	Thr	Asp	Arg	Pro	Val	Arg
65					70					75					80
His	Leu	Pro	Ile	Val	Arg	Gly	Ala	Thr	Val	Gly	Gly	Ser	Gly	Ala	Ile
				85					90					95	
Asn	Gly	Gly	Tyr	Phe	Cys	Arg	Gly	Leu	Pro	Ser	Asp	Phe	Asp	Arg	Ala
			100					105					110		
Ser	Ile	Pro	Gly	Trp	Ala	Trp	Ser	Asp	Val	Leu	Glu	His	Phe	Arg	Ala
		115					120					125			
Ile	Glu	Thr	Asp	Leu	Asp	Phe	Glu	Thr	Pro	Val	His	Gly	Arg	Ser	Gly
	130					135					140				
Pro	Ile	Pro	Val	Arg	Arg	Thr	His	Glu	Met	Thr	Gly	Ile	Thr	Glu	Ser
145					150					155					160
Phe	Met	Ala	Ala	Ala	Glu	Asp	Ala	Gly	Phe	Ala	Trp	Ile	Ala	Asp	Leu
				165					170					175	
Asn	Asp	Val	Gly	Pro	Glu	Met	Pro	Ser	Gly	Val	Gly	Ala	Val	Pro	Leu
			180					185					190		
Asn	Ile	Val	Asn	Gly	Val	Arg	Thr	Ser	Ser	Ala	Val	Gly	Tyr	Leu	Met
		195					200					205			
Pro	Ala	Leu	Gly	Arg	Pro	Asn	Leu	Thr	Leu	Leu	Ala	Arg	Thr	Arg	Ala
	210					215					220				
Val	Arg	Leu	Arg	Phe	Ser	Ala	Thr	Thr	Ala	Val	Gly	Val	Asp	Ala	Ile
225					230					235					240
Gly	Pro	Gly	Gly	Pro	Val	Ser	Leu	Ser	Ala	Asp	Arg	Ile	Val	Leu	Cys
				245					250					255	
Ala	Gly	Ala	Ile	Gln	Ser	Ala	His	Leu	Leu	Met	Leu	Ser	Gly	Val	Gly
			260					265					270		

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Glu Glu Glu Val Leu Arg Ser Ala Gly Val Lys Val Leu Met Ala Leu
 275 280 285

Pro Val Gly Met Gly Cys Ser Asp His Pro Glu Trp Val Met Pro Thr
 290 295 300

Asn Trp Ala Val Ala Val Asp Arg Pro Val Leu Glu Val Leu Leu Ser
 305 310 315 320

Thr His Asp Gly Ile Glu Ile Arg Pro Tyr Thr Gly Gly Phe Val Ala
 325 330 335

Met Thr Gly Asp Gly Thr Ala Gly His Arg Asp Trp Pro His Ile Gly
 340 345 350

Val Ala Leu Met Gln Pro Arg Ala Arg Gly Arg Ile Thr Leu Val Ser
 355 360 365

Ser Asp Pro Gln Ile Pro Val Arg Ile Glu His Arg Tyr Asp Ser Glu
 370 375 380

Pro Ala Asp Val Ala Ala Leu Arg Gln Gly Ser Ala Leu Ala His Glu
 385 390 395 400

Leu Cys Gly Ala Ala Thr Arg Ile Gly Pro Ala Val Trp Ala Thr Ser
 405 410 415

Gln His Leu Cys Gly Ser Ala Pro Met Gly Thr Asp Asp Asp Pro Arg
 420 425 430

Ala Val Val Asp Pro Arg Cys Arg Val Arg Gly Ile Glu Asn Leu Trp
 435 440 445

Val Ile Asp Gly Ser Val Leu Pro Ser Ile Thr Ser Arg Gly Pro His
 450 455 460

Ala Thr Ile Val Met Leu Gly His Arg Ala Ala Glu Phe Val Gln
 465 470 475

<210> 44

<211> 1437

<212> DNA

<213> Mycobacterium tuberculosis

<400> 44

```

gtgactgcgg cgggtccggca tagcgatgtg ctgggtcgctg gtgctggaag tgctggatcg      60
gttggttgccg agcgtctttc catggactcg agctgtgtgg tgaccgtgct tgaggctggc      120
ccccgggctgg ccgatccggg gttgctggct cagacggcca atggggttgca actgccgatc      180
ggagctggca gccctctggg tgagcgttat cggacgcggc tcaccgatcg accgggtcgc      240
cacttgccga tcgtgcgggg tgcgacggtc ggcgggttccg gcgcaatcaa cggcggctat      300
ttctgccgcg gactgccag cgatttcgac cgtgcctcga taccaggctg ggcatggtct      360
gacgttctgg agcacttccg ggctatcgag acagatctgg atttcgagac gcctgtgcat      420
ggccgtagtg gccccatccc agttcgccgc acacacgaaa tgactggcat cactgaaagt      480
ttcatggctg ccgcagagga cgcagggttc gcttgatcg ctgacctcaa cgatgttggg      540
ccggaaatgc cttcgggtgt aggcgcggtc ccgctcaaca tcgttaacgg cgtacgcacc      600
agctcggcgg tcggctatct gatgcccgcg ctgggacggc cgaatctgac actgctggcc      660
cggacgcggg cgggtgcggtt gcgcttttcc gccaccaccg cgggtgggtgt cgacgcgatc      720
ggcccaggag gcccggttaag cctgagcgct gaccgaatcg tattgtgcgc cggagcgatt      780
cagtcagctc atctgttgat gctctcgggc gtcggcgagg aggaggtgtt gcgatccgcc      840
ggtgtgaagg tgcttatggc gttgccggtt ggcatgggct gcagtgaaca cccggaatgg      900
gtgatgccga ccaactgggc ggtggctgtc gatcggcccg tgtagaggt gctgctgagc      960
actcatgacg gcatcgaaat aaggccgtac acaggcggct tcgttgcgat gaccggcgac     1020
ggtacagccg ggcatcgca ttggccgcat atcgggggtgg cgctcatgca gccgcgggca     1080
cgcggaacga tcacgttggg ctcgagtgat cccagatac cagtccgat cgagcaccga     1140
tacgacagtg aacctgccga tgtcgcggcc ctgcgccagg gtagcgcat ggcccacgaa     1200
ttatgcggtg cggcaacgcg catcggtcca gccgtatggg cgacatcgca gcatctgtgt     1260
ggtagtgccc caatgggcac cgacgatgac ccacgagccg tcgtcgaccc gaggtgtcgg     1320
gtccgcggca tcgaaaacct atgggtgata gacggatctg tccttcgctc gatcaccagt     1380
cgcggtccac acgcaacgat cgtaatgctg ggccaccgcg cggccgaatt tggttcag     1437

```

<210> 45

<211> 203

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<212> PRT

<213> Mycobacterium tuberculosis

<400> 45

Leu Gly Arg Arg Gly Asn Arg Arg Val His Val Asp Arg Val Arg Leu
 1 5 10 15

Thr Gly Thr Glu Arg Glu Leu Arg Ala Glu Asn Gln Ser Pro Pro Ile
 20 25 30

Phe Arg Pro Gln Asn Thr Leu Gly Asp Gly Ala Asn Gly Leu Pro Leu
 35 40 45

Ala Val Cys Thr Thr Thr Ala His Thr Cys His Thr Ser His Thr His
 50 55 60

Pro Ser Arg Trp Thr Pro Asn Pro Val Pro Ala Thr Lys Gly Val Pro
 65 70 75 80

Ala Gly Leu Val Gln Ala Thr Phe Ile Ile Glu Asn Leu Asp Pro Gly
 85 90 95

Asn Asn Asp Thr Pro Thr Pro Pro Thr Pro Lys Leu Arg Leu Ala Arg
 100 105 110

Lys Pro Gly His His Arg Arg Ser Glu Tyr Asp Ala Asp Ser Val Leu
 115 120 125

Arg Arg Lys Asp Thr Ser Arg Arg Cys Val Gln Ala Asp Asp Val Arg
 130 135 140

Cys Val Gln Leu Val Gln Asp Pro Arg Arg Gly Arg Val Glu Leu Gly
 145 150 155 160

Gly Tyr Arg Ala Glu Leu Thr Val Gly Arg Arg Ala Ala Val Asn Cys
 165 170 175

Gln Arg Pro Gln Tyr Gly Ala Asp Gly Trp Pro Val Arg Leu Gly Cys
 180 185 190

Gly Val Gly Gly Ala Ala Arg Gly Asp Gln Arg
 195 200

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<210> 46

<211> 609

<212> DNA

<213> Mycobacterium tuberculosis

<400> 46

```

ttgggtcgca ggggtaaccg aaggggtgcac gttgaccgcg tgaggctaac cggcaccgag      60
cgtgaactga gggcggagaa tcagagcccc ccgattttcc gcccgagaa cacgttgggc      120
gacggcgcca acgggctgcc actggccgtg tgcaccacga cggctcacac gtgccacact      180
tcccatactc acccatcgcg gtggacccca aaccagtgcc cggccaccaa gggcgtcccc      240
gctggattgg tgcaagcaac cttcatcatc gaaaaccttg acccggcaa caacgacacg      300
ccgaccccc ctacaccaa actgcgatta gcccgaaaac ctgggcacca taggcgatct      360
gaatacgatg cggattcggg gctgcggaga aaggatacat cgcgccgatg cgtccaggcg      420
gatgacgtcc gatgcgtgca gctggtccag gatccgcggc gcggacgtgt cgaactcggg      480
ggttaccgcg ccgagcttac tgttggccga cgggcggcgg tgaattgcca acgcccga      540
tatggtgcgg atggatggcc cgttcgggtg ggttgcgggg taggcggcgc cgcgcgaggc      600
gatcagcgc                                     609

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<210> 47

<211> 250

<212> PRT

<213> Mycobacterium tuberculosis

<400> 47

```

Met Thr Met Pro Leu Arg Gly Leu Gly Pro Pro Asp Asp Thr Gly Val
1           5           10          15

```

```

Arg Glu Val Ser Thr Gly Asp Asp His His Tyr Ala Met Trp Asp Ala
20          25          30

```

```

Ala Tyr Val Leu Gly Ala Leu Ser Ala Ala Asp Arg Arg Glu Phe Glu
35          40          45

```

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Ala His Leu Ala Gly Cys Pro Glu Cys Arg Gly Ala Val Thr Glu Leu
 50 55 60

Cys Gly Val Pro Ala Leu Leu Ser Gln Leu Asp Arg Asp Glu Val Ala
 65 70 75 80

Ala Ile Ser Glu Ser Ala Pro Thr Val Val Ala Ser Gly Leu Ser Pro
 85 90 95

Glu Leu Leu Pro Ser Leu Leu Ala Ala Val His Arg Arg Arg Arg Arg
 100 105 110

Thr Arg Leu Ile Thr Trp Val Ala Ser Ser Ala Ala Ala Val Leu
 115 120 125

Ala Ile Gly Val Leu Val Gly Val Gln Gly His Ser Ala Ala Pro Gln
 130 135 140

Arg Ala Ala Val Ser Ala Leu Pro Met Ala Gln Val Gly Thr Gln Leu
 145 150 155 160

Leu Ala Ser Thr Val Ser Ile Ser Gly Glu Pro Trp Gly Thr Phe Ile
 165 170 175

Asn Leu Arg Cys Val Cys Leu Ala Pro Pro Tyr Ala Ser His Asp Thr
 180 185 190

Leu Ala Met Val Val Val Gly Arg Asp Gly Ser Gln Thr Arg Leu Ala
 195 200 205

Thr Trp Leu Ala Glu Pro Gly His Thr Ala Thr Pro Ala Gly Ser Ile
 210 215 220

Ser Thr Pro Val Asp Gln Ile Ala Ala Val Gln Val Val Ala Ala Asp
 225 230 235 240

Thr Gly Gln Val Leu Leu Gln Arg Ser Leu
 245 250

<210> 48

<211> 750

<212> DNA

-60-

<213> *Mycobacterium tuberculosis*

<400> 48

```

atgacgatgc cgctacgagg acttggtccc cccgatgaca ccggtgtgcg cgaggtgtcg      60
acgggtgatg atcaccacta cgcgatgtgg gatgcagctt acgtgttggg agcattgtct      120
gcggccgacc gccgcgaatt cgaagcgcac ctggccggtt gccccgaatg ccggggggcc      180
gtcaccgaac tctgcggggt gcccgccttg ctgtcccagc tcgatcgtga cgaagtggcc      240
gcgattagcg aatccgcccc gactgtggtg gcttcggggc tgtcgccgga gttgttgccg      300
tcgttgctgg cggcgggtgca caggcgtcgg cgccgtaccc ggctgatcac ctgggtggcc      360
tcgtccgccc ctgccgcggt gctggcgatc ggtgtgctag tcggtgtgca gggccactcc      420
gcggcaccgc agcgggcggc cgtgtcggcg ctgccgatgg ccagggtcgg cagcagctg      480
ttggcgctca cggtgtcgat cagcggcgag ccttggggga cgttcatcaa cctgcgggtgc      540
gtctgcctgg cgccgcgta tgcttccac gacacgctgg ccatggttgt ggtgggtcgt      600
gacggcagcc agacacggct ggcgacttgg ttggccgaac ccggtcacac cgcgacaccc      660
gccggcagca ttctgacacc ggttgaccag atcgccgccg tgcaagtggg tgccgccgat      720
accggccagg ttctgctgca gcgttcgctc                                     750

```

<210> 49

<211> 294

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 49

```

Met Thr Thr Ile Ala Phe Leu Gly Leu Gly Asn Met Gly Ala Pro Met
1          5          10          15

Ser Ala Asn Leu Val Gly Ala Gly His Val Val Arg Gly Phe Asp Pro
          20          25          30

Ala Pro Thr Ala Ala Ser Gly Ala Ala Ala His Gly Val Ala Val Phe
          35          40          45

Arg Ser Ala Pro Glu Ala Val Ala Glu Ala Asp Val Val Ile Thr Met
          50          55          60

```

-61-

Leu Pro Thr Gly Glu Val Val Arg Arg Cys Tyr Thr Asp Val Leu Ala
 65 70 75 80

Ala Ala Arg Pro Ala Thr Leu Phe Ile Asp Ser Ser Thr Ile Ser Val
 85 90 95

Thr Asp Ala Arg Glu Val His Ala Leu Ala Glu Ser His Gly Met Leu
 100 105 110

Gln Leu Asp Ala Pro Val Ser Gly Gly Val Lys Gly Ala Ala Ala Ala
 115 120 125

Thr Leu Ala Phe Met Val Gly Gly Asp Glu Ser Thr Leu Arg Arg Ala
 130 135 140

Arg Pro Val Leu Glu Pro Met Ala Gly Lys Ile Ile His Cys Gly Ala
 145 150 155 160

Ala Gly Ala Gly Gln Ala Ala Lys Val Cys Asn Asn Met Val Leu Ala
 165 170 175

Val Gln Gln Ile Ala Ile Ala Glu Ala Phe Val Leu Ala Glu Lys Leu
 180 185 190

Gly Leu Ser Ala Gln Ser Leu Phe Asp Val Ile Thr Gly Ala Thr Gly
 195 200 205

Asn Cys Trp Ala Val His Thr Asn Cys Pro Val Pro Gly Pro Val Pro
 210 215 220

Thr Ser Pro Ala Asn Asn Asp Phe Lys Pro Gly Phe Ser Thr Ala Leu
 225 230 235 240

Met Asn Lys Asp Leu Gly Leu Ala Met Asp Ala Val Ala Ala Thr Gly
 245 250 255

Ala Thr Ala Pro Leu Gly Ser His Ala Ala Asp Ile Tyr Ala Lys Phe
 260 265 270

Ala Ala Asp His Ala Asp Leu Asp Phe Ser Ala Val Ile His Thr Leu
 275 280 285

Arg Ala Arg Ala Asp Ala

-62-

290

<210> 50

<211> 882

<212> DNA

<213> Mycobacterium tuberculosis

<400> 50

```
atgacgacca tcgccttcct aggtttgggc aacatgggtg cgccgatgtc ggcgaatctg      60
gttggtgcgg gccacgtcgt gcgtggattc gaccgggcac ccacggcggc gtccggcgcc      120
gccgcgcacg gtgtcgcggt gtttcgtagc gcgcccgaag cgggtggccga ggccgacgtg      180
gtcatcacca tgctgcccac cggcgaggtg gtccggcgct gctacaccga cgtgctggcc      240
gccgcgcgtc cggcaacgct gttcatcgac agctccacga tctcggtcac cgatgcccggt      300
gaggtgcacg cgctggccga atcgcacggc atgctccaac tggatgcgcc ggtctccggc      360
ggggtgaagg gcgccgccgc cgcgacgctg gcattcatgg tcggcgccga cgagtccacg      420
ctacggcggg cagccccggt actagagccc atggcgggca agatcattca ctgcggcgcc      480
gccggtgccg gacaggccgc caaggtgtgc aacaacatgg tgctggcggt gcagcagatc      540
gcgatcgccg aggcgttcgt gctggccgag aagctcgggc tgtccgcaca atcgttgttc      600
gacgtcatca ccggcgcgcac cggcaattgc tgggcggtgc acaccaattg cccggtgccg      660
ggcccgggtg ccacctcacc ggccaacaac gacttcaagc ccgggttttc gaccgcgttg      720
atgaacaagg acctgggcct ggcgatggat gcggtggccg ccaccggtgc gacggccccg      780
ctgggcagcc acgccgccga catctacgcc aaattcgccg ccgaccacgc cgacctggac      840
ttcagcgcgg tgatccacac gttgcgcgcg cgagcagacg ca                        882
```

<210> 51

<211> 207

<212> PRT

<213> Mycobacterium tuberculosis

<400> 51

Met Gly Val Thr Ala Ala Val Thr Pro Lys Gly Glu Arg Arg Arg Tyr

1				5					10					15		
Ala	Leu	Val	Ser	Ala	Ala	Ala	Glu	Leu	Leu	Gly	Glu	Gly	Gly	Phe	Glu	
			20					25					30			
Ala	Val	Arg	His	Arg	Ala	Val	Ala	Arg	Arg	Ala	Gly	Leu	Pro	Leu	Ala	
		35					40					45				
Ser	Thr	Thr	Tyr	Tyr	Phe	Ser	Ser	Leu	Asp	Asp	Leu	Ile	Ala	Arg	Ala	
	50					55					60					
Val	Glu	His	Ile	Gly	Met	Ile	Glu	Val	Ala	Gln	Leu	Arg	Ala	Arg	Val	
65					70					75					80	
Ser	Ala	Leu	Ser	Arg	Arg	Arg	Arg	Gly	Pro	Glu	Thr	Thr	Ala	Val	Val	
				85					90					95		
Leu	Val	Asp	Leu	Leu	Val	Gly	Glu	Met	Ser	Ser	Pro	Gly	Leu	Ala	Glu	
			100					105					110			
Gln	Leu	Ile	Ser	Arg	Tyr	Glu	Arg	His	Ile	Ala	Cys	Thr	Arg	Leu	Pro	
		115					120					125				
Asp	Leu	Arg	Glu	Ser	Met	Arg	Arg	Ser	Leu	Arg	Gln	Arg	Ala	Glu	Ala	
	130					135					140					
Val	Ala	Glu	Ala	Ile	Glu	Arg	Ser	Gly	Arg	Ser	Ala	Gln	Ile	Glu	Leu	
145					150					155					160	
Val	Cys	Thr	Leu	Ile	Cys	Ala	Val	Asp	Gly	Ser	Val	Val	Ser	Ala	Leu	
				165					170					175		
Val	Glu	Gly	Arg	Asp	Pro	Arg	Ala	Ala	Ala	Leu	Ala	Thr	Val	Val	Asp	
			180					185					190			
Leu	Ile	Asp	Val	Leu	Ala	Pro	Val	Asp	Gln	Arg	Pro	Val	Pro	Phe		
		195					200					205				

<213> Mycobacterium tuberculosis

-64-

<400> 52
 atggggtga cagcagcggg cactccaaaa ggagaacgtc ggcggtatgc gttgggtcagc 60
 gccgccgcgg agctgctcgg cgagggcggg ttcgagggcg tacgccaccg ggcggtggcg 120
 cggcgggccg gtttgccgtt gggtctacc acctactact tctcgtcgtc cgacgatttg 180
 atcgtcgcg cggtcgaaca catcggaatg atcgaggtgg ctcagctgcg agcccgggtc 240
 agtgcgctgt cccggcgacg tcggggggccc gagaccaccg ccgttgtgct ggttgacctg 300
 ctgggtggggg aaatgtccag tccggggcct gccgagcagc tgatctcacg atacgagcgc 360
 catatgcct gtaccgcct gcctgacctg cgcgaaagca tgcgccgcag cctgcgtcag 420
 cgcgtgagg ccgtggccga ggccatcgag cgctccggcc gctccgcaca gatcgaactg 480
 gtgtgtacgt tgatctgtgc ggtcgacgga tcggtggtct cggcgctggt cgaagggcg 540
 gaccgcgtg ccgtgcgtt ggcgacggtg gtcgacctca tcgacgtgct cgcgcccgtc 600
 gaccagcgtc cgggtgccgtt c 621

<210> 53

<211> 259

<212> PRT

<213> Mycobacterium tuberculosis

<400> 53

Met Tyr Phe Val Gly Val Asp Leu Ala Trp Ala Gly Arg Asn Pro Thr
 1 5 10 15

Gly Val Ala Ala Val Asp Ala Asp Gly Cys Leu Val Gly Val Gly Ala
 20 25 30

Ala Arg Asp Asp Ala Ser Val Leu Ala Ala Leu Arg Pro Tyr Val Val
 35 40 45

Gly Asp Cys Leu Val Ala Phe Asp Ala Pro Leu Val Val Ala Asn Arg
 50 55 60

Thr Gly Gln Arg Pro Ala Glu Ala Ala Leu Asn Arg Asp Phe Arg Gln
 65 70 75 80

-65-

Phe Glu Ala Gly Ala Tyr Pro Ala Asn Thr Glu Lys Pro Glu Phe Ala
 85 90 95

Asp Val Pro Arg Ala Ala Arg Leu Ala Arg Gln Leu Ala Leu Asp Met
 100 105 110

Asp Pro Leu Ser Ser Ala Thr Arg Arg Ala Ile Glu Val Tyr Pro His
 115 120 125

Pro Ala Thr Val Ala Leu Phe Arg Leu Pro Arg Ala Leu Lys Tyr Lys
 130 135 140

Ala Lys Pro Gly Arg Ser Val Asp Leu Leu Lys Ser Glu Leu Leu Arg
 145 150 155 160

Leu Met Asp Gly Val Glu Gly Leu Ala Gln Ala Gly Val Arg Met Gln
 165 170 175

Val Ala Gly Gln Pro Asp Trp Val Ser Leu Arg Arg Gln Val Thr Val
 180 185 190

Ala Gln Arg Lys Ser Asp Leu Arg Ala Ala Glu Asp Pro Ile Asp Ala
 195 200 205

Val Val Cys Ala Tyr Val Ala Leu Tyr Ala Gln Arg Arg Pro Ala Asp
 210 215 220

Val Thr Ile Tyr Gly Asp Phe Thr Thr Gly Tyr Ile Val Thr Pro Ser
 225 230 235 240

Leu Pro Thr Asp Phe Arg Thr Ala Pro Asp Ala Gly Arg Arg Ala Arg
 245 250 255

Ala Arg Arg

<210> 54

<211> 777

<212> DNA

<213> Mycobacterium tuberculosis

-66-

<400> 54
 atgtacttctg tcggcgtgga cctcgccctgg gccggccgca atccgaccgg tgtcgcggt 60
 gtcgacgcgg acgggtgtct ggtgggggtc ggtgccgtc ggcacgatgc ctccgtgctg 120
 gcggcgctgc ggccctacgt tgtgggcgat tgcctggtcg ccttcgacgc gccgctggtg 180
 gtggccaacc gcaccggcca gcggccggcg gaggcgcac tgaatcgaga ctcccgacaa 240
 ttcgaggccg gcgcgtatcc ggccaacacc gaaaagcccg agtttgccga cgttccacgc 300
 gccgcccggc tggcccggca actggcgctg gatatggatc ctctttcgtc cgccacgcgg 360
 cgggccatcg aggtctatcc gcaccggct acggtggcgc tgtttcggct accccgcgcg 420
 ctgaagtaca aggccaagcc gggacgcagc gttgacctgc tcaaatacga gctattgcga 480
 ctgatggacg gcgtcgagg gctcgcccag gccgggggttc ggatgcagggt agccggtcag 540
 ccggattggg tctcgttgcg ccggcagggt acggtcgcg agcgaaaaag cgacctgcgg 600
 gccgcccagg atccgatcga cgcgctcgta tgcgcctacg tggcgttgta cgcccaacgc 660
 cggcccgcgg atgtcacgat ctatggggac ttcaccaccg ggtacattgt cagccgctcg 720
 ctgcccaccg acttcagaac ggcaccggac gctggtcgac gggcgcgagc acgtcga 777

<210> 55

<211> 566

<212> PRT

<213> Mycobacterium tuberculosis

<400> 55

Val Ala Leu Thr Cys Thr Asp Met Ser Asp Ala Val Ala Gly Ser Asp
 1 5 10 15
 Ala Glu Gly Leu Thr Ala Asp Ala Ile Val Val Gly Ala Gly Leu Ala
 20 25 30
 Gly Leu Val Ala Ala Cys Glu Leu Ala Asp Arg Gly Leu Arg Val Leu
 35 40 45
 Ile Leu Asp Gln Glu Asn Arg Ala Asn Val Gly Gly Gln Ala Phe Trp
 50 55 60
 Ser Phe Gly Gly Leu Phe Leu Val Asn Ser Pro Glu Gln Arg Arg Leu
 65 70 75 80

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Gly Ile Arg Asp Ser His Glu Leu Ala Leu Gln Asp Trp Leu Gly Thr
 85 90 95

Ala Ala Phe Asp Arg Pro Glu Asp Tyr Trp Pro Glu Gln Trp Ala His
 100 105 110

Ala Tyr Val Asp Phe Ala Ala Gly Glu Lys Arg Ser Trp Leu Arg Ala
 115 120 125

Arg Gly Leu Lys Ile Phe Pro Leu Val Gly Trp Ala Glu Arg Gly Gly
 130 135 140

Tyr Asp Ala Gln Gly His Gly Asn Ser Val Pro Arg Phe His Ile Thr
 145 150 155 160

Trp Gly Thr Gly Pro Ala Leu Val Asp Ile Phe Val Arg Gln Leu Arg
 165 170 175

Asp Arg Pro Thr Val Arg Phe Ala His Arg His Gln Val Asp Lys Leu
 180 185 190

Ile Val Glu Gly Asn Ala Val Thr Gly Val Arg Gly Thr Val Leu Glu
 195 200 205

Pro Ser Asp Glu Pro Arg Gly Ala Pro Ser Ser Arg Lys Ser Val Gly
 210 215 220

Lys Phe Glu Phe Arg Ala Ser Ala Val Ile Val Ala Ser Gly Gly Ile
 225 230 235 240

Gly Gly Asn His Glu Leu Val Arg Lys Asn Trp Pro Arg Arg Met Gly
 245 250 255

Arg Ile Pro Lys Gln Leu Leu Ser Gly Val Pro Ala His Val Asp Gly
 260 265 270

Arg Met Ile Gly Ile Ala Gln Lys Ala Gly Ala Ala Val Ile Asn Pro
 275 280 285

Asp Arg Met Trp His Tyr Thr Glu Gly Ile Thr Asn Tyr Asp Pro Ile
 290 295 300

Trp Pro Arg His Gly Ile Arg Ile Ile Pro Gly Pro Ser Ser Leu Trp

-68-

305		310		315		320
Leu Asp Ala Ala Gly Lys Arg Leu Pro Val Pro Leu Phe Pro Gly Phe						
		325		330		335
Asp Thr Leu Gly Thr Leu Glu Tyr Ile Thr Lys Ser Gly His Asp Tyr						
		340		345		350
Thr Trp Phe Val Leu Asn Ala Lys Ile Ile Glu Lys Glu Phe Ala Leu						
		355		360		365
Ser Gly Gln Glu Gln Asn Pro Asp Leu Thr Gly Arg Arg Leu Gly Gln						
		370		375		380
Leu Leu Arg Ser Arg Ala His Ala Gly Pro Pro Gly Pro Val Gln Ala						
385		390		395		400
Phe Ile Asp Arg Gly Val Asp Cys Val His Ala Asn Ser Leu Arg Glu						
		405		410		415
Leu Val Ala Ala Met Asn Glu Leu Pro Asp Val Val Pro Leu Asp Tyr						
		420		425		430
Glu Thr Val Ala Ala Ala Val Thr Ala Arg Asp Arg Glu Val Val Asn						
		435		440		445
Lys Tyr Ser Lys Asp Gly Gln Ile Thr Ala Ile Arg Ala Ala Arg Arg						
		450		455		460
Tyr Arg Gly Asp Arg Phe Gly Arg Val Val Ala Pro His Arg Leu Thr						
465		470		475		480
Asp Pro Lys Ala Gly Pro Leu Ile Ala Val Lys Leu His Ile Leu Thr						
		485		490		495
Arg Lys Thr Leu Gly Gly Ile Glu Thr Asp Leu Asp Ala Arg Val Leu						
		500		505		510
Lys Ala Asp Gly Thr Pro Leu Ala Gly Leu Tyr Ala Ala Gly Glu Val						
		515		520		525
Ala Gly Phe Gly Gly Gly Gly Val His Gly Tyr Arg Ala Leu Glu Gly						
		530		535		540

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Thr Phe Leu Gly Gly Cys Ile Phe Ser Gly Arg Ala Ala Gly Arg Gly
 545 550 555 560

Ala Ala Glu Asp Ile Arg
 565

<210> 56

<211> 1698

<212> DNA

<213> .Mycobacterium tuberculosis

<400> 56

```

gtggcggttaa cctgtaccga catgagcgat gctgtagccg gttcagatgc cgaggggctc      60
accgctgatg ccattgtcgt gggagccgga ttagcgggcc tggtagccgc ttgtgagttg      120
gccgaccgcg gcctacgggt gctgatactc gaccaggaga atcggggcaa cgtgggcggg      180
caggccttct ggtcggttcg cggtttgttc ttggtcaaca gtcccagca gcgccgcttg      240
ggcatccgtg atagccatga gcttgctctg caggattggc tggggacggc ggcgttcgac      300
cgccccgagg actactggcc cgaacaatgg gcgcattgct acgtcgattt cgcgggcggg      360
gagaagcgca gctggctgcg ggcccgcggg ctgaagatct ttccgctggt gggctgggcc      420
gagcgtggtg gttacgacgc gcagggggcac ggcaactcgg tgccccgttt ccacatcacc      480
tggggtactg ggccggctct ggtcgacata ttcgtgcgtc agctgcgtga tcgccccacg      540
gtgcgctttg cgcaccgcca ccaggtcgac aaactgatcg tcgagggtaa cgcggtgaca      600
ggcgttcggg gtaccgtgct ggagccctcg gatgagccgc gcggcgcgcc ttcgtcgcga      660
aagtctgtgg ggaaattcga gtttcgcgcg tcagcgggtga tcgtcgccag tgggtggtatc      720
ggtggcaatc atgagctggt gcgcaaaaac tggccgagac ggatggggccg cattcccaag      780
caactgttga gcgggggtgcc cgcgcacggt gatggcagga tgatcggcat cgctcaaaaag      840
gccggggctg cgggtgatcaa tccggaccgg atgtggcatt acaccgaagg cattaccaac      900
tacgaccoga tctggccgcg gcacgggtatc cggattattc cggggccgtc gtcgctatgg      960
ctggatgccg cgggcaagcg gttgccggta ccgttgtttc ccgggttcga caccctcggc     1020
acattggagt acatcaccaa gtctggacat gactacacct ggttcgtggt gaatgccaag     1080
ataatcgaga aggaattcgc gctgtccggt caggagcaga accctgactt gaccggtcgg     1140
cgcctgggcc agctgttgcg ctctcgggct cacgccggcc cgcccggacc ggtgcaggca     1200

```

-70-

```

ttcatcgatc gtggtgtgga ctgcgtccac gcgaactcgt tgcgcgagtt ggtggccgcg 1260
atgaacgagt tgcccgatgt ggtgccgctg gactacgaga cggtaggcagc cgcggtcact 1320
gcgcgcgatc gtgaggtggt caataagtac agcaaggatg gacagatcac cgcgattcgt 1380
gccgctcgcc gctaccgagg cgaccgattt ggccgggtgg tggcgccaca tcggttgacc 1440
gatccgaagg ccggggccgct gatcgcggtc aagctgcaca tcctgactcg aaagacgttg 1500
ggtggcatcg aaactgactt agatgctcgg gtgctcaagg ccgacggtag gccactggcc 1560
gggttgatatg cagccggcga ggtcgccggg ttccggcgggg gcggtgtcca tggctaccgg 1620
gccttgaggg gcaccttcct gggtaggatgc atattttccg gccgcgctgc cggccgcggg 1680
gccgcccaggg atatccgc 1698

```

<210> 57

<211> 242

<212> PRT

<213> Mycobacterium tuberculosis

<400> 57

```

Met Thr Leu Ala Asn Asn Gly Thr Gly Met Asp His Phe Leu Thr Pro
1      5      10      15

```

```

Thr Glu Tyr Leu Asp Ala Gly His Pro Leu Val Arg Thr Thr Ala Ala
      20      25      30

```

```

Thr Leu Ile Arg Asp Ala Val Ser Asp Thr Glu Arg Val Arg Arg Ile
      35      40      45

```

```

Tyr Tyr Tyr Val Arg Asp Val Pro Tyr Asp Val Leu Ala Ser Phe Arg
      50      55      60

```

```

Tyr Leu Ala Gln Gly His His Arg Ala Ser Asp Val Ile Gly His Gly
      65      70      75      80

```

```

Val Ala Phe Cys Met Gly Lys Ala Ser Ser Phe Val Ala Leu Cys Arg
      85      90      95

```

```

Ala Ala Gly Val Pro Ala Arg Ile Ala Phe Gln Thr Ile Asp Ala Pro
      100      105      110

```

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Asp Lys Glu Phe Leu Ser Pro Gln Val Arg Ala Leu Trp Gly Gly Arg
 115 120 125

Thr Gly Arg Pro Phe Pro Trp His Ser Leu Gly Glu Ala Tyr Leu Gly
 130 135 140

Arg Arg Trp Val Lys Leu Asp Ala Thr Ile Asp Ala Pro Thr Ala Ala
 145 150 155 160

Arg Leu Gly Lys Pro Tyr Arg Gln Glu Phe Asp Gly Ala Thr Pro Ile
 165 170 175

Pro Thr Val Glu Gly Thr Ile Leu Arg Glu Asn Gly Ser Tyr Ala Asp
 180 185 190

Tyr Pro Ser Ala Val Ala Gln Trp Tyr Glu Arg Ile Ala Gln Ser Val
 195 200 205

Leu Lys Ala Leu Gln Ser Thr Glu Val His Ala Leu Val Ala Ala Asp
 210 215 220

Glu Glu Leu Trp Thr Gly Pro Pro Val Glu Leu Ala Asp Ala Thr His
 225 230 235 240

Arg Leu

<210> 58

<211> 726

<212> DNA

<213> Mycobacterium tuberculosis

<400> 58

atgacgctag ccaacaatgg aaccggcatg gaccactttc tgacgcccac ggagtacctc 60
 gacgcggggc atccgctcgt tcgtacgacg gcagcaaccc tcatccggga cgcggtgtcg 120
 gataccgagc gggtcaggcg gatctactac tacgtgcgcg acgtgccata cgacgtcctc 180
 gcgtcctttc gctacctcgc gcaggacat caccgcgcca gcgacgtgat cggccacggg 240
 gtcgccttct gcatgggcaa ggcaagttcc ttcgtcgccc tgtgccgagc cgccgggtgtc 300
 ccggcccgtg tcgcgttcca gacgatcgac gcccccgata aggagtttct gtccccgcag 360

-72-

```

gtacgtgccc tatggggagg ccgaactggc cggcccttcc cgtggcactc gctgggtgag      420
gcatatcttg gtcggcgatg ggtcaagctg gacgccacca tcgacgcacc caccgccgcc      480
cgccctggca agccctaccg gcaagaattc gacggagcta ccccgatccc gacggtggaa      540
ggaaccatcc tgcgggaaaa cggcagctac gccgactatc ccagcgcggt cgcgcaatgg      600
tacgaacgaa tcgctcagtc ggtcctgaag gcgttgcaat ccaccgaagt acacgccttg      660
gtagccgctg acgaggaact gtggaccggc cccccggttg aattggccga cgcaaccac      720
cgactg                                          726

```

<210> 59

<211> 499

<212> PRT

<213> Mycobacterium tuberculosis

<400> 59

```

Met Thr Ala Ala Gln Gln Asp Gln Ala Pro Met Ala Thr Pro Gly Cys
1           5           10           15

```

```

Arg Glu Gly Glu Thr Tyr Asp Val Val Val Leu Gly Ala Gly Pro Val
          20           25           30

```

```

Gly Gln Asn Val Ala Asp Arg Ala Arg Ala Gly Gly Leu Arg Val Ala
          35           40           45

```

```

Val Val Glu Arg Glu Leu Val Gly Gly Glu Cys Ser Tyr Trp Ala Cys
          50           55           60

```

```

Val Pro Ser Lys Ala Leu Leu Arg Pro Val Ile Ala Ile Ser Asp Ala
          65           70           75           80

```

```

Arg Arg Val Asp Gly Ala Arg Glu Ala Val Asp Gly Ser Ile Asn Thr
          85           90           95

```

```

Ala Gly Val Phe Gly Arg Arg Asn Arg Tyr Val Ala His Trp Asp Asp
          100          105          110

```

```

Thr Gly Gln Ala Asp Trp Val Ser Gly Ile Gly Ala Thr Leu Ile Arg
          115          120          125

```

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Gly Asp Gly Arg Leu Asp Gly Pro Arg Arg Val Val Val Thr Lys Ser
 130 135 140

Ser Gly Glu Ser Val Ala Leu Thr Ala Arg His Ala Val Val Ile Cys
 145 150 155 160

Thr Gly Ser Arg Pro Ala Leu Pro Asp Leu Pro Gly Ile Thr Glu Ala
 165 170 175

Arg Pro Trp Thr Asn Arg Gln Ala Thr Asp Asn Ser Thr Val Pro Asp
 180 185 190

Arg Leu Ala Ile Val Gly Ala Gly Gly Val Gly Val Glu Met Ala Thr
 195 200 205

Ala Trp Gln Gly Leu Gly Ala Ser Val Thr Leu Leu Ala Arg Gly Ser
 210 215 220

Gly Leu Leu Pro Arg Met Glu Pro Phe Val Gly Glu Leu Ile Gly Arg
 225 230 235 240

Gly Leu Ala Asp Ala Gly Val Asp Val Arg Val Gly Val Ser Val Arg
 245 250 255

Ala Leu Gly Arg Pro Asn Pro Thr Gly Pro Val Val Leu Glu Leu Asp
 260 265 270

Asp Gly Thr Glu Leu Arg Val Asp Glu Val Leu Phe Ala Thr Gly Arg
 275 280 285

Ala Pro Arg Thr Asp Asp Ile Gly Leu Glu Thr Ile Gly Leu Thr Pro
 290 295 300

Gly Ser Trp Leu Asp Val Asp Asp Thr Cys Arg Val Arg Ala Val Asp
 305 310 315 320

Asp Gly Trp Leu Tyr Ala Ala Gly Asp Val Asn His Arg Ala Leu Leu
 325 330 335

Thr His Gln Gly Lys Tyr Gln Ala Arg Ile Ala Gly Thr Ala Ile Gly
 340 345 350

Ala Arg Ala Ala Gly Arg Pro Leu Asp Thr Thr Ser Trp Gly Met His
 355 360 365

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Ala Thr Thr Ala Asp His His Ala Val Pro Gln Ala Phe Phe Thr Asp
 370 375 380

Pro Glu Ala Ala Ala Val Gly Leu Thr Ala Asp Gln Ala Ala Gln Ala
 385 390 395 400

Gly His Arg Ile Lys Ala Ile Asp Val Glu Ile Gly Asp Val Val Met
 405 410 415

Gly Ala Lys Leu Phe Ala Asp Gly Tyr Thr Gly Arg Ala Arg Met Val
 420 425 430

Val Asp Val Asp Arg Gly His Leu Leu Gly Val Thr Met Val Gly Pro
 435 440 445

Gly Ala Ala Glu Leu Leu His Ser Ala Thr Val Ala Val Ala Gly Gln
 450 455 460

Val Pro Ile Asp Arg Leu Trp His Ala Val Pro Cys Phe Pro Thr Ile
 465 470 475 480

Ser Glu Leu Trp Leu Arg Leu Leu Glu Ser Tyr Arg Asp Ser Phe Tyr
 485 490 495

Leu Leu Val

<210> 60

<211> 1497

<212> DNA

<213> Mycobacterium tuberculosis

<400> 60

atgaccgcgg cccaacagga ccaggcgcca atggcaacac ccggctgccg tgaggggtgaa 60
 acgtatgacg tcgtcgtgct cggcgcgagg cccgttgagc agaacgtcgc cgatcgtgcc 120
 cgcgcggggg gcctgcgtgt cgcggtggtg gagcgcgaaac tcgtcggggg tgaatgctcc 180
 tattgggcct gtgtgcccag caaagccttg ctgcgtccgg tcatcgcgat ctctgacgcc 240
 cgacgggtcg acggcgcgcg cgaagcagtc gacggctcga tcaacacagc cggcgtcttt 300

-75-

```

ggccgcccga accgctatgt ggcccactgg gacgacaccg gccaggccga ctgggtgagt      360
ggaatcggcg cgacgctgat acgcggtgac gggcgattgg acggtccgcg ccgcgtcgtc      420
gtcaccaagt cgagcggcga aagcgtggcg ctgaccgccg ggcatgccgt tgtcatctgc      480
accggaagcc ggccagcact ccccgacott cctggcatca ccgaagcccg gccatggacc      540
aatcgccaag ccaccgacaa cagtacggtc cccgaccggc ttgcgatcgt cggcgccggc      600
ggcgtcgggtg tggagatggc gaccgcctgg cagggactgg ggcctcgggt gaccctgctg      660
gctcggggat ctggcctgct gccccgaatg gaaccgtttg tgggggaact catcggtcgc      720
ggactggccg acgccggcgt tgacgtgcgc gtgggagtat cggtagcgcg gctgggcccgc      780
cccaacccaa ctggcccagt ggtcctcgag ctggacgacg gtaccgagct gcgggtcgac      840
gaggtactct tcgccaccgg ccgagcaccg cgaaccgacg acatcggctt ggagacaata      900
ggactgacgc cgggcagctg gctggacgtc gatgacacct gccgagtgcg ggctgttgac      960
gacggctggc tctatgccgc cggcgacgtc aaccatcgcg cgttgctgac ccaccaaggc     1020
aaataccagg cgcggatcgc cggcaccgcg atcggcgccc gtgccgccgg acgaccgcta     1080
gacaccacgt cgtggggcat gcacgcgacc accgccgacc atcacgcggt gccgcaggca     1140
ttctttaccg accccgaagc cgcagcggtc ggcttgacag ctgatcaggc cgcacaggct     1200
ggtcaccgga tcaaagcgat cgatgtcgaa atcggcgatg tcgttatggg agccaagctc     1260
tttgccgacg gatacaccgg cagggcgcgc atggtggtcg acgtcgatcg gggccatctg     1320
ctgggcgtga ccatggttgg cccgggcgcc gccgagctgt tgcattcggc caccgtcgcc     1380
gtcgccggcc aggtgccaat cgatcggttg tggcacgcgc ttccgtgctt cccgaccatc     1440
agcgaactgt ggctgagact tcttgaatcc taccgagatt cgttttacct gctggta      1497

```

<210> 61

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 61

```

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
1           5           10          15

```

```

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp

```

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20	25	30
Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu		
35	40	45
Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg		
50	55	60
Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg		
65	70	75 80
Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser		
85	90	95
Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg		
100	105	

<210> 62

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 62

atgtcagggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg	60
gtcgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccgt	120
ctacttggtg ttggctgcgc ggagacgggtg cgtaagtggg tgcgccaggc gcaggtcgat	180
gccggcgcac ggcccgggac caccgacgaa gaatccgctg agctgaagcg cttgcggcgg	240
gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg	300
gccgagctcg accggccagc acgc	324

<210> 63

<211> 217

<212> PRT

<213> Mycobacterium tuberculosis

<400> 63

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Met Leu Val Gly Ala Gln Cys Arg Asp Leu Leu His Trp Arg Phe Cys
 1 5 10 15

Arg Gly Val Pro Pro Arg Ala Thr Asn Asp Thr Asp Ile Ala Gly Thr
 20 25 30

Leu Asn Asn Trp Asp His Phe Glu Ala Ile Arg Ala Thr Phe Arg Ala
 35 40 45

Leu Gly Ser Thr Gly His Arg Phe Leu Ile Ala Asp Arg Ala Val Asp
 50 55 60

Ala Leu Pro Phe Gly Glu Val Glu Ser Pro Thr Gly Thr Thr Arg His
 65 70 75 80

Pro Pro Gly Asn Gln Leu Met Asn Val His Gly Cys Thr Asp Ala Tyr
 85 90 95

Leu Arg Ala Asp Val Leu Pro Leu Pro Gly Gly Leu Thr Val His Leu
 100 105 110

Pro Gln Pro Pro Asn Tyr Ala Val Leu Lys Leu His Ala Trp Leu Asp
 115 120 125

Arg Ser Ala Asp His Asp Tyr Lys Asp Gly Pro Asp Leu Ala Leu Val
 130 135 140

Val His Trp Tyr Ala Gly Asp Leu Asp Arg Leu Tyr Ala Lys Pro Asp
 145 150 155 160

Gln Trp Ala Leu Arg Arg His Asp Phe Asp Leu Arg Thr Ala Ala Ala
 165 170 175

Ala Leu Leu Gly His Asp Met Arg Ala Ser Val Ser Ala Pro Glu Ala
 180 185 190

Ala Val Leu Ala Thr Arg Ala Thr Gln Ala Asp His Asp Leu Leu Ala
 195 200 205

Gln His Phe Ala Val Gly Arg Pro Gly
 210 215

<210> 64

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<211> 651

<212> DNA

<213> Mycobacterium tuberculosis

<400> 64

```

atgctcgtcg gggcacagtg ccgcgatcta ctgcactggc gttcttgccg cgggggtgccg      60
ccgcggggcca ccaacgacac cgatatcgca gggaccctga acaattggga ccacttcgag      120
gcaattcggg ccaccttcg cgccctgggc agcaccgggc accgattcct gatcgccgac      180
cgcgccgtcg atgccctccc gttcggcgag gtggagtcgc ccaccggcac aaccgcgcat      240
ccccaggca accagctcat gaacgtccac ggatgcaccg acgcctacct gcgtgccgat      300
gttctgcctc tccctggcgg cctgacagtc caccttcccc aaccgccgaa ctatgcggtc      360
ctcaaactgc acgcatggct cgatcgggcc gcggaccacg actacaaaga cggcccagat      420
ctggccttgg tgggtgactg gtacgccggc gacctcgacc ggctttacgc caaaccagac      480
cagtgggcgc tacgccgtca cgacttcgac ctacgcaccg ccgctgccgc gctgctgggc      540
cacgacatgc gcgccagtgt cagcgcaccg gaggccgccg tgctggcgac gcgcgccaca      600
caggccgacc acgacctgct ggcccagcac ttcgccgtgg gtcgaccggg c              651

```

<210> 65

<211> 342

<212> PRT

<213> Mycobacterium tuberculosis

<400> 65

```

Met Asp Gln Ile Gly Ala Asp Leu Ala Glu Ala Val Glu Arg His Leu
1              5              10              15

Thr Glu Tyr Gly Val Arg Val Leu Gly Gly Leu Ser Ala Leu Asn Ser
                20              25              30

Ala His Pro Glu Ser Leu Asp Leu Glu Ile Asp Ala His Pro Leu Thr
                35              40              45

Ile Thr Ala Leu Tyr Leu Pro His Leu Ser Ala Thr Ala Ala Leu Gln
50              55              60

```

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Ala Trp Asp Thr Ala Gly Ala Gly Ser Pro Leu Leu Val Val Gly Pro
65 70 75 80

Arg Leu His Pro Ser Ser Ala Glu Thr Leu Arg Ala Arg Gly Leu Trp
85 90 95

Tyr Ile Asp Gly Ala Gly Asn Ala Tyr Leu Arg His Gln Gly Gly Leu
100 105 110

Leu Ile Asp Val Arg Gly Arg Arg Ser Ala Val Ser Ala Gln Pro Gly
115 120 125

Thr Leu Gly Asp Gly Leu His Ser Asp Gly Pro Arg Asn Pro Phe Thr
130 135 140

Pro Lys Arg Ala Gln Val Val Cys Val Leu Leu Asp Ala Pro Gln Leu
145 150 155 160

Val Asp Ala Pro Leu Arg Ala Ile Ala Ala Ser Ala Gly Val Ser Val
165 170 175

Gly Met Ala Lys Glu Thr Met Asp Thr Leu Arg Thr Thr Gly Phe Phe
180 185 190

Glu His Leu Gly Ser Arg Arg Arg Leu Val Arg Thr Asp Glu Leu Leu
195 200 205

Asp Leu Trp Ala Ala Ala Tyr Pro Gly Gly Leu Gly Arg Ala Asn Lys
210 215 220

Leu Leu Val Ala Ser Gly Asp Ile His Thr Trp Ser Ala Pro Asp Gly
225 230 235 240

Leu Ala Val Ala Val Ser Gly Glu Gln Ala Leu Pro Asp Glu Ile Arg
245 250 255

Asn Pro Glu Ser Leu Met Leu Tyr Val Asp Thr Pro Ala Pro Gly Leu
260 265 270

Pro Ala Asp Leu Leu Ile His Asn Arg Trp His Arg Asp Pro His Gly
275 280 285

Ser Ile Val Ile Arg Lys Leu Phe Trp Arg Asn Leu Pro Asp Glu Gln

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290 295 300
 Pro Gly Leu Ala Pro Thr Ala Leu Ile Tyr Ala Asp Leu Leu Ala Ser
 305 310 315 320
 Arg Glu Pro Arg Gln Val Glu Val Ala His Leu Met Arg Arg Gln Asp
 325 330 335
 Glu Arg Leu Ala Arg Leu
 340

<210> 66

<211> 1026

<212> DNA

<213> Mycobacterium tuberculosis

<400> 66

atggatcaga tcggggctga cctcgctgag gccgtcgagc gtcacctcac cgaatacggg	60
gtgcgggtgc tcggtggcct atcagcattg aactccgcgc atcccgaatc actagacctt	120
gagatcgacg ctcaccccct cagcatcact gccctctacc ttcctcacct gtcggcaacg	180
gcagcactgc aggcctggga taccgccggc gctggttcgc cgctgcttgt ggtgggcccg	240
cgtctgcata cgctcgagcg tgaaacgctg cgggctcgcg gactctggta catcgacgga	300
gctgggaacg cttatttgcg gcaccaggtt ggcttgctca tcgacgtgcg cggccgacgg	360
tcagctgtgt ccgcacaacc gggcaccctc ggtgacggac tgcacagcga tggaccgcgt	420
aacccgttta cccccaagcg cgcgcaggtt gtctgcgtac tgcttgacgc accgcaactg	480
gtcgacgcgc cgctgcgtgc gatcgccgcg agcgccggcg tctcggtcgg tatggccaag	540
gagacgatgg atacgttgcg cactaccggc ttcttcgaac acctcggctc ccgccgcagg	600
ctgggtgcga ccgatgagct gctggacctg tgggcgggtg cctatccggg gggctctgggc	660
cgggccaaca aactcctggt cgccagtggg gatatccaca cgtggtccgc acccgacgga	720
ctcgcagtgg cggtcagcgg ggaacaggcc ctgcccgcag aaatccgcaa tcccgaatca	780
ctgatgctct acgtcgacac cccagcgccc gggctacccg ccgacctgct tatacacaac	840
cgctggcacc gcgaccaca cggcagcatc gtgatccgaa agctattctg gcgcaaccta	900
cctgacgagc aaccgggggt ggctcccacg gccttgatct atgccgacct ccttgctctg	960

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cgcgagccgc gccaggtcga agtcgcccac ctcatgagaa ggcaggatga gcgactcgcc 1020
cgatta 1026

<210> 67

<211> 286

<212> PRT

<213> Mycobacterium tuberculosis

<400> 67

Val Glu Gly Thr Ile Ala Val Pro Gly Gly Arg Val Trp Phe Gln Arg
1 5 10 15

Ile Gly Gly Gly Pro Gly Arg Pro Leu Leu Val Val His Gly Gly Pro
20 25 30

Gly Leu Pro His Asn Tyr Leu Ala Pro Leu Arg Arg Leu Ser Asp Glu
35 40 45

Arg Glu Val Ile Phe Trp Asp Gln Leu Gly Cys Gly Asn Ser Ala Cys
50 55 60

Pro Ser Asp Val Asp Leu Trp Thr Met Asn Arg Ser Val Ala Glu Met
65 70 75 80

Ala Thr Val Ala Glu Ala Leu Ala Leu Thr Arg Phe His Ile Phe Ser
85 90 95

His Ser Trp Gly Gly Met Leu Ala Gln Gln Tyr Val Leu Asp Lys Ala
100 105 110

Pro Asp Ala Val Ser Leu Thr Ile Ala Asn Ser Thr Ala Ser Ile Pro
115 120 125

Glu Phe Ser Ala Ser Leu Val Ser Leu Lys Ser Cys Leu Asp Val Ala
130 135 140

Thr Arg Ser Ala Ile Asp Arg His Glu Ala Ala Gly Thr Thr His Ser
145 150 155 160

Ala Glu Tyr Gln Ala Ala Ile Arg Thr Trp Asn Glu Thr Tyr Leu Cys

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	165		170		175	
Arg Thr Arg Pro Trp Pro Arg Glu Leu Thr Glu Ala Phe Ala Asn Met						
	180		185		190	
Gly Thr Glu Ile Phe Glu Thr Met Phe Gly Pro Ser Asp Phe Arg Ile						
	195		200		205	
Val Gly Asn Val Arg Asp Trp Asp Val Val Asp Arg Leu Ala Asp Ile						
	210		215		220	
Ala Val Pro Thr Leu Leu Val Val Gly Arg Phe Asp Glu Cys Ser Pro						
	225		230		235	240
Glu His Met Arg Glu Met Gln Gly Arg Ile Ala Gly Ser Arg Leu Glu						
	245		250		255	
Phe Phe Glu Ser Ser Ser His Met Pro Phe Ile Glu Glu Pro Ala Arg						
	260		265		270	
Phe Asp Arg Val Met Arg Glu Phe Leu Arg Leu His Asp Ile						
	275		280		285	

<210> 68

<211> 858

<212> DNA

<213> Mycobacterium tuberculosis

<400> 68

gtggagggga caatcgcggt cccgggtgga cgcgtctggt tccagcggat tgggtggcgg	60
cctggtcgtc cgctgcttgt agtgcacggt gggccgggct tgccgcacaa ctacttggcc	120
ccactgcgac ggttgtctga tgagcgggag gtcattcttct gggaccagct cggttgcgga	180
aattccgcat gtccgtcaga cgtagacctt tggacgatga accgctcagt ggccgagatg	240
gcaaccgtgg cggaagccct tgcccttacc cgctttcaca tcttcagcca ttcgtgggg	300
gggatgctgg cacagcagta cgtgctcgac aaggcgctg acgccgtcag tctgaccatc	360
gcgaacagca cggcttcgat acccgaattt tcggccagtc tggtcagctt gaagtcgtgc	420
ttggacgtgg caactcgctc ggcaattgac cgtcacgagg cggccggcac caccattcc	480

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gccgaatacc aggccgcat cagaacctgg aacgagactt atctgtgccg caccgcgccc 540
tggccccggg aactcacgga agcattcgcc aacatgggaa ccgagatctt cgagacgatg 600
tttgggcccc ggcactttcg catcggttggg aatgttcgag actgggacgt cgtcgaccgg 660
ttggccgaca tcgcggtgcc gaccttgctg gtggtgggcc gtttcgaaga atgttcgcct 720
gagcacatgc gagaaatgca gggccggatt gcgggctcgc gattggaatt cttcgagtcc 780
agttcccaca tgccgttcac cgaagagccg gcgcgattcg accgggtgat gcgtgaattc 840
cttcggctgc acgatatt 858

```

<210> 69

<211> 419

<212> PRT

<213> Mycobacterium tuberculosis

<400> 69

```

Met Gly Ala Arg Ala Ile Phe Arg Gly Phe Asn Arg Pro Ser Arg Val
1           5           10           15

```

```

Leu Met Ile Asn Gln Phe Gly Ile Asn Ile Gly Phe Tyr Met Leu Met
          20           25           30

```

```

Pro Tyr Leu Ala Asp Tyr Leu Ala Gly Pro Leu Gly Leu Ala Ala Trp
          35           40           45

```

```

Ala Val Gly Leu Val Met Gly Val Arg Asn Phe Ser Gln Gln Gly Met
          50           55           60

```

```

Phe Phe Val Gly Gly Thr Leu Ala Asp Arg Phe Gly Tyr Lys Pro Leu
65           70           75           80

```

```

Ile Ile Ala Gly Cys Leu Ile Arg Thr Gly Gly Phe Ala Leu Leu Val
          85           90           95

```

```

Val Ala Gln Ser Leu Pro Ser Val Leu Ile Ala Ala Ala Ala Thr Gly
          100           105           110

```

```

Phe Ala Gly Ala Leu Phe Asn Pro Ala Val Arg Gly Tyr Leu Ala Ala
          115           120           125

```

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Glu Ala Gly Glu Arg Lys Ile Glu Ala Phe Ala Met Phe Asn Val Phe
 130 135 140

Tyr Gln Ser Gly Ile Leu Leu Gly Pro Leu Val Gly Leu Val Leu Leu
 145 150 155 160

Ala Leu Asp Phe Arg Ile Thr Val Leu Ala Ala Ala Gly Val Phe Gly
 165 170 175

Leu Leu Thr Val Ala Gln Leu Val Ala Leu Pro Gln His Arg Ala Asp
 180 185 190

Ser Glu Arg Glu Lys Thr Ser Ile Leu Gln Asp Trp Arg Val Val Val
 195 200 205

Arg Asn Arg Pro Phe Leu Thr Leu Ala Ala Ala Met Thr Gly Cys Tyr
 210 215 220

Ala Leu Ser Phe Gln Ile Tyr Leu Ala Leu Pro Met Gln Ala Ser Ile
 225 230 235 240

Leu Met Pro Arg Asn Gln Tyr Leu Leu Ile Ala Ala Met Phe Ala Val
 245 250 255

Ser Gly Leu Val Ala Val Gly Gly Gln Leu Arg Ile Thr Arg Trp Phe
 260 265 270

Ala Val Arg Trp Gly Ala Glu Arg Ser Leu Val Val Gly Ala Thr Ile
 275 280 285

Leu Ala Ala Ser Phe Ile Pro Val Ala Val Ile Pro Asn Gly Gln Arg
 290 295 300

Phe Gly Val Ala Val Ala Val Met Ala Leu Val Leu Ser Ala Ser Leu
 305 310 315 320

Leu Ala Val Ala Ser Ala Ala Leu Phe Pro Phe Glu Met Arg Ala Val
 325 330 335

Val Ala Leu Ser Gly Asp Arg Leu Val Ala Thr His Tyr Gly Phe Tyr
 340 345 350

Ser Thr Ile Val Gly Val Gly Val Leu Val Gly Asn Leu Ala Ile Gly
 355 360 365

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Ser Leu Met Ser Ala Ala Arg Arg Leu Asn Thr Asp Glu Ile Val Trp
 370 375 380

Gly Gly Leu Ile Leu Val Gly Ile Val Ala Val Ala Gly Leu Arg Arg
 385 390 395 400

Leu Asp Thr Phe Thr Ser Gly Ser Gln Asn Met Thr Gly Arg Trp Ala
 405 410 415

Ala Pro Arg

<210> 70

<211> 1257

<212> DNA

<213> Mycobacterium tuberculosis

<400> 70

atgggagcgc gcgctatatt ccgcgggttc aaccgcccga gccgggtggt gatgatcaac 60
 cagttcggca tcaacatcgg cttctacatg ctgatgccgt acctggccga ctacctagcc 120
 gggccactgg ggctagccgc gtgggcggtg ggtctggtga tgggcgtgcg caatttctcc 180
 cagcagggca tgttcttcgt gggtagcacg ctggccgata gggtcggcta caagccactg 240
 atcatcgccg gatgtctgat ccgcaccggc gggtttgccct tgctgggtgg cgcccagtcg 300
 ctgcccagtg tgctgatcgc cgcggctgcc acgggctttg ccggcgcgct gttcaatccc 360
 gcgggtgcgc gctatctcgc ggccgaagcc ggggaacgca agatcgaagc gttcgcgatg 420
 ttcaacgtct tctaccagtc ggggatacctg ctcgcccccgc tggttggatt agtattgctg 480
 gcgctggatt tccggatcac ggtgctggcc gccgccggtg tgttcggcct actcacgctc 540
 gcgcagctgg tcgcactgcc ccaacaccgg gccgactcgg agcgcgaaaa aacatcgatc 600
 ctgcaggact ggcgggtcgt cgttcgcaac cgtccgtttc tgacgttagc cgccgccatg 660
 accggatgct atgcgctgtc gttccagatc tatctggctc tgcccatgca ggcgtcgatc 720
 ctcatgccac gcaaccaata tctcttgatt gcggcgatgt tcgcggtatc gggctctggtc 780
 gccgtcggcg ggcagctgcg catcacccgc tggttcgccg tcagatgggg ggccgagcgc 840
 agcctggtag tcggcgcgac gattttggcg gcctcgttca tcccggttgc agtcatccca 900

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aacggccagc ggttcggcgt cgccgttgcg gtcattggcat tgggtgctgtc ggcgagtcctg 960
 ctggcggttg cctcggcagc gttgtttcct ttcgaaatgc gtgccgtggg cgcactgtcg 1020
 ggcgaccggc tgggtggcgac ccactacggg ttctacagca ccatcgtggg cgtcggagtc 1080
 ctcgtcggaa atctggcgat cggatcgctc atgagcgccg cgcgccgctt aaataccgat 1140
 gaaattgttt ggggcggatt gattctgggtg ggcattcgtt cggtggccgg gctccgtcgg 1200
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<210> 71

<211> 593

<212> PRT

<213> Mycobacterium tuberculosis

<400> 71

Met Ser Ala Lys Glu Arg Gly Asp Gln Asn Ala Val Val Asp Ala Leu
 1 5 10 15

Arg Ser Ile Gln Pro Ala Val Phe Ile Pro Ala Ser Val Val Ile Val
 20 25 30

Ala Met Ile Val Val Ser Val Val Tyr Ser Ser Val Ala Glu Asn Ala
 35 40 45

Phe Val Arg Leu Asn Ser Ala Ile Thr Gly Gly Val Gly Trp Trp Tyr
 50 55 60

Ile Leu Val Ala Thr Gly Phe Val Val Phe Ala Leu Tyr Cys Gly Ile
 65 70 75 80

Ser Arg Ile Gly Thr Ile Arg Leu Gly Arg Asp Asp Glu Leu Pro Glu
 85 90 95

Phe Ser Phe Trp Ala Trp Leu Ala Met Leu Phe Ser Ala Gly Met Gly
 100 105 110

Ile Gly Leu Val Phe Tyr Gly Val Ala Glu Pro Leu Ser His Tyr Leu
 115 120 125

Arg Pro Pro Arg Ser Arg Gly Val Pro Ala Leu Thr Asp Ala Ala Ala

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130	135	140
Asn Gln Ala Met Ala Leu Thr Val Phe His Trp Gly Leu His Ala Trp		
145	150	155 160
Ala Ile Tyr Val Val Val Gly Leu Gly Met Ala Tyr Met Thr Tyr Arg		
	165	170 175
Arg Gly Arg Pro Leu Ser Val Arg Trp Leu Leu Glu Pro Val Val Gly		
	180	185 190
Arg Gly Arg Val Glu Gly Ala Leu Gly His Ala Val Asp Val Ile Ala		
	195	200 205
Ile Val Gly Thr Leu Phe Gly Val Ala Thr Ser Leu Gly Phe Gly Ile		
	210	215 220
Thr Gln Ile Ala Ser Gly Leu Glu Tyr Leu Gly Trp Ile Arg Val Asp		
	225	230 235 240
Asn Trp Trp Met Val Gly Met Ile Ala Ala Ile Thr Ala Thr Ala Thr		
	245	250 255
Ala Ser Val Val Ser Gly Val Ser Lys Gly Leu Lys Trp Leu Ser Asn		
	260	265 270
Ile Asn Met Ala Leu Ala Ala Ala Leu Ala Leu Phe Val Leu Leu Leu		
	275	280 285
Gly Pro Thr Leu Phe Leu Leu Gln Ser Trp Val Gln Asn Leu Gly Gly		
	290	295 300
Tyr Val Gln Ser Leu Pro Gln Phe Met Leu Arg Thr Ala Pro Phe Ser		
	305	310 315 320
His Asp Gly Trp Leu Gly Asp Trp Thr Ile Phe Tyr Trp Gly Trp Trp		
	325	330 335
Ile Ser Trp Ala Pro Phe Val Gly Met Phe Ile Ala Arg Ile Ser Arg		
	340	345 350
Gly Arg Thr Ile Arg Glu Phe Ile Gly Ala Val Leu Leu Val Pro Thr		
	355	360 365

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Val Ile Ala Ser Leu Trp Phe Thr Ile Phe Gly Asp Ser Ala Leu Leu
 370 375 380

Arg Gln Arg Asn Asn Gly Asp Met Leu Val Asn Gly Ala Val Asp Thr
 385 390 395 400

Asn Thr Ser Leu Phe Arg Leu Leu Asp Gly Leu Pro Ile Gly Ala Ile
 405 410 415

Thr Ser Val Leu Ala Val Leu Val Ile Val Phe Phe Phe Val Thr Ser
 420 425 430

Ser Asp Ser Gly Ser Leu Val Ile Asp Ile Leu Ser Ala Gly Gly Glu
 435 440 445

Leu Asp Pro Pro Lys Leu Thr Arg Val Tyr Trp Ala Val Leu Glu Gly
 450 455 460

Val Ala Ala Ala Val Leu Leu Leu Ile Gly Gly Ala Gly Ser Leu Thr
 465 470 475 480

Ala Leu Arg Thr Ala Ala Ile Ala Thr Ala Leu Pro Phe Ser Ile Val
 485 490 495

Met Val Val Ala Cys Tyr Ala Met Thr Lys Ala Phe His Phe Asp Leu
 500 505 510

Ala Ala Thr Pro Arg Leu Leu His Val Thr Val Pro Asp Val Val Ala
 515 520 525

Ala Gly Asn Arg Arg Arg His Asp Ile Ser Ala Thr Leu Ser Gly Leu
 530 535 540

Ile Ala Val Arg Asp Val Asp Ser Gly Thr Tyr Ile Val His Pro Asp
 545 550 555 560

Thr Gly Ala Leu Thr Val Thr Ala Pro Pro Asp Pro Leu Asp Asp His
 565 570 575

Val Phe Glu Ser Asp Arg His Val Thr Arg Arg Asn Thr Thr Ser Ser
 580 585 590

Arg

<210> 72

<211> 1779

<212> DNA

<213> Mycobacterium tuberculosis

<400> 72

atgtcagcga aagaacgcgg tgaccagaac gccgtcgtcg acgccctgcg gagtattcag	60
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tactcgagcg tcgccgagaa tgcgttcggt cggctgaact ccgcgatcac cggcggcgctc	180
gggtgggtgg acatcctggg tgccaccggg tttgtgggtat tcgcgctgta ctgcggcatt	240
tcccggattg gcactatccg gctgggccgc gacgatgagc tcccagagtt cagcttcttg	300
gcatggctgg caatgctggt tagtgccggg atgggtatcg gcctgggtct ctacgggggtg	360
gccgagccgc tcagccacta cctgcggcca ccgcgggtcac gggcggtgcc cgcgcttact	420
gatgcggcgg ctaaccaggc gatggcgctg acagtgttcc actggggcct gcacgcctgg	480
gcaatttatg tcgtgggttg cctcggtatg gcgtacatga cctatcggcg gggtcgcccc	540
ttgtcggtgc gctggctgct ggagccggtc gtgggtcggg gccgtgtaga gggcgccctg	600
gggcacgcgg tggacgtcat cgccattgtc ggaacactct ttggtgtcgc cacgtcactg	660
ggcttcggta tcactcagat cgctccggc ctggaatatc tcggctggat ccgggtggac	720
aactgggtga tggtcggcat gatcgccgcc atcaccgcca ctgcgacggc gtcggtggtc	780
agtggggcca gcaagggttt gaagtggctg tcgaacatca atatggcgct ggccgcccga	840
ttggccctgt tcgtgttggt gctcgggccg acacttttct tgctgcagtc gtgggtgcaa	900
aatttgagg gctacgtcca gtcgcttcg caattcatgc tgcgcaccgc gccgttctcg	960
cacgacggct ggctcggcga ctggactatc ttctactggg gttggtggat cagctgggct	1020
ccgtttgtcg ggatgttcat cgcgcggatt tcgcggggac ggacgatccg ggagttcatc	1080
ggggcggtgc tgctcgttcc caccgtgatc gcctcgctat ggtttacgat cttcggtgac	1140
tcggcgttgt tgcggcaacg caacaacggc gacatgctcg tcaacggggc ggtagacacc	1200
aacacatcgc ttttccgatt gctggacggg ttgcctatcg gggctattac cagcgttctt	1260
gctgtgctgg tgatcgtggt cttcttcggt acgtcgtcgg actccgggtc gttggtcac	1320
gacatcttgt cagcgggtgg tgagctggac ccgccaagc tgaccagggt ctactgggcg	1380

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```

gtgttgaggagg gggtagccgc ggccgttttg ctctgatcg gaggtgctgg gtcactgacc 1440
gcgttgcgga cggccgctat tgccacggcc ctgccgttct caatcgatcat ggtgggtggcg 1500
tgctatgcga tgaccaaagc gttccacttc gacctggccg ccacacctag gctgctgcac 1560
gtcaccgtgc ctgacgtggg tgcggcagga aaccggcgac gccacgatat ctcggcgacg 1620
ctgtcggggc tcattgccgt ccgtgatgtc gatagcggca catatatagt ccaccccgac 1680
accggcgctc tcaccgtcac tgcaccacca gatccgttgg acgatcatgt ttttgagtct 1740
gatcggcacg taacgcgaag aaacacaaca tcatcgaga 1779

```

<210> 73

<211> 331

<212> PRT

<213> Mycobacterium tuberculosis

<400> 73

```

Met Ser Phe Val Asn Val Ala Pro Gln Leu Val Ser Thr Ala Ala Ala
1           5           10           15

```

```

Asp Ala Ala Arg Ile Gly Ser Ala Ile Asn Thr Ala Asn Thr Ala Ala
20           25           30

```

```

Ala Ala Thr Thr Gln Val Leu Ala Ala Ala Gln Asp Glu Val Ser Thr
35           40           45

```

```

Ala Ile Ala Ala Leu Phe Gly Ser His Gly Gln His Tyr Gln Ala Ile
50           55           60

```

```

Ser Ala Gln Val Ala Ala Tyr Gln Gln Arg Phe Val Leu Ala Leu Ser
65           70           75           80

```

```

Gln Ala Gly Ser Thr Tyr Ala Val Ala Glu Ala Ala Ser Ala Thr Pro
85           90           95

```

```

Leu Gln Asn Val Leu Asp Ala Ile Asn Ala Pro Val Gln Ser Leu Thr
100          105          110

```

```

Gly Arg Pro Leu Ile Gly Asp Gly Ala Asn Gly Ile Asp Gly Thr Gly
115          120          125

```

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Gln Ala Gly Gly Asn Gly Gly Trp Leu Trp Gly Asn Gly Gly Asn Gly
 130 135 140

Gly Ser Gly Ala Pro Gly Gln Ala Gly Gly Ala Gly Gly Ala Ala Gly
 145 150 155 160

Leu Ile Gly Asn Gly Gly Ala Gly Gly Thr Gly Gly Ala Val Ser Leu
 165 170 175

Ala Arg Ala Gly Thr Ala Gly Gly Ala Gly Arg Gly Pro Val Gly Gly
 180 185 190

Ile Gly Gly Ala Gly Gly Val Gly Gly Ala Gly Gly Ala Ala Gly Ala
 195 200 205

Val Thr Thr Ile Thr His Ala Ser Phe Asn Asp Pro His Gly Val Ala
 210 215 220

Val Asn Pro Gly Gly Asn Val Tyr Val Thr Asn Phe Gly Ser Gly Thr
 225 230 235 240

Val Ser Val Ile Asn Pro Ala Thr Asn Thr Val Thr Gly Ser Pro Ile
 245 250 255

Thr Ile Gly Asn Gly Pro Ser Gly Val Ala Val Ser Pro Val Thr Gly
 260 265 270

Leu Val Phe Val Thr Asn Phe Asp Ser Asn Thr Val Ser Val Ile Asp
 275 280 285

Pro Thr Thr Asn Thr Val Thr Gly Ser Pro Ile Thr Val Gly Thr Ala
 290 295 300

Pro Thr Gly Val Ala Val Asn Pro Val Thr Gly Glu Val Tyr Val Thr
 305 310 315 320

Asn Phe Ala Gly Asp Thr Val Ser Val Ile Ser
 325 330

<210> 74

<211> 993

<212> DNA

-92-

<213> Mycobacterium tuberculosis

<400> 74

```

atgtcgtttg tcaacgtggc cccacagtta gtgtccacag ccgcggccga tgcagcgagg 60
atcggctcgg cgatcaacac cgccaacacc gcggcgggcg cgaccacca ggtggtggcc 120
gccgccaag acgaggtgtc aacggcgatc gccgcgctgt tcggcagcca cggccagcac 180
tatcaagcga tcagcgcgca ggtcgcggcc tatcagcaac ggttcgtgct ggccttaagc 240
caagctggca gcacctacgc ggtcgcggaa gcggccagcg caacaccgct gcagaacgtg 300
ctcgatgcga tcaacgcacc cgttcagtcg ctgaccgggc gccattgat cggcgacggc 360
gcgaacggga tcgacgggac cgggcaagcc ggcggtaacg gcgggtggct gtggggcaac 420
ggcggcaacg gcgggtcggg ggcaccggga caggccggcg gcgccggcgg ggcggccggg 480
ttgatcggca acggtggggc cggcggcacc ggcggcgcgg tcagcctcgc ccgcgcgggc 540
acggccggcg gtgccggccg cggcccggtc ggcggtatcg gcggtgcggg tggggtcggc 600
ggtgccggtg gggccgcccg cgcgcgcacc accatcaccc acgccagctt caacgatccg 660
cacgggggtg cgggtcaaccc ggcgggcaac gtctacgtca ccaatttcgg cagcggcacg 720
gtgtcgggtg tcaaccccgc caccaacacc gtcaccggct ccccatcac catcggaac 780
ggtccaagcg ggggtggcgg cagccccgtc accggcctgg tcttcgtgac caacttcgac 840
agcaacacgg tgtcgggtgat cgaccgacc accaacaccg tcaccggctc ccccatcacc 900
gtcggcaccg ctccgaccgg ggtggcggtc aaccccgta ccggcgaggt ttatgtcacc 960
aacttcgccg gcgacacggg gtcggtaatc agc 993

```

<210> 75

<211> 251

<212> PRT

<213> Mycobacterium tuberculosis

<400> 75

```

Met Arg Ala Asp Val Thr Ala Glu His Leu Thr Gln Val Val Arg Asp
1           5           10           15

```

```

Ile Ala Val Ile Asp Ile Asp Asp Gly Val Ala Phe Asn Leu Asp Thr
20           25           30

```

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Ser Ser Val Gln Glu Ile Arg Glu Arg Ala Asp Tyr Pro Gly Leu Arg
 35 40 45

Val Arg Val Ala Met Ser Val Gly Pro Trp Gln Gly Ile Ala Ala Trp
 50 55 60

Asp Val Ser Thr Gly Glu Pro Ile Ala Pro Trp Pro Thr Arg Val Thr
 65 70 75 80

Ile Asp Arg Ile Leu Gly Glu Pro Ile Thr Leu Leu Gly Tyr Ala Pro
 85 90 95

Glu Thr Ile Ile Ala Glu Lys Gly Val Thr Ile Leu Glu Arg Gly Ile
 100 105 110

Thr Ser Thr Arg Trp Arg Asp Tyr Val Asp Ile Val Gln Leu Asp Arg
 115 120 125

Arg Gly Ile Asp Asp Asp Glu Leu Leu Arg Ser Ala Arg Ala Val Ala
 130 135 140

Gln Tyr Arg Gly Ala Thr Leu Glu Pro Val Ala Pro His Leu Ala Gly
 145 150 155 160

Tyr Gly Ala Val Ala Gln Ala Lys Trp Ala Thr Glu His Gly Arg Cys
 165 170 175

Gln His Cys Trp Arg His Trp Lys Pro Ala His Val Gly Arg Arg Asn
 180 185 190

Met Asp Leu Leu Asp Ala Lys Gln Val Ser Glu Met Ile Gly Val Pro
 195 200 205

Val Gly Thr Leu Arg His Trp Arg His Ser Asp Ile Gly Pro Ala Ser
 210 215 220

Phe Thr Leu Gly Arg Arg Val Val Tyr Arg Arg Asp Glu Val Ser Arg
 225 230 235 240

Trp Ile Ser Lys Arg Glu Ser Ala Thr Arg Arg
 245 250

-94-

<211> 753

<212> DNA

<213> Mycobacterium tuberculosis

<400> 76

```

atgcgcgccg acgtcaccgc cgagcatctc acccaggtgg ttcgcgacat cgccgtgata      60
gacatcgacg acgggggtggc gttcaacctc gacacgagca gcgtgcagga aattcgcgag      120
cgggccgact acccgggcct gcgcgtgcga gtcgctatgt cggtcggacc gtggcagggc      180
atcgcggcct gggatgtgtc caccggcgaa ccgatcgcgc cgtggcccac acgggtgacc      240
atcgaccgga tcctcggcga gccgatcaca ctctggggct acgcgcccga gaccatcatc      300
gccgagaagg gagtgaccat cctcgaacgc ggcataacca gcaccgctg gcgggactac      360
gtcgacatcg tccaactcga ccgccggggc atcgacgacg acgagctgct ccgctcggcc      420
agggcagtcg cacaataccg cggcgccact ctcgaacccg tcgcgcctca cctggccggg      480
tatggcgcag tcgcgcaagc gaaatgggcg accgaacacg gacgctgccg gcaactgttg      540
agacattgga aaccagccca tgtcgggagg agaaacatgg atctgctgga cgcaaaacaa      600
gtttcggaga tgatcggcgt tcccgtcggc actctacggc actggcggca ctcggacatc      660
ggaccggcga gttcacctt gggacggcgc gtcgtgtacc ggcgcgacga ggtgtcgcgc      720
tggatctcaa agcgggagag cgcaactcga cgt                                     753

```

<210> 77

<211> 254

<212> PRT

<213> Mycobacterium tuberculosis

<400> 77

```

Met Ser Val Asp Tyr Pro Gln Met Ala Ala Thr Arg Gly Arg Ile Glu
1           5           10          15

Pro Ala Pro Arg Arg Val Arg Gly Tyr Leu Gly His Val Leu Val Phe
          20          25          30

Asp Thr Ser Ala Ala Arg Tyr Val Trp Glu Val Pro Tyr Tyr Pro Gln
          35          40          45

```

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Tyr Tyr Ile Pro Leu Ala Asp Val Arg Met Glu Phe Leu Arg Asp Glu
 50 55 60

Asn His Pro Gln Arg Val Gln Leu Gly Pro Ser Arg Leu His Ser Leu
 65 70 75 80

Val Ser Ala Gly Gln Thr His Arg Ser Ala Ala Arg Val Phe Asp Val
 85 90 95

Asp Gly Asp Ser Pro Val Ala Gly Thr Val Arg Phe Asn Trp Asp Pro
 100 105 110

Leu Arg Trp Phe Glu Glu Asp Glu Pro Ile Tyr Gly His Pro Arg Asn
 115 120 125

Pro Tyr Gln Arg Ala Asp Ala Leu Arg Ser His Arg His Val Arg Val
 130 135 140

Glu Leu Asp Gly Ile Val Leu Ala Asp Thr Arg Ser Pro Val Leu Leu
 145 150 155 160

Phe Glu Thr Gly Ile Pro Thr Arg Tyr Tyr Ile Asp Pro Ala Asp Ile
 165 170 175

Ala Phe Glu His Leu Glu Pro Thr Ser Thr Gln Thr Leu Cys Pro Tyr
 180 185 190

Lys Gly Thr Thr Ser Gly Tyr Trp Ser Val Arg Val Gly Asp Ala Val
 195 200 205

His Arg Asp Leu Ala Trp Thr Tyr His Tyr Pro Leu Pro Ala Val Ala
 210 215 220

Pro Ile Ala Gly Leu Val Ala Phe Tyr Asn Glu Lys Val Asp Leu Thr
 225 230 235 240

Val Asp Gly Val Ala Leu Pro Arg Pro His Thr Gln Phe Ser
 245 250

<210> 78

<211> 762

<212> DNA

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<213> Mycobacterium tuberculosis

<400> 78

```

atgagcgtgg attaccccca aatggctgct acccggggaa gaatagaacc ggccccgcgg      60
cgagttcgcg gctatctcgg acatgtgctc gtcttcgaca ccagtgcggc gcgctatgtc      120
tgggaggttc cctactaccc gcagtactac atccccgtgg cggatgtccg catggagttc      180
ctgcgcgacg agaaccaccc gcagcagtg cagctgggtc cgtcgcggct gcactccttg      240
gtaagcgccg gtcagacca cccgatcggcg gcgcgggtat tcgatgtcga cggcgacagc      300
ccggtggcgg gcaccgtgcg tttcaactgg gatccgctgc ggtggttcga ggaggacgag      360
ccgatctacg gccatccgcg caatccctat cagcgggccc atgcgctgcg ctgcgaccga      420
cacgtccgtg tcgagctgga cggcattgtg ctgcgtgaca cccgatcgcc cgttctgcta      480
ttcgaaactg ggatacccac aaggtattac atcgatccgg ccgacatcgc tttcgagcat      540
ctggagoccca cctcgacgca gacgttgtgt ccgtacaagg ggacgacgtc gggctattgg      600
tctgtgcgcg tcggcgacgc cgtgcaccgc gacctggcct ggacgtatca ctatccactg      660
cccgccgttg ccccgatcgc cggcctgggtg gcgttttaca acgagaaggt cgacctcacc      720
gtcgacggcg tcgccctgcc gcggccgcac actcagttca gc                          762

```

<210> 79

<211> 120

<212> PRT

<213> Mycobacterium tuberculosis

<400> 79

```

Ser Phe Ala Gly Ala Glu Ala Ala Asn Ala Ser Gln Leu Gln Ser Ile
1           5           10           15

```

```

Ala Arg Gln Val Arg Gly Ala Val Asn Ala Val Ala Gly Gln Val Thr
20           25           30

```

```

Gly Asn Gly Gly Ser Gly Asn Ser Gly Thr Ser Ala Ala Ala Ala Asn
35           40           45

```

```

Pro Asn Ser Asp Asn Thr Ala Ser Ile Ala Asp Arg Gly Thr Ser Ala
50           55           60

```

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Ile Met Thr Thr Ala Ser Ala Thr Ala Ser Ser Thr Gly Val Asp Gly
65 70 75 80

Gly Ile Ala Ala Thr Tyr Ala Val Ala Ser Gln Trp Asp Gly Gly Tyr
85 90 95

Val Ala Asn Tyr Thr Ile Thr Gln Phe Gly Arg Asp Phe Asp Asp Arg
100 105 110

Leu Ala Val Ala Ile His Phe Ala
115 120

<210> 80

<211> 360

<212> DNA

<213> Mycobacterium tuberculosis

<400> 80

tcttttcgccg gcgccgaggc cgccaatgcg tcacagctgc agagcatcgc gcggcaggtg 60
cggggcgccg tcaacgccgt cgccggtcag gtgacgggca atggcggctc cggcaacagc 120
ggcacttcgg ctgcgggcggc caaccgaat tccgacaaca cagcgagcat cgccgatagg 180
ggcacaagcg ccatcatgac cacggcaagc gcgaccgcgt cttccacggg cgtcgatggc 240
ggaatagcgg cgacgtatgc ggtcgccctcg caatgggatg gtggctacgt ggccaattac 300
acgatcaccc aattcggggc cgacttcgat gaccgattgg cggttgcaat tcactttgcc 360

<210> 81

<211> 470

<212> PRT

<213> Mycobacterium tuberculosis

<400> 81

Val Ala Thr Val Ala Phe Val Ala Thr Ala Ser Ile Val Ile Thr Pro
1 5 10 15

Ala Ala Ile Val Leu Leu Gly Pro Arg Leu Asp Ala Leu Asp Val Arg

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20					25					30					
Arg	Leu	Val	Arg	Arg	Leu	Leu	Gly	Arg	Pro	Asp	Pro	Val	His	Lys	Pro
35					40					45					
Val	Lys	Gln	Leu	Phe	Trp	Tyr	Arg	Ser	Ser	Lys	Phe	Val	Met	Arg	Arg
50					55					60					
Trp	Leu	Pro	Val	Gly	Thr	Ala	Val	Val	Ala	Leu	Leu	Val	Leu	Leu	Gly
65					70					75					80
Leu	Pro	Phe	Leu	Ser	Val	Lys	Trp	Gly	Phe	Pro	Asp	Asp	Arg	Val	Leu
85					90					95					
Pro	Arg	Ser	Ala	Ser	Ala	Arg	Gln	Val	Gly	Asp	Ile	Leu	Arg	Asp	Asp
100					105					110					
Phe	Gly	His	Asp	Pro	Ala	Thr	Gln	Ile	Pro	Ile	Val	Val	Pro	Asp	Ala
115					120					125					
Arg	Gly	Leu	Gly	Pro	Val	Glu	Leu	Asp	Ser	Tyr	Ala	Ala	Glu	Leu	Ser
130					135					140					
Arg	Val	Pro	Asp	Val	Ser	Ala	Val	Ala	Ala	Pro	Thr	Gly	Thr	Phe	Val
145					150					155					160
Asp	Gly	Ser	Trp	Val	Gly	Thr	Pro	Arg	Gly	Ala	Thr	Gly	Leu	Ala	Glu
165					170					175					
Gly	Ser	Ala	Phe	Leu	Thr	Val	Ser	Ser	Thr	Ala	Pro	Leu	Phe	Ser	Arg
180					185					190					
Ala	Ser	Asp	Ile	Gln	Leu	Lys	Arg	Leu	His	Gln	Val	Ala	Gly	Pro	Ala
195					200					205					
Gly	Arg	Ser	Val	Val	Met	Ala	Gly	Val	Ala	Gln	Val	Asn	Arg	Asp	Ser
210					215					220					
Val	Asp	Ala	Val	Thr	Asp	Arg	Leu	Pro	Met	Val	Leu	Gly	Leu	Ile	Ala
225					230					235					240
Ala	Ile	Thr	Tyr	Val	Leu	Leu	Phe	Leu	Leu	Thr	Gly	Ser	Val	Val	Leu
245					250					255					

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Pro Ala Lys Ala Leu Val Cys Asn Val Leu Ser Leu Thr Ala Ala Phe
260 265 270

Gly Ala Leu Val Trp Ile Phe Gln Glu Gly His Phe Gly Ala Leu Gly
275 280 285

Thr Thr Pro Ser Gly Thr Leu Val Ala Asn Met Pro Val Leu Leu Phe
290 295 300

Cys Ile Ala Phe Gly Leu Ser Met Asp Tyr Glu Val Phe Leu Val Ser
305 310 315 320

Arg Ile Arg Glu Tyr Trp Leu Glu Ser Gly Ala Ala Arg Pro Ala Arg
325 330 335

Arg Ser Val Ala Glu Val His Ala Ala Asn Asp Glu Ser Val Ala Leu
340 345 350

Gly Val Ala Arg Thr Gly Arg Val Ile Thr Ala Ala Ala Leu Val Met
355 360 365

Ser Met Ser Phe Ala Ala Leu Ile Ala Ala His Val Ser Phe Met Arg
370 375 380

Met	Phe	Gly	Leu	Gly	Leu	Thr	Leu	Ala	Val	Ala	Ala	Asp	Ala	Thr	Leu
385					390					395					400

Val	Arg	Met	Val	Val	Val	Pro	Ala	Phe	Met	His	Val	Thr	Gly	Arg	Trp
			405						410					415	

Asn Trp Trp Ala Pro Arg Pro Leu Ala Trp Leu His Glu Arg Phe Gly
420 425 430

Val Ser Glu Ala Ala Glu Pro Val Ser Arg Arg Arg Ser His Ala Gly
435 440 445

Gly Leu Gly Lys Ile Ala Gly Arg Ser Asp Gly Gln Thr Ile Pro Ala
450 455 460

Ser Leu Thr Arg Asn Gly
465 470

-100-

<211> 1410

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 82

gtggctaccg tggcattcgt cgcgaccgcg tcgatcgtga tcaccccgcc cgcgattgtg	60
ttgctaggctc ctccgctaga tgcgttggac gtgcgccgac tgggtgcgtcg gctgctgggc	120
cgccccgatc cgggtgcacaa accggtcaag caactgttct ggtaccggtc gagcaagttc	180
gtgatgcgcc gttggctgcc ggtcggtagc gctgttgctc cgctgctggt gctgctcggg	240
ctgccgttct tgtcggtgaa gtgggggttc ccggacgacc ggggtgttgc gcggtcggcg	300
tcggcccgtc aagtcggcga tatcttgccg gatgactttg gccacgatcc tgcgacgcag	360
atacccatcg tcgtcccga cgctcgtggt ctccggcccg tcgaacttga cagctacgca	420
gccgagttgt cccgggtgcc cgacgtatcc gcggtagccg ccccgacggg cacgttcgta	480
gacggcagct ggggtgggaac gccgcgcggg gccaccgggt tggctgaggg cagcgcgttc	540
ctgacggtga gcagcacggc gccgctgttt tcgcgagcct ccgatatcca gctcaagcgg	600
ttgcaccagg tggcagggcc ggccggtcga tccgtcgtga tggccgggtg cgcgcaggtc	660
aaccgcgaca gtgtcgacgc ggtgaccgat cggcttccga tgggtgctagg gctaattgcc	720
gcgatcacct acgtactgtt gttcctgctc accggcagcg tgggtgctgcc ggcgaaagcg	780
ttggtttgta atgtgttatc gctgaccgcg gcgtttggcg cgttggtgtg gatcttcag	840
gaaggccatt tcggtgccct gggaacgact ccgagcggga cgttggtggc gaatatgccg	900
gtcctactgt tttgcatcgc attcggtttg tccatggact acgaggtgtt tctggtctcc	960
aggattcggg agtactggtt ggaatccga gccgcgcgac ccgcgcgaag aagcgtcgca	1020
gaggtgcacg ccgccaacga cgagagcgtc gcgctcggcg tggcccgcac cggtcgggtg	1080
atcaccgcgg cagcgttggg gatgtccatg tcgttcgccg cgttgatcgc tgcgcacgtg	1140
tcgttcatgc ggatgttcgg cctcggcctg acttttagccg tggctgcaga cgccacactg	1200
gtgcggatgg tcgtggtccc agcattcatg catgtgacgg gccgctggaa ttggtgggca	1260
ccgagacccc tggcgtggct gcatgagcgg ttcggtgtca gcgaggcagc agagccggtt	1320
tcgaggagac gttcccacgc cggtaggttg ggcaagattg ccggacgaag cgacggtcag	1380
acgatccctg cctcgtgac gcgcaatggt	1410

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<210> 83

<211> 216

<212> PRT

<213> Mycobacterium tuberculosis

<400> 83

Met Thr Ser Gly Ala Ala Ala Ser Ala Ser Arg Val Asp His Pro Leu
 1 5 10 15

Phe Ala Arg Ile Trp Pro Val Val Ala Ala His Glu Ala Glu Ala Ile
 20 25 30

Arg Ala Leu Arg Arg Glu Asn Leu Ala Gly Leu Ser Gly Arg Val Leu
 35 40 45

Glu Val Gly Ala Gly Val Gly Thr Asn Phe Ala Tyr Tyr Pro Val Ala
 50 55 60

Val Glu Gln Val Ile Ala Met Glu Pro Glu Pro Arg Leu Ala Ala Lys
 65 70 75 80

Ala Arg Ile Ala Ala Ala Asp Ala Pro Val Pro Ile Val Val Thr Asp
 85 90 95

Lys Thr Val Glu Glu Phe Arg Asp Thr Glu Thr Phe Asp Ala Val Val
 100 105 110

Cys Ser Leu Val Leu Cys Ser Val Ser Asp Pro Gly Ala Val Leu Ala
 115 120 125

His Leu Arg Ser Leu Leu Arg Arg Gly Gly Glu Leu Arg Tyr Leu Glu
 130 135 140

His Val Ala Ser Ala Gly Ala Arg Gly Arg Val Gln Arg Phe Val Asp
 145 150 155 160

Ala Thr Phe Trp Pro Arg Leu Ala Gly Asn Cys His Thr His Arg His
 165 170 175

Thr Glu Arg Ala Ile Leu Asp Ala Gly Phe Val Val Asp Ser Ser Arg
 180 185 190

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Arg Glu Trp Ala Phe Pro Ala Trp Val Pro Leu Pro Val Ser Glu Leu
 195 200 205

Ala Leu Gly Arg Ala His Arg Thr
 210 215

<210> 84

<211> 648

<212> DNA

<213> Mycobacterium tuberculosis

<400> 84

```

atgacgtcag ggcgcggccgc ttcggcgctcc aggggtcgacc acccgctttt cgcccggatc      60
tggcccgtgg tcgccgcaca cgaagccgaa gcaatacgag ccctccgccg ggagaatctg      120
gccggtttgt cggggcggggt gttggaagtc ggggccggcg tcgggacgaa ctttgctac      180
taccgggtgg ccgtcgaaca ggtcatcgcc atggagcccg agccgcggct tgctgccaag      240
gcccgcatcg cggccgctga cgcacccggt ccgatatgctg tgacggacaa gacggtcgag      300
gagttccgcg acaccgagac gtttgacgcg gtggtttgct cgctggtgct gtgctcggtg      360
agcgacccgg ggcgcggtgct ggcgcacctg cgttcgctac tacggcgagg cggggagctg      420
cgctatctcg agcatgtggc cagcgccggc gctcggggcc ggggtgcagcg gttcgtcgac      480
gcgacatttt ggcccaggct ggcgggcaac tgtcacacgc atcgccatac cgaacgcgcg      540
atcctcgacg ccggattcgt ggtggacagc tcccggcggg agtgggcatt tcccgccctgg      600
gtgccgctac cgggtgtcaga gttggctctg ggccgcgcgc accggacc      648

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<210> 85

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 85

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

-103-

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
 20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 86

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 86

atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtcgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccgt 120
 ctacttggtg ttggctgcgc ggagacgggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac caccaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggccaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 87

<211> 489

<212> PRT

<213> Mycobacterium tuberculosis

-104-

<400> 87

Val Thr Asn Asp Leu Pro Asp Val Arg Glu Arg Asp Gly Gly Pro Arg
1 5 10 15

Pro Ala Pro Pro Ala Gly Gly Pro Arg Leu Ser Asp Val Trp Val Tyr
20 25 30

Asn Gly Arg Ala Tyr Asp Leu Ser Glu Trp Ile Ser Lys His Pro Gly
35 40 45

Gly Ala Phe Phe Ile Gly Arg Thr Lys Asn Arg Asp Ile Thr Ala Ile
50 55 60

Val Lys Ser Tyr His Arg Asp Pro Ala Ile Val Glu Arg Ile Leu Gln
65 70 75 80

Arg Arg Tyr Ala Leu Gly Arg Asp Ala Thr Pro Arg Asp Ile His Pro
85 90 95

Lys His Asn Ala Pro Ala Phe Leu Phe Lys Asp Asp Phe Asn Ser Trp
100 105 110

Arg Asp Thr Pro Lys Tyr Arg Phe Asp Asp Pro Asn Asp Leu Leu His
115 120 125

Arg Val Lys Ala Arg Leu Ala Glu Pro Ala Leu Ala Ala Arg Ile Lys
130 135 140

Arg Met Asp Thr Leu Phe Asn Ala Ile Val Ala Val Leu Ala Val Gly
145 150 155 160

Tyr Phe Ala Val Gln Gly Val Arg Leu Val Glu Pro Ser Trp Met Pro
165 170 175

Leu Trp Ala Phe Val Ile Ala Met Val Leu Leu Arg Ser Ser Leu Ala
180 185 190

Gly Phe Gly His Tyr Ala Leu His Arg Ala Gln Arg Gly Leu Asn Arg
195 200 205

Val Phe Asn Asn Ala Phe Asp Leu Asn Tyr Val Ala Leu Ser Leu Val
210 215 220

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Thr	Ala	Asp	Gly	His	Thr	Leu	Leu	His	His	Pro	Tyr	Thr	Gln	Ser	Glu	225	230	235	240
Val	Asp	Ile	Lys	Lys	Asn	Val	Phe	Thr	Met	Met	Met	Arg	Leu	Pro	Trp	245	250	255	
Leu	Tyr	Arg	Val	Pro	Val	His	Thr	Ile	His	Lys	Phe	Gly	His	Met	Leu	260	265	270	
Ser	Gly	Met	Ala	Ile	Arg	Ile	Val	Asp	Val	Phe	Arg	Ile	Thr	Arg	Lys	275	280	285	
Val	Gly	Val	Glu	Glu	Ser	Tyr	Gly	Ser	Trp	Arg	Ala	Ala	Leu	Pro	His	290	295	300	
Phe	Leu	Gly	Ser	Ala	Gly	Val	Arg	Leu	Leu	Leu	Val	Ser	Glu	Leu	Val	305	310	315	320
Val	Phe	Ala	Ile	Ala	Gly	Asp	Phe	Trp	Pro	Trp	Ala	Leu	Gln	Phe	Val	325	330	335	
Ala	Thr	Leu	Trp	Val	Ser	Thr	Phe	Leu	Val	Val	Ala	Ser	His	Glu	Phe	340	345	350	
Glu	Asp	Asp	Thr	Gln	Gly	Gly	Ala	Val	Asn	Gly	Glu	Asp	Trp	Gly	Ile	355	360	365	
Asp	Gln	Leu	Glu	His	Ala	Asn	Asp	Leu	Thr	Val	Ile	Gly	Asn	Arg	Tyr	370	375	380	
Val	Asp	Cys	Phe	Leu	Ser	Ala	Gly	Leu	Ser	Ser	His	Arg	Val	His	His	385	390	395	400
Val	Leu	Pro	Phe	Gln	Arg	Ser	Gly	Phe	Ala	Asn	Ile	Val	Thr	Glu	Asp	405	410	415	
Val	Leu	Arg	Glu	Glu	Ala	Ala	Lys	Phe	Gly	Val	Glu	Trp	Leu	Pro	Ala	420	425	430	
Lys	Gly	Phe	Ile	Thr	Asp	Arg	Leu	Pro	Arg	Leu	Cys	Arg	Lys	Tyr	Leu	435	440	445	
Leu	Thr	Pro	Ser	Arg	Gln	Ala	Lys	Glu	Arg	His	Trp	Gly	Phe	Val	Arg	450	455	460	

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Glu His Cys Ser Pro Ala Ala Leu Lys Ala Ser Ala Ser Tyr Val Val
 465 470 475 480

Ala Gly Phe Val Gly Ile Gly Ser Val
 485

<210> 88

<211> 1467

<212> DNA

<213> Mycobacterium tuberculosis

<400> 88

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gtgacaaacg acctcccaga cgtccgagag cgtgacggcg gtccacgtcc cgctcctcct      60
gctggcgggc cacgcttgtc agacgtgtgg gtttacaacg ggcgggcgta cgacctgagt      120
gagtggattt ccaagcatcc cggcggcgcc ttcttcattg ggcggaacaa gaaccgcgac      180
atcacgcgaa tcgtcaagtc ctaccatcgt gatccggcga ttgtcgagcg aatcctgcag      240
cggaggtacg cgttggggcg cgacgcaacc cctagggaca tccaccccaa gcacaatgca      300
ccggcatttc tgttcaaaga cgacttcaac agctggcggg acaccccgaa gtatcgattc      360
gacgacccca acgatctgct gcaccgggtc aaagcgcggc tagccgagcc agcgctggcc      420
gcccggatca agcgcatgga cacactcttc aacgccatcg ttgcagtact ggccgtgggt      480
tatttcgcgg ttcaggggtg gcggttgggt gaaccgagct ggatgccgct gtgggccttc      540
gtgattgcga tggttctgct gcgcagttcg ttggccgggt tcggtcatta cgactgcac      600
cgcgcgcaac gaggcctcaa ccgggttttc aacaatgcct tcgatctcaa ctatgtggcc      660
ttgtccttag tcaccgccga cggacacacc ctgctgcacc acccgatac ccagagcgag      720
gtggacatca agaagaacgt gttcacgatg atgatgcggc taccgtggtt gtatcgcggt      780
cccgtaacata cgattcacia atttggccac atgctcagcg gcatggcgat ccggatcgtc      840
gacgtcttca ggatcacgcg caaggtaggt gtcgaggaat cctacggaag ctggcgcgcc      900
gcgcttccac acttccttgg atcggccggg gtgcgcttgc ttctggtgag tgaattggtg      960
gtcttcgcga tcgccggcga cttctggccc tgggcactgc aattcgtagc gacgctgtgg     1020
gttagtaoct tcttggtggt ggcgagccat gagttcgagg acgacacca gggcggtgcc     1080
gtcaacggcg aggactgggg catagatcaa ctcgagcacg ctaatgacct aacggtgatc     1140

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ggggaaccgct acgtcgactg cttcctgtca gccggcctga gctcccaccg agtccatcac 1200
 gtgctgcegt ttcagcgag cggttcgag aacatcgta ccgaggacgt tttgcgtgag 1260
 gaagcagcga agttcgggtg cgagtggtt cccgcaaagg gtttcatcac cgatcgggtg 1320
 ccgagggtgt gtcggaagta tctgttgacg ccgtcgcgcc aagccaagga gcgtcattgg 1380
 ggtttcgtcc gcgagcactg ctgcgcggcg gcattgaaag ccagtgccag ctacgtgggt 1440
 gcgggtttcg tcggaatcgg gtcggta 1467

<210> 89

<211> 393

<212> PRT

<213> Mycobacterium tuberculosis

<400> 89

Met Asn Val Ser Ala Glu Ser Gly Ala Pro Arg Arg Ala Gly Gln Arg
 1 5 10 15

His Glu Val Gly Leu Ala Gln Leu Pro Pro Ala Pro Pro Thr Thr Val
 20 25 30

Ala Val Ile Glu Gly Leu Ala Thr Gly Thr Pro Arg Arg Val Val Asn
 35 40 45

Gln Ser Asp Ala Ala Asp Arg Val Ala Glu Leu Phe Leu Asp Pro Gly
 50 55 60

Gln Arg Glu Arg Ile Pro Arg Val Tyr Gln Lys Ser Arg Ile Thr Thr
 65 70 75 80

Arg Arg Met Ala Val Asp Pro Leu Asp Ala Lys Phe Asp Val Phe Arg
 85 90 95

Arg Glu Pro Ala Thr Ile Arg Asp Arg Met His Leu Phe Tyr Glu His
 100 105 110

Ala Val Pro Leu Ala Val Asp Val Ser Lys Arg Ala Leu Ala Gly Leu
 115 120 125

Pro Tyr Arg Ala Ala Glu Ile Gly Leu Leu Val Leu Ala Thr Ser Thr

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130		135		140
Gly Phe Ile Ala Pro Gly Val Asp Val Ala Ile Val Lys Glu Leu Gly				
145		150		155 160
Leu Ser Pro Ser Ile Ser Arg Val Val Val Asn Phe Met Gly Cys Ala				
	165		170	175
Ala Ala Met Asn Ala Leu Gly Thr Ala Thr Asn Tyr Val Arg Ala His				
	180		185	190
Pro Ala Met Lys Ala Leu Val Val Cys Ile Glu Leu Cys Ser Val Asn				
	195		200	205
Ala Val Phe Ala Asp Asp Ile Asn Asp Val Val Ile His Ser Leu Phe				
210		215		220
Gly Asp Gly Cys Ala Ala Leu Val Ile Gly Ala Ser Gln Val Gln Glu				
225		230		235 240
Lys Leu Glu Pro Gly Lys Val Val Val Arg Ser Ser Phe Ser Gln Leu				
	245		250	255
Leu Asp Asn Thr Glu Asp Gly Ile Val Leu Gly Val Asn His Asn Gly				
	260		265	270
Ile Thr Cys Glu Leu Ser Glu Asn Leu Pro Gly Tyr Ile Phe Ser Gly				
	275		280	285
Val Ala Pro Val Val Thr Glu Met Leu Trp Asp Asn Gly Leu Gln Ile				
	290		295	300
Ser Asp Ile Asp Leu Trp Ala Ile His Pro Gly Gly Pro Lys Ile Ile				
305		310		315 320
Glu Gln Ser Val Arg Ser Leu Gly Ile Ser Ala Glu Leu Ala Ala Gln				
	325		330	335
Ser Trp Asp Val Leu Ala Arg Phe Gly Asn Met Leu Ser Val Ser Leu				
	340		345	350
Ile Phe Val Leu Glu Thr Met Val Gln Gln Ala Glu Ser Ala Lys Ala				
	355		360	365

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Ile Ser Thr Gly Val Ala Phe Ala Phe Gly Pro Gly Val Thr Val Glu
 370 375 380

Gly Met Leu Phe Asp Ile Ile Arg Arg
 385 390

<210> 90

<211> 1179

<212> DNA

<213> Mycobacterium tuberculosis

<400> 90

```

atgaacgtct cagctgagag cgggtgcgccg cgccggggccg gccagaggca tgagggttggc      60
cttgcccagt tgccgccggc tccgccacc acggtggcgg tgattgaagg gcttgcgacg      120
ggcacgccgc gtcgggtagt caaccagtcc gacgccgccg atcgggtcgc cgagcttttc      180
ctcgatcccc gtcagcggga acggattccc cgggtgtatc aaaaatcgcg gatcaccacg      240
cgccgggatgg cggtcgaccc gtcgacgcc aaatttgatg tcttcaggcg ggaacctgcg      300
acgatccgtg atcggatgca tctgttctac gaacacgcgg ttccgctggc ggtggacgtg      360
agcaagcgtg ccctggcccg cctgccatac cgtgccgccg agatcgggct gctggtgttg      420
gccaccagca ccggattcat cgcgccgggc gtggacgttg cgatcgtcaa agagctcggg      480
ctctccccgt cgatatcacg tgtcgtggtc aatttcatgg gatgtgccgc cgcgatgaat      540
gccctgggca ccgccaccaa ctatgttcgt gccaccccg ccatgaaggc gctggtgggtg      600
tgtatcgaat tgtgctcggg gaacgctgtt tttgccgacg acatcaacga cgtcgtcatt      660
cacagcttgt ttggcgacgg gtgcgcggcg ttggtgatcg gcgccagcca gggtcaggag      720
aagctcgagc caggcaagggt ggtagtccgc agtagtttca gtcagctgct cgacaacacc      780
gaagacggta tcgtgcttgg cgtcaatcac aacggcatca cctgcgagct gtcggagaat      840
ctccccggct acatcttcag cggggtcgca ccggtgggtga cagagatggt atgggacaat      900
ggattacaga tatccgatat cgatctctgg gcgatccatc cgggtggccc caagatcatc      960
gagcagtcgg tgcgctcgct ggggatctcc gcggagctgg cggcgagag ctgggacgtg     1020
ctcgcccgtc tcggcaacat gtcagcgta tcgcttatct ttgtgctaga gacgatgggtg     1080
cagcaggcgg agtcggccaa agccatctcg acgggggtgg cgttcgcggtt cgggccgggc     1140
gtcactgtcg aaggcatgct gttcgacatc atccgacgg                                1179

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<210> 91

<211> 326

<212> PRT

<213> Mycobacterium tuberculosis

<400> 91

Met Asn Ser Glu His Pro Met Thr Asp Arg Val Val Tyr Arg Ser Leu
 1 5 10 15

Met Ala Asp Asn Leu Arg Trp Asp Ala Leu Gln Leu Arg Asp Gly Asp
 20 25 30

Ile Ile Ile Ser Ala Pro Ser Lys Ser Gly Leu Thr Trp Thr Gln Arg
 35 40 45

Leu Val Ser Leu Leu Val Phe Asp Gly Pro Asp Leu Pro Gly Pro Leu
 50 55 60

Ser Thr Val Ser Pro Trp Leu Asp Gln Thr Ile Arg Pro Ile Glu Glu
 65 70 75 80

Val Val Ala Thr Leu Asp Ala Gln Gln His Arg Arg Phe Ile Lys Thr
 85 90 95

His Thr Pro Leu Asp Gly Leu Val Leu Asp Asp Arg Val Ser Tyr Ile
 100 105 110

Cys Val Gly Arg Asp Pro Arg Asp Ala Ala Val Ser Met Leu Tyr Gln
 115 120 125

Ser Ala Asn Met Asn Glu Asp Arg Met Arg Ile Leu His Glu Ala Val
 130 135 140

Val Pro Phe His Glu Arg Ile Ala Pro Pro Phe Ala Glu Leu Gly His
 145 150 155 160

Ala Arg Ser Pro Thr Glu Glu Phe Arg Asp Trp Met Glu Gly Pro Asn
 165 170 175

Gln Pro Pro Pro Gly Ile Gly Phe Thr His Leu Lys Gly Ile Gly Thr

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180	185	190
Leu Ala Asn Ile Leu His Gln Leu Gly Thr Val Trp Val Arg Arg His		
195	200	205
Leu Pro Asn Val Ala Leu Phe His Tyr Ala Asp Tyr Gln Ala Asp Leu		
210	215	220
Ala Gly Glu Leu Leu Arg Pro Ala Arg Val Leu Gly Ile Ala Ala Thr		
225	230	235
Arg Asp Arg Ala Arg Asp Leu Ala Gln Tyr Ala Thr Leu Asp Ala Met		
245	250	255
Arg Ser Arg Ala Ser Glu Ile Ala Pro Asn Thr Thr Asp Gly Ile Trp		
260	265	270
His Ser Asp Glu Arg Phe Phe Arg Arg Gly Gly Ser Gly Asp Trp Gln		
275	280	285
Gln Phe Phe Thr Glu Ala Glu His Leu Arg Tyr Tyr His Arg Ile Asn		
290	295	300
Gln Leu Ala Pro Pro Asp Leu Leu Ala Trp Ala His Glu Gly Arg Arg		
305	310	315
Gly Tyr Asp Pro Ala Asn		
325		

<210> 92

<211> 978

<212> DNA

<213> Mycobacterium tuberculosis

<400> 92

atgaattcag aacacccgat gaccgaccgg gttgtgtatc gatcgttgat ggccgacaac	60
ctgcgatggg atgccctgca attgcgcgac ggcgacatca ttatctcggc gccgtccaag	120
agcggcctga cctggacaca gcgcctggtg tccctgctgg tgttcgacgg gcccgacttg	180
cccgaccct tgtcgacggt gtccccgtgg ctcgaccaga ccattcggcc catcgaggaa	240

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gtgggtcgcta ctctcgatgc ccagcagcac cgccgggttca tcaagaccca cacgccgttg      300
gacggcctgg tgctcgacga ccgcgtcagc tacatctgcg taggacgcga cccgcgcgat      360
gccgcggtgt caatgctgta ccaatcggcc aacatgaacg aagaccggat gcggattctg      420
cacgaggccg tagtgccgtt tcacgagcga atcgcccccc cgtttgcgga actcgggtcat      480
gcgcgcagcc cgaccgagga gttccgggat tggatggagg ggccgaatca gcctccccct      540
ggcatagggtt tcacacatct gaaggggatc ggcaactctgg ccaacatcct gcaccagcta      600
ggcacggtat ggggtccgcg tcacctacc aacgtggcct tgtttcatta cgccgattac      660
caggcggact tggcgggcga gctgctccg cgggcaaggg tcctcggtat cgccgcgacc      720
cgcgatcgag cccgggacct ggcgagtag gccacgctgg atgcgatgcg ctcccgcgcg      780
tcagaaatcg ctctaacac caccgacggc atctggcaca gtgacgagcg tttcttcgcg      840
cggggcgggga gtggcgactg gcagcagttc ttcaccgaag ccgagcacct gcgctactac      900
caccgcatca accagctggc gccacctgat ctgctggcct gggcacacga gggcgcgcgg      960
ggatacgacc cggccaac                                     978

```

<210> 93

<211> 422

<212> PRT

<213> Mycobacterium tuberculosis

<400> 93

```

Val Ala Glu Ala Gly Gly Gly Pro Ile Ser Val Ile Ala Arg His Met
1           5           10           15

```

```

Gln Leu Ile Arg Asp Asp Phe Ile Ser Glu Leu Phe Asp Lys Met Lys
20           25           30

```

```

Ala Glu Ile Arg Gly Leu Asp Tyr Asp Ala Arg Met Ala Asp Leu Trp
35           40           45

```

```

Arg Ala Ser Ile Thr Glu Asn Phe Val Thr Ala Val His Tyr Leu Asp
50           55           60

```

```

Arg Asp Thr Pro Gln Ser Leu Val Glu Ala Pro Ala Ala Ala Leu Ala
65           70           75           80

```

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Tyr Ala Arg Ala Ala Ala Gln Arg Asp Ile Pro Leu Ser Gly Leu Val
 85 90 95

Arg Ala His Arg Leu Gly His Ala Arg Phe Leu Glu Val Ala Met Gln
 100 105 110

Tyr Val Ser Leu Leu Glu Pro Ala Asp Arg Val Ser Thr Ile Ile Glu
 115 120 125

Leu Val Asn Arg Ser Ala Arg Leu Val Asp Leu Val Ala Asp Gln Leu
 130 135 140

Ile Val Ala Tyr Glu His Glu His Asp Arg Trp Leu Ser Arg Arg Ser
 145 150 155 160

Gly Leu Gln Gln Gln Trp Val Ser Glu Leu Leu Ala Asp Thr Pro Val
 165 170 175

Asp Val Pro Arg Ala Glu Arg Ala Leu Gly Tyr Arg Leu Asp Gly Val
 180 185 190

His Ile Ala Ala Val Val Trp Val Asp Ser Ala Val Pro Ile Gly Asp
 195 200 205

Val Val Ala Gln Phe Asp Gln Val Arg Cys Leu Leu Ala Gly Glu Leu
 210 215 220

Gly Pro Glu Leu Gly Pro Val Ala Asn Ser Leu Met Val Pro Thr Asp
 225 230 235 240

Glu Arg Glu Ala Arg Leu Trp Phe Ser Pro Ala Pro Thr Arg Ala Phe
 245 250 255

Ala Pro Ser Arg Ile Arg Ala Ala Phe Glu Ser Ala Gly Ile Arg Ala
 260 265 270

Arg Leu Ala Cys Gly Arg Val Gly Asp Gly Leu Arg Gly Phe Arg Ala
 275 280 285

Ser Leu Lys Gln Ala Glu Arg Val Lys Ala Leu Ala Leu Ala Gly Gly
 290 295 300

Ala Arg Pro Gly Gly Arg Val Met Phe Tyr Asp Asp Val Ala Pro Val
 305 310 315 320

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Ala Leu Leu Ala Asp Asp Leu Glu Glu Leu Arg Arg Phe Val Thr Asp
 325 330 335

Val Leu Gly Asp Leu Ser Val Asp Asp Glu Arg Asn Ser Trp Leu Arg
 340 345 350

Glu Thr Leu Arg Glu Phe Leu Leu Arg Asn Arg Ser Tyr Val Ala Thr
 355 360 365

Ala Asp Ala Met Ile Leu His Arg Asn Thr Ile Gln Tyr Arg Val Ile
 370 375 380

Gln Ala Met Glu Leu Cys Gly Gln Asn Leu Asp Asp Pro Asp Ala Ala
 385 390 395 400

Phe Arg Val Gln Met Ala Leu Glu Val Cys Arg Trp Met Ala Pro Ala
 405 410 415

Val Leu Arg Ala Lys Gln
 420

<210> 94

<211> 1266

<212> DNA

<213> Mycobacterium tuberculosis

<400> 94

gtggctgaag ctggtggcgg gccatttcg gtgatcgccc ggcatatgca gttgattcgc 60
 gatgacttca tctccgagtt gtttgacaag atgaaggcgg agattcgggg gctggattac 120
 gacgcgcgga tggcggacct gtggcgggag agcatcaccg agaatttcgt gacggccggt 180
 cactatattgg atcgcgatac gccgcagtcc ttggtggagg ctccagcggc cgcgctggca 240
 tacgcccgcg ccgcggcgca gcgtgatatt ccgttggtccg ggttggttcg ggcgcaaccgg 300
 ctcgggcatg cgcgtttctt ggaggtggcg atgcagtagc tgtagctgct ggagcccgt 360
 gaccgggtgt cgacgatcat cgagctgggt aatcgctccg ctgcctcgt tgacctgggt 420
 gccgaccagt tgattgtcgc ctatgagcac gaacacgata gctgggtgag tcgcgcgagc 480
 ggtctgcaac agcaatgggt cagcgagctg ctgcgcgata ccccggtcga cgttccgcgg 540

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```

gccgagcgcg cgttgggcta tcggttgga ggtgtgcata tcgccgcggt ggtatgggtc   600
gattcggcgg tgcccatcgg tgatgtggtg gcgcaattcg accaggtgcg ctgcttgctg   660
gccggggagc tgggccccga actgggcccc gtggcgaaact cgctgatggt gccgaccgat   720
gagcgcgagg cacggctgtg gttttcgccc gcgcccacgc gggccttcgc cccgtcgcg   780
attcgcgcg cgttcgagtc ggcgggaatc cgggcgcggt tggcgtgcgg tcgggtaggg   840
gacgggctgc gtgggttccg ggcgtcgttg aaacaggccg aacgagtga ggcgttggcc   900
ctggccggtg gcgcccggcc cggcggccgg gtcattgttt atgacgatgt cgcgccagtc   960
gcgttgctgg ccgacgatct agaggaactg cggcggttcg tcaccgatgt gctgggtgac  1020
ctgagtgttg acgacgagcg caatagctgg ctacgcgaga cgttacggga gttcttgctg  1080
cgtaaccgca gctacgtcgc cacggccgac gcgatgatcc tgcaccgcaa caccattcaa  1140
taccgggtga tccaggcgat ggaactatgc ggacagaatc tcgacgatcc cgatgcccg   1200
tttcgggtgc agatggcgct ggaggtctgc cgctggatgg caccggcggt gtcgccgcc   1260
aaacaa                                           1266

```

<210> 95

<211> 287

<212> PRT

<213> Mycobacterium tuberculosis

<400> 95

```

Met Lys Leu Ala Arg Pro Asp Val Phe His Pro Arg Val Val Leu Ala
1           5           10           15

```

```

Gly Trp Pro Gln Gln Pro Ala Gly Asp Gly Asp Asp Ala Gly Leu Val
          20           25           30

```

```

Ala Ala Leu Arg His Arg Gly Leu His Ala Gly Trp Leu Ser Trp Asp
          35           40           45

```

```

Asp Pro Glu Ile Val His Ala Asp Leu Val Ile Leu Arg Ala Thr Arg
          50           55           60

```

```

Asp Tyr Pro Ala Arg Leu Asp Glu Phe Leu Ala Trp Thr Thr Arg Val
          65           70           75           80

```

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Ala Asn Leu Leu Asn Ser Arg Pro Val Val Ala Trp Asn Val Glu Arg
85 90 95

Arg Tyr Leu Arg Asp Leu Met Asp Arg Gly Val Pro Thr Val Pro Gly
100 105 110

Glu Val Tyr Val Pro Gly Glu Pro Val Arg Leu Pro Arg Lys Gly Gln
115 120 125

Val Phe Val Gly Pro Thr Ile Gly Thr Gly Thr Arg Arg Cys Ser Ala
130 135 140

Arg Phe Ala Ala Glu Phe Val Ala Gln Leu His Ala Ala Gly Gln Ala
145 150 155 160

Val Leu Val Gln Pro Gly Gly Ser Gly Asp Glu Thr Val Leu Val Phe
165 170 175

Leu Gly Gly Glu Pro Ser His Ala Phe Thr Lys Gln Ala Asp Thr Trp
180 185 190

Arg Gln Thr Glu Pro Asp Phe Glu Ile Trp Asp Val Gly Ala Ala Ala
195 200 205

Val Ala Gly Ala Ala Ala Gln Val Gly Val Asp Pro Gly Glu Leu Leu
210 215 220

Tyr Ala Arg Ala His Ile Thr Gly Gly Ser Arg Asp Pro Arg Leu Leu
225 230 235 240

Glu Leu Gln Leu Val Asp Pro Ser Leu Gly Trp Gln Trp Leu Asp Pro
245 250 255

Asp Ile Arg Asn Leu Ala Gln Arg Asp Phe Ala Leu Cys Val Gln Ser
260 265 270

Ala Leu Glu Arg Leu Gly Leu Gly Pro Phe Ser His Arg Arg Pro
275 280 285

<210> 96

<211> 861

<212> DNA

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<213> Mycobacterium tuberculosis

<400> 96

```

atgaagcttg cccggccgga cgtcttccat ccgcgcgtcg ttttggcggg ttggccacag      60
cagcccgccg gtgacggcga cgatgctggg ctggttgcgg ccctgcgcca ccgcggcttg      120
catgctgggt ggctgtcttg ggacgatccc gaaatagtcc acgcggatct ggtgattttg      180
cgggctaccc gcgattaccc cgcgcggtc gacgagtttt tggcctggac taccgcgtg      240
gccaatctgc tgaactcgcg gccggtggtg gcctggaatg tcgagcgccg ttacctacgt      300
gacctgatgg atcggggggg gccgaccgtg cccggcgagg tgtatgtgcc gggagagccg      360
gtccggttgc caccgaaagg ccaggctctt gcggtccga ccatcggtac cgggacacgg      420
cgctgtagtg cccggttcgc tgccgagttc gtcgcgcaac tgcacgcggc cggccaggcg      480
gtgctcgttc agcccgaggg ttccggtgac gagaccgtgt tggctcttct tggcggtgag      540
ccgtcgcatt cgtttaccaa gcaggccgac acttggcgcc agaccgagcc cgacttcgaa      600
atctgggacg tgggtgcggc cgccgtggcc ggcgcgccg cgcagggtgg tgttgaccca      660
ggtgagctgc tctacgcgcg ggcccacatc acagggtgaa gccgagatcc ccggttgctg      720
gaattgcaat tgggtggacc gtcgctgggc tggcagtggc tggaccaga catccgcaat      780
cttgcccagc gtgacttcgc gctatgcgtc cagtcagcgt tggagcggct ggggctgggc      840
ccgttctccc atcgacgccc a                                             861

```

<210> 97

<211> 280

<212> PRT

<213> Mycobacterium tuberculosis

<400> 97

```

Met Thr Asp Pro Phe Leu Gly Ser Glu Ala Leu Ala Ala Gly Val Leu
1           5           10          15

Thr Pro Tyr Glu Leu Arg Ser Arg Tyr Val Ala Leu His Lys Asp Val
          20           25          30

Tyr Val Pro Gln Gly Val Glu Leu Thr Ala Gln Leu Arg Ala Lys Ala
          35           40          45

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Leu Trp Leu Arg Ser Arg Arg Arg Gly Val Leu Ala Gly Tyr Ser Ala
 50 55 60

Ser Ala Phe His Gly Ala Lys Trp Ile Asp Ala Asp Leu Pro Ala Ala
 65 70 75 80

Ile Ile Asp Thr Asn Arg Arg Arg Ala Pro Gly Leu Gln Val Trp Glu
 85 90 95

Glu Arg Ile Glu Pro Asp Glu Ile Cys Val Ile Glu Gly Met Arg Val
 100 105 110

Thr Thr Pro Glu Arg Thr Ala Leu Asp Leu Thr Ser Arg Phe Pro Leu
 115 120 125

Asp Pro Ala Val Ala Ala Val Asp Ala Leu Ile Gln Ala Thr Asp Leu
 130 135 140

Lys Val Ala Asp Val Glu Pro Leu Ile Glu Arg Tyr Arg Gly Arg Arg
 145 150 155 160

Gly Met Lys Ala Ala Arg Ala Ala Leu Asp Leu Val Asp Gly Gly Ala
 165 170 175

Gln Ser Pro Lys Glu Thr Trp Leu Arg Leu Leu Leu Ile Arg Ala Gly
 180 185 190

Phe Pro Arg Pro Gln Thr Gln Ile Ala Val Arg Asn Glu Trp Gly Trp
 195 200 205

Ala Glu Ala His Leu Asp Met Gly Trp Gln Asp Ile Lys Val Ala Ala
 210 215 220

Glu Tyr Asp Gly Asp His His Leu Thr Ser Arg Tyr His Tyr Arg Lys
 225 230 235 240

Asp Ile Leu Arg His Glu Lys Val Gln His Arg Tyr Gly Trp Ile Val
 245 250 255

Val Arg Val Val Ala Glu Asp His Pro Ala Asp Ile Ile Arg Arg Val
 260 265 270

Gly Glu Ala Arg Ala Phe Arg Ala

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275

280

<210> 98

<211> 840

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 98

```

atgacggatc cttttctggg cagcgaggcc ctggctgcgg gtgtattgac gccctacgaa      60
ttgcgagca ggtatgtcgc gctacataaa gacgtgtacg tgccgcaggg tgtggaactg      120
accgcgcaat tgcgtgcaaa agcgctgtgg ctgcgctcgc gccgccgcgg cgtgctggcc      180
ggctactcgg cttctgcctt ccatggcgcc aagtggatcg acgcggatct tcccgcgcgg      240
atcatcgaca ccaaccgccg ccgtgccccg gggctgcaag tctgggaaga gcgcacgag      300
cccgacgaga tctgcgtcat cgagggcatg cgcgtgacca caccggagcg aacggcgctc      360
gacctgacca gtcgatttcc attggacccc gccgtgcggg ccgtcgacgc cctgatacag      420
gccaccgatt tgaagggtggc cgacgtcgag ccgctgatcg agcgctatcg gggccgcgct      480
ggcatgaagg ccgcaagagc cgctctggac ctgcgtgacg gcggtgcca gtcccccaag      540
gaaacctggc tgcgcttgtt gttgatccgc gccggcttcc cgcgccccca gacgcagatc      600
gcggtgcgca acgaatgggg ctgggcggaa gccatttgg atatgggctg gcaagacatc      660
aaggctcgcg ccgagtatga cggcgaccac catctgacca gtcgctacca ctaccgaaa      720
gacatcctcc ggcacgagaa agtccagcac cgctacgggt ggatcgtggt ccgggtcgtc      780
gccgaggacc accccgctga catcatccgc cgcgtggggc aggccgcgcg tttccgagcg      840

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<210> 99

<211> 334

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 99

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Met Met Ala Ala Ser His Asp Asp Asp Thr Val Asp Gly Leu Ala Thr
1           5           10          15

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Ala Val Arg Gly Gly Asp Arg Ala Ala Leu Pro Arg Ala Ile Thr Leu
 20 25 30

Val Glu Ser Thr Arg Pro Asp His Arg Glu Gln Ala Gln Gln Leu Leu
 35 40 45

Leu Arg Leu Leu Pro Asp Ser Gly Asn Ala His Arg Val Gly Ile Thr
 50 55 60

Gly Val Pro Gly Val Gly Lys Ser Thr Ala Ile Glu Ala Leu Gly Met
 65 70 75 80

His Leu Ile Glu Arg Gly His Arg Val Ala Val Leu Ala Val Asp Pro
 85 90 95

Ser Ser Thr Arg Thr Gly Gly Ser Ile Leu Gly Asp Lys Thr Arg Met
 100 105 110

Ala Arg Leu Ala Val His Pro Asn Ala Tyr Ile Arg Pro Ser Pro Thr
 115 120 125

Ser Gly Thr Leu Gly Gly Val Thr Arg Ala Thr Arg Glu Thr Val Val
 130 135 140

Leu Leu Glu Ala Ala Gly Phe Asp Val Ile Leu Ile Glu Thr Val Gly
 145 150 155 160

Val Gly Gln Ser Glu Val Ala Val Ala Asn Met Val Asp Thr Phe Val
 165 170 175

Leu Leu Thr Leu Ala Arg Thr Gly Asp Gln Leu Gln Gly Ile Lys Lys
 180 185 190

Gly Val Leu Glu Leu Ala Asp Ile Val Val Val Asn Lys Ala Asp Gly
 195 200 205

Glu His His Lys Glu Ala Arg Leu Ala Ala Arg Glu Leu Ser Ala Ala
 210 215 220

Ile Arg Leu Ile Tyr Pro Arg Glu Ala Leu Trp Arg Pro Pro Val Leu
 225 230 235 240

Thr Met Ser Ala Val Glu Gly Arg Gly Leu Ala Glu Leu Trp Asp Thr
 245 250 255

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Val Glu Arg His Arg Gln Val Leu Thr Gly Ala Gly Glu Phe Asp Ala
 260 265 270

Arg Arg Arg Asp Gln Gln Val Asp Trp Thr Trp Gln Leu Val Arg Asp
 275 280 285

Ala Val Leu Asp Arg Val Trp Ser Asn Pro Thr Val Arg Lys Val Arg
 290 295 300

Ser Glu Leu Glu Arg Arg Val Arg Ala Gly Glu Leu Thr Pro Ala Leu
 305 310 315 320

Ala Ala Gln Gln Ile Leu Glu Ile Ala Asn Leu Thr Asp Arg
 325 330

<210> 100

<211> 1002

<212> DNA

<213> Mycobacterium tuberculosis

<400> 100

atgatggccg catccacga cgacgacacc gtgcgagggg tggcgacggc cgtgcgcggc 60
 ggtgaccgtg cggcgctgcc acgggccatc aactgggtcg agtcgaccg ccccgaccat 120
 cgtgagcagg cgcaacagct gctgctgcga ttgctgccgg actccgggaa cgcccatcgc 180
 gtcggcatca ccgggggtccc ggggggtgggc aagtcgactg ccatcgaggc gctgggcatg 240
 catctgatcg agcgcgggca tcgggtggcg gtgctggcgg tcgaccgcgc gtcgaccgcg 300
 acgggtggat cgattcttgg tgataaaacc cggatggcgc ggctggcggg gcacccgaac 360
 gcctacatcc ggccgtcccc gacgtcggga acgctgggtg gggtgacgag ggccacccgg 420
 gaaacggtgg tgctgttga ggcgccggg tttgatgtga tcctgatcga aaccgtcggg 480
 gtgggcccagt ccgaggtcgc ggtggccaac atggctgaca cgttcgtgtt gctgaccttg 540
 gcccgaccg gtgatcagtt gcagggcatc aagaagggcg tgctggagct cgccgacatc 600
 gtgggtggtga acaaggccga cggggagcac cacaagagg ccgggtggc cgccggggag 660
 ctgtcggcgg cgatcagatt gatctatcct cgcaagcac tgtggcgccc accggtgctc 720
 accatgagcg cgtggaggg caggggactg gccgagctgt gggacaccgt cgagcgtcat 780

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cgccaggtgc tcaccggggc cggcgaattc gacgcccgtc ggcgcgatca gcaggtcgcac 840
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 cgcaaggtcc gctccgagct cgagcgtcgg gtccgcgccg gcgaactgac cccggccctg 960
 gcggctcagc aaatactgga gatagctaac ctaacggata gg 1002

<210> 101

<211> 426

<212> PRT

<213> Mycobacterium tuberculosis

<400> 101

Met Lys Phe Val Leu Ala Val His Gly Thr Arg Gly Asp Val Glu Pro
 1 5 10 15

Cys Ala Ala Val Gly Val Glu Leu Arg Arg Arg Gly His Ala Val His
 20 25 30

Met Ala Val Pro Pro Asn Leu Ile Glu Phe Val Glu Ser Ala Gly Leu
 35 40 45

Thr Gly Val Ala Tyr Gly Pro Asp Ser Asp Glu Gln Ile Asn Thr Val
 50 55 60

Ala Ala Phe Val Arg Asn Leu Thr Arg Ala Gln Asn Pro Leu Asn Leu
 65 70 75 80

Ala Arg Ala Val Lys Glu Leu Phe Val Glu Gly Trp Ala Glu Met Gly
 85 90 95

Thr Thr Leu Thr Thr Leu Ala Asp Gly Ala Asp Leu Val Met Thr Gly
 100 105 110

Gln Thr Tyr His Gly Val Ala Ala Asn Val Ala Glu Tyr Tyr Asp Ile
 115 120 125

Pro Ala Ala Ala Leu His His Phe Pro Met Gln Val Asn Gly Gln Ile
 130 135 140

Ala Ile Pro Ser Ile Pro Thr Pro Ala Thr Leu Val Arg Ala Thr Met

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145		150		155		160									
Lys	Val	Ser	Trp	Arg	Leu	Tyr	Ala	Tyr	Val	Ser	Lys	Asp	Ala	Asp	Arg
				165					170					175	
Ala	Gln	Arg	Arg	Glu	Leu	Gly	Leu	Pro	Pro	Ala	Pro	Ala	Pro	Ala	Val
				180				185						190	
Arg	Arg	Leu	Ala	Glu	Arg	Gly	Ala	Pro	Glu	Ile	Gln	Ala	Tyr	Asp	Pro
				195				200						205	
Val	Phe	Phe	Pro	Gly	Leu	Ala	Ala	Glu	Trp	Ser	Asp	Arg	Arg	Pro	Phe
	210							215				220			
Val	Gly	Pro	Leu	Thr	Met	Glu	Leu	His	Ser	Glu	Pro	Asn	Glu	Glu	Leu
225					230					235					240
Glu	Ser	Trp	Ile	Ala	Ala	Gly	Thr	Pro	Pro	Ile	Tyr	Phe	Gly	Phe	Gly
				245					250					255	
Ser	Thr	Pro	Val	Gln	Thr	Pro	Val	Gln	Thr	Leu	Ala	Met	Ile	Ser	Asp
			260					265					270		
Val	Cys	Ala	Gln	Leu	Gly	Glu	Arg	Ala	Leu	Ile	Tyr	Ser	Pro	Ala	Ala
		275					280					285			
Asn	Ser	Thr	Arg	Ile	Arg	His	Ala	Asp	His	Val	Lys	Arg	Val	Gly	Leu
		290				295					300				
Val	Asn	Tyr	Ser	Thr	Ile	Leu	Pro	Lys	Cys	Arg	Ala	Val	Val	His	His
305					310					315				320	
Gly	Gly	Ala	Gly	Thr	Thr	Ala	Ala	Gly	Leu	Arg	Ala	Gly	Met	Pro	Thr
				325					330					335	
Leu	Ile	Leu	Trp	Asp	Val	Ala	Asp	Gln	Pro	Ile	Trp	Ala	Gly	Ala	Val
			340					345					350		
Gln	Arg	Leu	Lys	Val	Gly	Ser	Ala	Lys	Arg	Phe	Thr	Asn	Ile	Thr	Arg
		355					360					365			
Gly	Ser	Leu	Leu	Lys	Glu	Leu	Arg	Ser	Ile	Leu	Ala	Pro	Glu	Cys	Ala
	370					375					380				

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Ala Arg Ala Arg Glu Ile Ser Thr Arg Met Thr Arg Pro Thr Ala Ala
 385 390 395 400

Val Thr Ala Ala Ala Asp Leu Leu Glu Ala Thr Ala Arg Gln Thr Pro
 405 410 415

Gly Ser Thr Pro Ser Ser Ser Pro Gly Arg
 420 425

<210> 102

<211> 1278

<212> DNA

<213> Mycobacterium tuberculosis

<400> 102

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atgaagtttg tcttggcggg ccacggaacc cgcggatgatg tcgaaccttg cgccgcgggtt      60
ggcgtggagc tgcggcgggc aggccacgca gttcatatgg cagtgcggcc caacctgatc      120
gagttcgtcg agtcggcagg tctgaccggc gtcgcctacg gcccggaactc ggacgaacag      180
atcaacacgg tcgcggcatt cgtccgcaac ctccaccagag ccagaatcc gctcaacctc      240
gcccgcgccg tcaaggaact attcgtcgaa ggctggggcg agatgggcac gacgttgacc      300
acgttggccg acggcgccga cctggtgatg acgggccaaga catatcatgg tgtggcagcc      360
aacgtcgccg agtactacga cattccggct gcggcactgc atcaactttcc gatgcagggtc      420
aacggccaaa tcgcgatccc gtcgataccg acgcccggca ctctggtgcg cgcgacgatg      480
aaggtctcat ggcggctgta tgcgtacgtc agcaaggatg ccgatcgcg cgaacgacgt      540
gaactggggc taccgccagc accggcgccg gcggtgcgtc ggctggcgga acgcgagcgc      600
cccgaaatcc aagcctacga cccggttttt ttccccggac tggcgggcca atggagcgac      660
cgccgcccgt ttgtcgggcc gctgaccatg gagttacaca gcgaacccaa cgaagaactc      720
gagtcgtgga tcgccgcccg aacaccaccc atctacttcg gcttcggcag cacgcccgtc      780
caaacgcccg tccaaacgct cgccatgatc tccgatgtct gcgcacagct cggcgagcga      840
gccctgatct attctccggc agccaactcc acccgcatc gtcatgccga ccacgtgaaa      900
cgtgtcgggc tgggtcaacta ttcgaccatc cttcccaagt gccgcgcggg cgtccaccac      960
ggcggcgccg gtaccaccgc cgccggcctg cgagcgggaa tgcccacgct gattctctgg      1020
gacgtggccg atcaaccgat ctgggcccgg gccgtccaac gactcaaagt cgggtctgcc      1080

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aaacgcttta cgaacatcac ccgcgggtca ttgctcaagg agctacgata gatcctggcg 1140
 ccggaatgcg ccgcgcgggc acgtgagata tcgacacgga tgacccggcc gacagccgcc 1200
 gtcaccgcgg ccgcggacct gctggaggcg acggcacgcc aaacgcctgg gagcacgcct 1260
 agcagctcgc cgggcagg 1278

<210> 103

<211> 165

<212> PRT

<213> Mycobacterium tuberculosis

<400> 103

Val Thr Gln Leu Pro Gln Pro Thr Trp Arg Trp Trp Gln Gln Arg Glu
 1 5 10 15

Thr Glu Gln Val Gln Ser Ser His Ile Asp Gly Glu Ile Val Gly Ala
 20 25 30

Leu Ile Pro Asp Leu Ala Val Leu His Ser Glu Asp Ala Ser Arg Ala
 35 40 45

Ala Val Gly Arg Glu Lys His Arg Cys Ser Leu Asp Pro Leu Gly Gly
 50 55 60

Gly Phe Arg Ser Arg Arg Ala Ser Met Pro Ala Gly Ala Leu Leu Leu
 65 70 75 80

Ser Ala Val Ile Ala Ile Gln Leu Asp Arg Met Asn Ala Arg Val Phe
 85 90 95

Gly Asp Gly Trp Ile Gly Ala Gln Ala Cys Met Trp Val Asn Lys Phe
 100 105 110

His Glu Glu Ser Thr Val Thr Ala Leu Ser Pro Ser Ser Pro Ile Ala
 115 120 125

Gln Gly Ser Ile Ala Arg His Pro Glu Thr Met Gln Ser Ala Tyr Val
 130 135 140

Arg Ile Ala Glu Gly Gly Ser Arg Asp Val Ala Pro Ala Ala Gln Leu

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145

150

155

160

Gln Arg Arg Arg Pro
165

<210> 104

<211> 495

<212> DNA

<213> Mycobacterium tuberculosis

<400> 104

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gtgactcagc ttccacaacc aacctggcgc tggcggcagc aaagagagac ggagcaggtg      60
cagtccagcc acatcgacgg agaaatagtc ggcgcgttga tccctgacct ggcgggtgctg     120
cacagcgagg atgcctcacg cgcggccgtg ggaagggaaa agcatagatg ctcgttggat      180
cctctagggtg gcggcttccg ttcccgtcgt gcctcgatgc cggccggcgc gcttctgctg     240
tctgcgggtca tcgcaataca actggaccgg atgaatgcc aagatattcg cgatggctgg      300
atcggcgcgcg aagcgtgcat gtgggtcaac aagtttcacg aggagagcac cgtcaccgcg     360
ttgtccccca gtagtccgat cgcgcagggc tcgatcgcgc ggcattccaga gacgatgcaa     420
tcggcgtagc tgcgcatcgc cgagggcgga tcgcgcgatg tcgccccagc cgcccagctt     480
cagcgacgac ggcct                                     495

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<210> 105

<211> 583

<212> PRT

<213> Mycobacterium tuberculosis

<400> 105

Met Thr Ala Gln His Asn Ile Val Val Ile Gly Gly Gly Gly Ala Gly
1 5 10 15

Leu Arg Ala Ala Ile Ala Ile Ala Glu Thr Asn Pro His Leu Asp Val
20 25 30

Ala Ile Val Ser Lys Val Tyr Pro Met Arg Ser His Thr Val Ser Ala

35

40

45

His Ala His Asp Thr Val Ser Gly Gly Asp Trp Leu Cys Asp Gln Asp
65 70 75 . 80

Ala Val Glu Ala Phe Val Ala Glu Ala Pro Lys Glu Leu Val Gln Leu
85 90 95

Glu His Trp Gly Cys Pro Trp Ser Arg Lys Pro Asp Gly Arg Val Ala
100 105 110

Val	Arg	Pro	Phe	Gly	Gly	Met	Lys	Lys	Leu	Arg	Thr	Trp	Phe	Ala	Ala
			115				120					125			

Asp Lys Thr Gly Phe His Leu Leu His Thr Leu Phe Gln Arg Leu Leu
130 135 140

Thr	Tyr	Ser	Asp	Val	Met	Arg	Tyr	Asp	Glu	Trp	Phe	Ala	Thr	Thr	Leu
145					150					155					160

Leu Val Asp Asp Gly Arg Val Cys Gly Leu Val Ala Ile Glu Leu Ala
165 170 175

Thr Gly Arg Ile Glu Thr Ile Leu Ala Asp Ala Val Ile Leu Cys Thr
180 185 190

Gly Gly Cys Gly Arg Val Phe Pro Phe Thr Thr Asn Ala Asn Ile Lys
195 200 205

Thr Gly Asp Gly Met Ala Leu Ala Phe Arg Ala Gly Ala Pro Leu Lys
210 215 220

Asp Met Glu Phe Val Gln Tyr His Pro Thr Gly Leu Pro Phe Thr Gly
225 230 235 240

Ile Leu Ile Thr Glu Ala Ala Arg Ala Glu Gly Gly Trp Leu Leu Asn
245 250 255

Lys Asp Gly Tyr Arg Tyr Leu Gln Asp Tyr Asp Leu Gly Lys Pro Thr

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Pro Glu Pro Arg Leu Arg Ser Met Glu Leu Gly Pro Arg Asp Arg Leu
 275 280 285

Ser Gln Ala Phe Val His Glu His Asn Lys Gly Arg Thr Val Asp Thr
 290 295 300

Pro Tyr Gly Pro Val Val Tyr Leu Asp Leu Arg His Leu Gly Ala Asp
 305 310 315 320

Leu Ile Asp Ala Lys Leu Pro Phe Val Arg Glu Leu Cys Arg Asp Tyr
 325 330 335

Gln His Ile Asp Pro Val Val Glu Leu Val Pro Val Arg Pro Val Val
 340 345 350

His Tyr Met Met Gly Gly Val His Thr Asp Ile Asn Gly Ala Thr Thr
 355 360 365

Leu Pro Gly Leu Tyr Ala Ala Gly Glu Thr Ala Cys Val Ser Ile Asn
 370 375 380

Gly Ala Asn Arg Leu Gly Ser Asn Ser Leu Pro Glu Leu Leu Val Phe
 385 390 395 400

Gly Ala Arg Ala Gly Arg Ala Ala Ala Asp Tyr Ala Ala Arg His Gln
 405 410 415

Lys Ser Asp Arg Gly Pro Ser Ser Ala Val Arg Ala Gln Ala Arg Thr
 420 425 430

Glu Ala Leu Arg Leu Glu Arg Glu Leu Ser Arg His Gly Gln Gly Gly
 435 440 445

Glu Arg Ile Ala Asp Ile Arg Ala Asp Met Gln Ala Thr Leu Glu Ser
 450 455 460

Ala Ala Gly Ile Tyr Arg Asp Gly Pro Thr Leu Thr Lys Ala Val Glu
 465 470 475 480

Glu Ile Arg Val Leu Gln Glu Arg Phe Ala Thr Ala Gly Ile Asp Asp
 485 490 495

His Ser Arg Thr Phe Asn Thr Glu Leu Thr Ala Leu Leu Glu Leu Ser
 500 505 510

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Gly Met Leu Asp Val Ala Leu Ala Ile Val Glu Ser Gly Leu Arg Arg
 515 520 525

Glu Glu Ser Arg Gly Ala His Gln Arg Thr Asp Phe Pro Asn Arg Asp
 530 535 540

Asp Glu His Phe Leu Ala His Thr Leu Val His Arg Glu Ser Asp Gly
 545 550 555 560

Thr Leu Arg Val Gly Tyr Leu Pro Val Thr Ile Thr Arg Trp Pro Pro
 565 570 575

Gly Glu Arg Val Tyr Gly Arg
 580

<210> 106

<211> 1749

<212> DNA

<213> Mycobacterium tuberculosis

<400> 106

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attgcgatag ccgaaaccaa tccgcacctg gatgtggcga tcgtttccaa ggtgtaccgc	120
atgcgcagcc acaccgtctc ggctgagggc ggcgccgcgg cggtgaccgg tgacgacgac	180
agcctcgatg aacacgcgca cgacacggta tccggtggcg actggctgtg tgaccaagat	240
gcggctgagg ctttcgtggc cgaggcgccc aaagagttgg tgcagctcga gcattggggc	300
tgtccgtgga gccgtaaacc agacgggcgc gttgccgttc gcccgttcgg cgggatgaag	360
aagctgcgca cctggtttgc cgccgacaag acgggatttc acctcctgca cacgttgttt	420
caacggctgc tcacctattc cgacgtcatg cgctatgacg agtggttcgc tacgacgctg	480
ctggctgacg acggcagggc atgtggtctg gtcgctatcg agttggcgac cgggcgcac	540
gagacgatcc ttgccgacgc ggtgattctg tgcaccggcg gatgcgggcg ggtattttcca	600
ttcaccacca acgcgaacat caagaccggc gacggcatgg cgctcgcatc ccgcgcgggc	660
gcgcccctaa aagacatgga attcgtccaa taccaccca ccggactgcc gttcaccggg	720
atcttgatca ccgaggccgc acgagctgaa ggcggctggc tgctcaacaa agacggctac	780

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cgctacctcc aggattacga cctcggcaag cccacgcccg agcccaggct gcgcagtatg 840
 gagctcgggc ccagggaccg actgtcgcag gccttcgtac acgagcaciaa caaaggaagg 900
 acggctcgaca ccccgtacgg ccccgtcgtc tatctagacc tgcggcacct gggggcggac 960
 ctgatcgatg caaagttgcc gtctgtacgt gagctgtgcc gcgactacca gcacatcgac 1020
 cccgtggtcg aattgggtccc ggtacgaccg gtagtgcact acatgatggg tggcgttcac 1080
 accgatatca acggcgccac aacgcttccc gggctatatg ccgcagggtga aacagcctgc 1140
 gtgagcatta atggcgccaa ccgcctgggg tcgaactcgc tgcccagact gctggtgttc 1200
 ggggctcgag cgggccgtgc cggcgcgat tacgcagcgc gccacaaaaa gtcggaccgt 1260
 ggcccgtcgt cggcagtgcg ggctcaggcc cgcaccgagg ctctacggct agagcgtgag 1320
 ctcagccgcc atggccaggg aggcgaacga atcgcggata ttccggcgga catgcaggcc 1380
 accttggaiaa gcgcgcggg tatttatcgt gacggaccca ccctcaccaa agcggtcgag 1440
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 ttcaacaccg agctgactgc gctgctcgag ttgtcgggga tgctcgacgt tgcaactggcg 1560
 atcgtcgaat cgggtttgcg ccgagaagaa tcccgtggcg cacaccagcg aaccgacttt 1620
 ccgaaccggg acgacgagca tttcttggcg cacacottgg ttcatagaga aagcgacgga 1680
 acgctgcggg tcggctacct tccggtcact atcactcgct ggccaccggg cgaacgcgtg 1740
 tatgggagg 1749

<210> 107

<211> 386

<212> PRT

<213> Mycobacterium tuberculosis

<400> 107

Met Lys Ala Ala Thr Gln Ala Arg Ile Asp Asp Ser Pro Leu Ala Trp
 1 5 10 15

Leu Asp Ala Val Gln Arg Gln Arg His Glu Ala Gly Leu Arg Arg Cys
 20 25 30

Leu Arg Pro Arg Pro Ala Val Ala Thr Glu Leu Asp Leu Ala Ser Asn
 35 40 45

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Asp Tyr Leu Gly Leu Ser Arg His Pro Ala Val Ile Asp Gly Gly Val
 50 55 60

Gln Ala Leu Arg Ile Trp Gly Ala Gly Ala Thr Gly Ser Arg Leu Val
 65 70 75 80

Thr Gly Asp Thr Lys Leu His Gln Gln Phe Glu Ala Glu Leu Ala Glu
 85 90 95

Phe Val Gly Ala Ala Ala Gly Leu Leu Phe Ser Ser Gly Tyr Thr Ala
 100 105 110

Asn Leu Gly Ala Val Val Gly Leu Ser Gly Pro Gly Ser Leu Leu Val
 115 120 125

Ser Asp Ala Arg Ser His Ala Ser Leu Val Asp Ala Cys Arg Leu Ser
 130 135 140

Arg Ala Arg Val Val Val Thr Pro His Arg Asp Val Asp Ala Val Asp
 145 150 155 160

Ala Ala Leu Arg Ser Arg Asp Glu Gln Arg Ala Val Val Val Thr Asp
 165 170 175

Ser Val Phe Ser Ala Asp Gly Ser Leu Ala Pro Val Arg Glu Leu Leu
 180 185 190

Glu Val Cys Arg Arg His Gly Ala Leu Leu Leu Val Asp Glu Ala His
 195 200 205

Gly Leu Gly Val Arg Gly Gly Gly Arg Gly Leu Leu Tyr Glu Leu Gly
 210 215 220

Leu Ala Gly Ala Pro Asp Val Val Met Thr Thr Thr Leu Ser Lys Ala
 225 230 235 240

Leu Gly Ser Gln Gly Gly Val Val Leu Gly Pro Thr Pro Val Arg Ala
 245 250 255

His Leu Ile Asp Ala Ala Arg Pro Phe Ile Phe Asp Thr Gly Leu Ala
 260 265 270

Pro Ala Ala Val Gly Ala Ala Arg Ala Ala Leu Arg Val Leu Gln Ala
 275 280 285

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Glu Pro Trp Arg Pro Gln Ala Val Leu Asn His Ala Gly Glu Leu Ala
 290 295 300

Arg Met Cys Gly Val Ala Ala Val Pro Asp Ser Ala Met Val Ser Val
 305 310 315 320

Ile Leu Gly Glu Pro Glu Ser Ala Val Ala Ala Ala Ala Ala Cys Leu
 325 330 335

Asp Ala Gly Val Lys Val Gly Cys Phe Arg Pro Pro Thr Val Pro Ala
 340 345 350

Gly Thr Ser Arg Leu Arg Leu Thr Ala Arg Ala Ser Leu Asn Ala Gly
 355 360 365

Glu Leu Glu Leu Ala Arg Arg Val Leu Thr Asp Val Leu Ala Val Ala
 370 375 380

Arg Arg
 385

<210> 108

<211> 1158

<212> DNA

<213> Mycobacterium tuberculosis

<400> 108

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accgagctgg acttggcctc caacgactat ctcggtctgt cccgacatcc cgcgcgtcatc	180
gacggcggcg tccaggcgct gcggatctgg ggcgccggcg ccaccgggtc ggcgctgggt	240
accggcgaca ccaagctgca ccagcaattc gaggccgagc tcgccgagtt cgtcggcgct	300
gccgcgggat tgctgttctc ctctggctac acggccaacc tgggcgcggt ggtcggcctg	360
tccggcccgg gttccctgct ggtgtccgac gcccggtcgc atgcgtcggt ggtggatgcc	420
tgctggctgt cgcgggcgcg ggttggtggt acgccgcacc gcgacgtcga cgcgctggac	480
gccgcgtgc gatcgcgcga cgagcagcgc gccgtcgtcg tcaccgactc ggtgttcagc	540

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gccgacggct cgctggcgcc ggttcgggag ttgcttgagg tctgccggcg tcatggtgcg      600
ctgcttctgg tggacgaggc gcacggcctg ggtgtgcgtg gcggcggacg cgggctgctc      660
tacgagttag gtctagcggg tgcgcccgcac gtggtgatga ccaccacgct gtccaaggcg      720
ctgggcagcc aggggtggtgt ggtgctcggg ccgacgccgg tgcggggcca tctgatcgat      780
gctgcccggc cgttcattctt cgacaccggt ctggcgccgg cggcgggtggg tgccgcacgg      840
gccgcgctgc gcgtcttgca ggccgagccg tggcgaccgc aggcgggtgct caaccacgct      900
ggtgaacttg cgcggatgtg cgggtgtggct gcggtgccgg actcggcgat ggtgtcggtg      960
atcctggggc agccggagtc ggcagtggcc gccgcggcgg cctgcctgga cgccggggtc     1020
aaggtgggct gcttccggcc gccgacggtg cccgcgggta cgtcgcggct gcggctgacc     1080
gcgcgcgcac cgctgaacgc cggcgagctc gagctggccc ggcggggtgct gacggatggt     1140
ctcgccgtgg cgcgccgt                                     1158

```

<210> 109

<211> 136

<212> PRT

<213> Mycobacterium tuberculosis

<400> 109

```

Met Thr Thr Thr Pro Ala Arg Phe Asn His Leu Val Thr Val Thr Asp
1           5           10           15

```

```

Leu Glu Thr Gly Asp Arg Ala Val Cys Asp Arg Asp Gln Val Ala Glu
          20           25           30

```

```

Thr Ile Arg Ala Trp Phe Pro Asp Ala Pro Leu Glu Val Arg Glu Ala
          35           40           45

```

```

Leu Val Arg Leu Gln Ala Ala Leu Asn Arg His Glu His Thr Gly Glu
          50           55           60

```

```

Leu Glu Ala Phe Leu Arg Ile Ser Val Glu His Ala Asp Ala Ala Gly
65           70           75           80

```

```

Gly Asp Glu Cys Gly Pro Ala Ile Leu Ala Gly Arg Ser Gly Pro Glu
          85           90           95

```

Gln Ala Ala Ile Asn Arg Gln Leu Gly Leu Ala Gly Asp Asp Glu Pro
100 105 110

Asp Gly Asp Asp Thr Pro Pro Trp Ser Arg Met Ile Gly Leu Gly Gly
115 120 125

Gly Ser Pro Ala Glu Asp Glu Arg
130 135

 $\langle 210 \rangle$ 110

<211> 408

<212> DNA

<213> Mycobacterium tuberculosis

```
<400> 110
atgaccacca caccagcacg tttcaaccac ttggtgacgg taaccgacct ggaaacgggt 60
gaccgcgccg tctgcgaccg cgaccaggtg gccgagacga tccggggcgtg gttcccggac 120
gcgcccttgg aggtgagggg agcgctcggt cggctgcagg ccgcgttgaa tcggcacgag 180
cacaccggcg agctcgaagc gttcctgcgg atcagcgtcg agcacgccga cgccgccggc 240
ggcgacgagt gcggcccggc gatcctggcc ggccgctccg ggccggaaca agccgccatc 300
aacccggcaac tcggactcgc cggcgacgac gagcccgacg gcgacgacac cccgccgtgg 360
agccggatga tcgggcttgg cggcggaagc ccaqcggaag acgagcgc 408
```

<210> 111

<211> 170

<212> PRT

<213> Mycobacterium tuberculosis

<400> 111

Met Ala Glu Leu Arg Ser Gly Glu Gly Arg Thr Val His Gly Thr Ile
1 5 10 15

Val Pro Tyr Asn Glu Ala Thr Thr Val Arg Asp Phe Asp Gly Glu Phe
20 25 30

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Gln Glu Met Phe Ala Pro Gly Ala Phe Arg Arg Ser Ile Ala Glu Arg
 35 40 45

Gly His Lys Leu Lys Leu Leu Val Ser His Asp Ala Arg Thr Arg Tyr
 50 55 60

Pro Val Gly Arg Ala Val Glu Leu Arg Glu Glu Pro His Gly Leu Phe
 65 70 75 80

Gly Ala Phe Glu Ile Ala Asp Thr Pro Asp Gly Asp Glu Ala Leu Ala
 85 90 95

Asn Val Lys Ala Gly Val Val Asp Ser Phe Ser Val Gly Phe Arg Pro
 100 105 110

Ile Arg Asp Arg Arg Glu Gly Asp Val Leu Val Arg Val Glu Ala Ala
 115 120 125

Leu Leu Glu Val Ser Leu Thr Gly Val Pro Ala Tyr Ser Gly Ala Gln
 130 135 140

Ile Ala Gly Val Arg Ala Glu Ser Leu Thr Val Val Ser Arg Ser Thr
 145 150 155 160

Ala Glu Ala Trp Leu Ser Leu Leu Asp Trp
 165 170

<210> 112

<211> 510

<212> DNA

<213> Mycobacterium tuberculosis

<400> 112

atggccgagc tgcggtctgg cgaaggccga accgtgcacg gcaccatcgt gccctacaac	60
gaggcgacca ccgtccgcga cttegacggc gagttccagg aaatgttcgc tcctggcgct	120
tttcggcgct ccatcgccga gcgcggccac aaattgaagc tgctggtctc tcacgacgct	180
cgaaccgcgt acccggtggg ccgggccgtt gagttgcggg aggagcctca cggcttggtc	240
ggggcgttcg agattgcgga cccccggac ggcgacgagg ctttggcgaa cgtaaaagct	300
ggtgtcgtcg actcgttttc ggtgggtttc cgaccgatcc gggaccgtcg cgaaggggat	360

-136-

gtgctgggtgc gcgtcgaagc ggcgctgtta gaggtttccc taaccggcgt tccggcctat 420
 tcggggggcac aaatcgccgg ggtgcgcgcg gaatcgctta cagtcgtttc ccgttcgaca 480
 gccgaagcct ggctgtccct actcgattgg 510

<210> 113

<211> 115

<212> PRT

<213> Mycobacterium tuberculosis

<400> 113

Met Ile Arg Ala Val Trp Asn Gly Thr Val Leu Ala Glu Ala Pro Arg
 1 5 10 15

Thr Val Arg Val Glu Gly Asn His Tyr Phe Pro Pro Glu Ser Leu His
 20 25 30

Arg Glu His Leu Ile Glu Ser Pro Thr Thr Ser Ile Cys Pro Trp Lys
 35 40 45

Gly Leu Ala His Tyr Tyr Asn Val Val Val Asp Gly Pro Tyr Gly Pro
 50 55 60

Val Asn Pro Asp Ala Ala Trp Tyr Tyr Arg Arg Pro Ser Pro Leu Ala
 65 70 75 80

Arg Arg Ile Lys Asn His Val Ala Phe Trp His Gly Val Thr Val Glu
 85 90 95

Gly Glu Ser Glu Ser Arg His Gly Leu Ala Arg Arg Val Val Ala Trp
 100 105 110

Leu Gly Lys
 115

<210> 114

<211> 345

<212> DNA

<213> Mycobacterium tuberculosis

-137-

<400> 114
 atgattcgtg ctgtgtggaa tggaacagtg ctcgctgagg cgccgcgaac cgtacgggtg 60
 gaaggcaacc actactttcc gcccgagtcg ctgcaccgcg agcatctaata cgaaagcccg 120
 accacgtcga tatgcccattg gaagggctctg gccattact acaacgtcgt cgtggacggc 180
 ccctatggtc cggttaaccc ggacgctgcc tggactacc gccggcccag tccactggct 240
 cgccggatca aaaaccatgt tgcgttctgg cacggtgtga cggtcgaagg tgaatccgag 300
 agtcggcatg gcttggcgcg ccgggttgtg gcgtggctcg gcaaa 345

<210> 115

<211> 236

<212> PRT

<213> Mycobacterium tuberculosis

<400> 115

Val Gln Pro Tyr Gly Gln Tyr Cys Pro Val Ala Arg Ala Ala Glu Leu
 1 5 10 15

Leu Gly Asp Arg Trp Thr Leu Leu Ile Val Arg Glu Leu Leu Phe Gly
 20 25 30

Pro Leu Arg Phe Thr Glu Ile Glu Arg Gly Leu Pro Gly Ile Ser Arg
 35 40 45

Ser Val Leu Ala Gln Arg Leu Arg Arg Leu Gln His Asp Arg Ile Ile
 50 55 60

Glu Ala Val Pro Glu His Thr Gly Gly Gly Tyr Arg Phe Thr Val Ala
 65 70 75 80

Gly Glu Glu Leu Arg Pro Val Leu Gln Thr Leu Gly Asp Trp Val Ser
 85 90 95

Arg Trp Leu Met Ala Asp Pro Thr Pro Ala Glu Cys Asp Pro Glu Leu
 100 105 110

Leu Thr Leu Trp Ile Ser Arg Arg Val Asn Thr Glu Ala Leu Pro Gly
 115 120 125

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Arg Arg Val Val Val Glu Phe Arg Tyr His Gly Glu Arg Pro Leu Trp
 130 135 140

Ala Trp Leu Val Leu Glu Pro Gly Asp Ile Ser Val Cys Leu His Asp
 145 150 155 160

Pro Cys Leu Pro Val Asp Leu Thr Val Arg Gly His Pro Arg Asp Leu
 165 170 175

Tyr Arg Val Tyr Ser Gly Arg Ser Thr Leu Ala Ala Glu Ile Ser Ala
 180 185 190

Glu Arg Ile Glu Leu Asp Gly Leu Pro Ala Met Arg Arg Ala Phe Pro
 195 200 205

Ser Trp Met Ala Trp Ser Pro Phe Ala Pro Ala Met Arg Gln Ala Val
 210 215 220

Val Ser Val Asp Gln Met Pro Glu Ala His Gly Gly
 225 230 235

<210> 116

<211> 708

<212> DNA

<213> Mycobacterium tuberculosis

<400> 116
 gtgcagccgt acggccagta ctgcccggta ggcggggcgg cggagctgct gggggaccgc 60
 tggacgctgc taatcgtgcg ggagctgctc ttcggcccgc tgcggttcac cgaaatcgag 120
 cggggcctgc ccggcatctc ccgctcgggtg ctggcccagc ggctacgccg acttcagcac 180
 gaccgcatca tcgaagcggg ccccgaaacac acggggcgggg gctatcggtt cacgggtggcc 240
 ggcgaggagc tacgccccgt gctgcagacc ctgggggact ggggtctcccg ttggttgatg 300
 gccgaccca ctcccgccga atgcgacccc gaactactca cgttgtggat ctcccggcgc 360
 gtcaacaccg aggccttcc cggccggcgg gtggtggtgg agttccgcta ccacggcgag 420
 cggccactgt gggcctgggt cgtgttgga cctggggaca tctcgggtgtg cctgcacgat 480
 ccatgcctac ctgtcgacct cacggtgcgc ggccatcctc gagatctgta tcgggtctac 540

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agcggccgca gcacactggc cgccgagatc tccgccgagc gcatcgaact ggacggcctg 600
 ccggcgatgc ggcgcgcggt cccatcctgg atggcttgga gtcccttcgc cccagccatg 660
 cggcaagccg tgggtgtccgt agaccagatg ccggaggctc atgggtggg 708

<210> 117

<211> 517

<212> PRT

<213> Mycobacterium tuberculosis

<400> 117

Leu Cys Pro Pro Ile Ile Leu Ser Ser Ala Thr Pro Thr Gly Thr Arg
 1 5 10 15

Cys Gly Thr Arg His Gly Arg Ala Val Val Thr Glu Tyr Val Arg Ala
 20 25 30

Leu Asp Arg Leu Pro His Glu Ile Ala Thr Ala Val Val Glu Thr Val
 35 40 45

Asn Cys Ala Asp Pro Gly Ala Ala Phe Asp Glu Leu Asp Ala Lys Ile
 50 55 60

Asn Ala Gly Met Lys Ala Tyr Ala Ile Pro Gly Val Ala Val Ala Val
 65 70 75 80

Trp Ala Gly Gly Gln Glu Tyr Val Lys Gly Tyr Gly Val Thr Asn Val
 85 90 95

Asp His Pro Met Pro Val Asp Gly Asp Thr Val Phe Arg Ile Gly Ser
 100 105 110

Thr Thr Lys Thr Phe Thr Gly Thr Val Met Met Arg Leu Val Glu Arg
 115 120 125

Gly Lys Val Asp Leu Asp Ser Pro Val Arg Arg Tyr Ile Pro Asp Phe
 130 135 140

Ala Val Ala Asp Glu Ser Ala Ser Ala Thr Val Thr Val Arg Gln Leu
 145 150 155 160

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Leu Asn His Thr Ala Gly Trp Asp Gly Arg Asn Gly Gln Asp Phe Gly
 165 170 175

Arg Gly Asp Asp Ala Val Ala Leu Tyr Val Lys Ala Met Thr Arg Leu
 180 185 190

Pro Gln Leu Thr Pro Pro Gly Thr Ala Phe Ala Tyr Asn Asn Ser Gly
 195 200 205

Leu Val Val Ala Gly Arg Ile Ile Glu Leu Val Ala Gly Thr Thr Tyr
 210 215 220

Glu Ser Thr Val Gln Arg Leu Leu Leu Asp Pro Leu Gln Leu Ala His
 225 230 235 240

Thr Arg Tyr Phe Ser Asp Gln Ile Ile Gly Leu Asn Val Ala Ala Ser
 245 250 255

His Ser Val Val Asp Gly Lys Pro Ile Ala Val Thr Asp Phe Trp Thr
 260 265 270

Phe Pro Arg Ser Cys Asn Pro Thr Gly Gly Leu Met Ser Thr Ala Arg
 275 280 285

Asp Gln Leu Arg Tyr Ala Gln Phe His Leu Gly Asp Gly Arg Ala Pro
 290 295 300

Asn Gly Glu Gln Ile Leu Ser Arg Gln Ser Leu Lys Ala Met Arg Ser
 305 310 315 320

Asn Pro Gly Ala Gly Gly Thr Leu Trp Val Glu Leu Thr Gly Met Gly
 325 330 335

Val Thr Trp Met Leu Arg Pro Ser Ala Glu Asn Val Thr Ile Val Glu
 340 345 350

His Gly Gly Thr Trp Lys Gly Gln Arg Ser Gly Phe Val Met Val Pro
 355 360 365

Asp Arg Asn Phe Ala Met Thr Val Leu Thr Asn Ser Asp Gly Gly Phe
 370 375 380

His Met Ile Asn Asp Leu Phe Ala Ser Asp Trp Ala Leu Gln Arg Phe
 385 390 395 400

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Ala Gly Leu Ser Asn Leu Pro Ala Thr Pro Gln Arg Leu Gly Ala Val
 405 410 415

Asp Leu Ala Pro Tyr Glu Gly Arg Tyr Ile Ala Lys Gln Val Ala Gln
 420 425 430

Asn Gly Asp Leu Glu Thr Thr Val Ile Asp Phe Arg Ala Arg Asp Gly
 435 440 445

Gln Leu Ala Gly Ser Met Ser Thr Asp Asp Ala Asn Pro Asp Gly Gln
 450 455 460

Asn Ser Ala Asn Leu Gly Leu Ala Phe Tyr Arg Pro Asp Tyr Gly Leu
 465 470 475 480

Asp Leu Gly Pro Asp Asn Lys Pro Thr Gly Ser Arg Ser Asn Phe Val
 485 490 495

Arg Gly Pro Asp Gly Asn Ile Ala Trp Phe Cys Ser Gln His Gly Arg
 500 505 510

Leu Phe Arg Arg Gln
 515

<210> 118

<211> 1551

<212> DNA

<213> Mycobacterium tuberculosis

<400> 118
 ttgtgtccgc cgatcatctt gagttccgcg acgccgaccg gcacgcggtg cgggacgcgc 60
 catgggacgcg cggtcgtcac cgaatacgtg cgtgcgctag atcgactgcc gcaacgaaatc 120
 gccactgcag tggttgaaac tgtcaactgc gcagaccctg gtgcagcggt cgacgaactc 180
 gatgcaaaaa tcaacgcggg catgaaggcc tatgcgattc cgggacgctgc ggttgctgtc 240
 tgggacggcg ggcaagaata cgtcaaaggc tacgggggtca ccaatgtcga ccatccgatg 300
 cctgttgacg gcgacactgt cttcagaatc ggttcacca caaagacttt cacaggtacg 360
 gtgatgatgc ggctggtcga gcgaggcaag gtggacctgg attcacctgt gcgccgtac 420

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```

atccccgact tgcggttagc cgacgaatca gccagcgcta cggttaccgt tgcccaactg      480
ctcaaccata ccgcaggctg ggatggctgc aatgggcagg actttgggcg cggcgatgac      540
gcggtggcgc tctatgtcaa ggcgatgaca cgcctaccgc agctcacccc tccgggaacc      600
gcgttcgcgt acaacaattc aggtottgtg gttgcgggcc gcatcatcga gcttgctgcc      660
ggaacaacct acgaatctac ggttcagagg ctgttgcttg acccgctgca gcttgctcac      720
acgcgctact tttccgacca aataatcggc ctgaatgtgg ccgcacgcga tagcgtggtc      780
gacggcaaac cgattgccgt tactgacttt tggacattcc cgcgcagctg caaccccacc      840
ggtgggttga tgtccacagc gcgagatcag ctgcgttacg cacagttcca cctcggcgac      900
ggcagggcgc ctaacggtga gcagattctg agccgacaat cgctgaaggc aatgcgctct      960
aaccctgggg cgggcggaac actttgggtg gaactgaccg ggatgggcgt gacctggatg     1020
ctgcggccct ccgcggagaa tgtgaccatc gttgagcacg gcggcacctg gaaggggcag     1080
cgctctgggt tcgtcatggt gcccgatcga aacttcgcca tgaccgtgct cactaactct     1140
gatggcggat ttcatatgat caacgacctt ttcgcatccg actgggcatt gcagagattc     1200
gccgggctca gcaatcttcc ggccacgccg caacgccttg gtgccgtcga cctggcgccc     1260
tacgagggcc ggtacatcgc caagcaagtc gcccaaatg gcgacctcga gacaacggtc     1320
atcgacttcc gggccaggga cggccagctt gctggaagca tgagcaccga cgatgccaac     1380
ccggatggcc aaaacagcgc caatctgggc ctgccttct atcgggccga ctatgggctc     1440
gaccttggac ccgacaacaa gccaccggc agtcgctcca acttcgtgcg cgggccggac     1500
ggcaacatcg cctggttctg tagccagcac ggccgtctgt tccgacgcca a              1551

```

<210> 119

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 119

```

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
1           5           10           15

```

```

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
          20           25           30

```

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Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 120

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 120
 atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtcgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccgt 120
 ctacttggtg ttggctgcgc ggagacgggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac caccgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgctgcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 121

<211> 365

<212> PRT

<213> Mycobacterium tuberculosis

<400> 121

Met Ser Ser Thr Ala Thr Ser Gly Ala Ala Val Val Ser Pro Ala Glu
 1 5 10 15

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Arg Val Glu Val Leu Phe Glu Glu Leu Ala Glu Leu Ala Gly Gln Arg
 20 25 30

Asn Ala Ile Asp Gly Arg Ile Val Glu Ile Val Ala Glu Leu Asp Arg
 35 40 45

Asp Gly Leu Trp Gly Val Thr Gly Ala Arg Ser Val Ala Gly Leu Val
 50 55 60

Ala Trp Lys Met Gly Cys Ser Ser Gly Asn Ala His Thr Ile Ala Thr
 65 70 75 80

Val Ala Arg Arg Leu Pro Glu Phe Pro Arg Cys Ala Arg Gly Met Arg
 85 90 95

Glu Gly Arg Leu Ser Leu Asp Gln Val Gly Val Ile Ala Gly Arg Ala
 100 105 110

Gly Glu Gly Ser Asp Ala His Tyr Ala Gln Leu Ala Gly Val Ala Thr
 115 120 125

Val Asn Gln Leu Arg Thr Ala Leu Lys Leu Glu Pro Arg Pro Glu Pro
 130 135 140

Glu Pro Asp Phe Arg Pro Glu Pro Arg Pro Ser Ile Thr Arg Ser Ala
 145 150 155 160

Asp Glu Gln Phe Ser Cys Trp Arg Ile Lys Leu Pro His Val Glu Ala
 165 170 175

Ala Lys Phe Asp Ala Ala Leu Gln Ser His Leu Asp Ala Leu Ile Ala
 180 185 190

Glu Tyr Lys Arg Asp His Asp Asn Ser Asp Gly Val Ser Asp Gln Arg
 195 200 205

Pro Pro Leu Pro Gly Asn Val Glu Ala Phe Leu Arg Leu Val Glu Ala
 210 215 220

Gly Trp Asp Ala Glu Val Ala Arg Arg Pro His Gly Gln His Thr Thr
 225 230 235 240

Val Val Met His Leu Asp Val Gln Glu Arg Ala Ala Gly Leu His Leu

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	245		250		255
Gly Pro Leu Leu Ser Glu Ser Glu Arg Arg Tyr Leu Leu Cys Asp Ala					
	260		265		270
Thr Phe Glu Ala Trp Phe Glu Arg Asp Gly Gln Val Ile Gly Cys Gly					
	275		280		285
Arg Thr Thr Arg Gln Ile Asn Arg Arg Leu Arg Arg Ala Leu Glu His					
	290		295		300
Arg Asp Arg Thr Cys Val Val Pro Gly Cys Gly Ala Thr Arg Gly Leu					
	305		310		315 320
His Ala His His Ile Arg His Trp Gln Asp Gly Gly Ala Thr Glu Leu					
		325		330	335
Ala Asn Leu Val Leu Val Cys Pro Tyr His His Arg Ala His His Arg					
	340		345		350
Gly Leu Asn Arg Pro Gly Glu Ser Gly Asp Ser Leu Ile					
	355		360		365

<210> 122

<211> 1095

<212> DNA

<213> Mycobacterium tuberculosis

<400> 122

atgtcctcga ccgcgacgtc tggcgcagcg gtagtcagtc ctgccgagcg tgtggagggtg	60
ttgtttgagg agttggcgga gttggccggt cagcgcaatg cgattgatgg gcgcattgtg	120
gagatcgtgg ctgagctgga tcgcgacggg ttgtgggggtg tgacggggggc gcggtcggtg	180
gcgggggttg tggcctggaa gatgggctgc tcgtcaggca acgcccacac gatcgccacg	240
gtggcgcggc ggttgccgga gtttccgcgc tgcgcccggg gtatgcggga ggggcggttg	300
tcgttgatc aggttggggg gatcgcgggg cgggcgggtg agggttcgga tgcgcattat	360
gcgcagttgg ccggcggtgc cacggtgaat cagctgcgga ccgcgctcaa gttggaaccg	420
cgacccgaac ccgaaccgga ttttcggccg gaaccgcggc cctcgatcac caggagcgcc	480

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```

gatgagcagt tcagttgttg gcgaatcaag cttccgcacg tggaggcggc gaagttcgat      540
gcggcggttg agtctcatct ggatgcgttg atcgccgagt acaagcgtga tcacgacaac      600
agcgacgggtg tgtcggatca gcggcccccg ttgccgggca atgttgaggc gtttctgcgt      660
ctgggtgagg ccggctggga cgccgagggtg gctcgtcggc cacatgggca gcacaccacc      720
gtggtgatgc atctagacgt gcaggagcgt gccgctggcc tgcacctggg tccgctgctc      780
agcgagtccg aacgccgata tctgctctgt gatgccacct ttgaggcctg gtttgaacgt      840
gacgggcagg tcattggctg cggtcgaacg actcgtcaga tcaatcgtcg gttgcgtcgt      900
gcgcttgagc atcgcgaccg cacgtgtgtg gttcccggtt gtggggccac ccgggggttg      960
cacgcccacc acatccgaca ttggcaggac ggtggggcca ccgagctggc caacctggtg     1020
ctggtgtgcc cgtatcacca ccgggcacac catcggggcc tgaaccgcc cggtgagttc     1080
ggagactctc tgatec                                         1095

```

<210> 123

<211> 434

<212> PRT

<213> Mycobacterium tuberculosis

<400> 123

```

Val Arg Arg Ser Pro Lys Gly Ser Pro Gly Ala Val Leu Asp Leu Gln
1           5           10           15

```

```

Arg Arg Val Asp Gln Ala Val Ser Ala Asp His Ala Glu Leu Met Thr
          20           25           30

```

```

Ile Ala Lys Asp Ala Asn Thr Phe Phe Gly Ala Glu Ser Val Gln Asp
          35           40           45

```

```

Pro Tyr Pro Leu Tyr Glu Arg Met Arg Ala Ala Gly Ser Val His Arg
          50           55           60

```

```

Ile Ala Asn Ser Asp Phe Tyr Ala Val Cys Gly Trp Asp Ala Val Asn
65           70           75           80

```

```

Glu Ala Ile Gly Arg Pro Glu Asp Phe Ser Ser Asn Leu Thr Ala Thr
          85           90           95

```

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Met Thr Tyr Thr Ala Glu Gly Thr Ala Lys Pro Phe Glu Met Asp Pro
 100 105 110

Leu Gly Gly Pro Thr His Val Leu Ala Thr Ala Asp Asp Pro Ala His
 115 120 125

Ala Val His Arg Lys Leu Val Leu Arg His Leu Ala Ala Lys Arg Ile
 130 135 140

Arg Val Met Glu Gln Phe Thr Val Gln Ala Ala Asp Arg Leu Trp Val
 145 150 155 160

Asp Gly Met Gln Asp Gly Cys Ile Glu Trp Met Gly Ala Met Ala Asn
 165 170 175

Arg Leu Pro Met Met Val Val Ala Glu Leu Ile Gly Leu Pro Asp Pro
 180 185 190

Asp Ile Ala Gln Leu Val Lys Trp Gly Tyr Ala Ala Thr Gln Leu Leu
 195 200 205

Glu Gly Leu Val Glu Asn Asp Gln Leu Val Ala Ala Gly Val Ala Leu
 210 215 220

Met Glu Leu Ser Gly Tyr Ile Phe Glu Gln Phe Asp Arg Ala Ala Ala
 225 230 235 240

Asp Pro Arg Asp Asn Leu Leu Gly Glu Leu Ala Thr Ala Cys Ala Ser
 245 250 255

Gly Glu Leu Asp Thr Leu Thr Ala Gln Val Met Met Val Thr Leu Phe
 260 265 270

Ala Ala Gly Gly Glu Ser Thr Ala Ala Leu Leu Gly Ser Ala Val Trp
 275 280 285

Ile Leu Ala Thr Arg Pro Asp Ile Gln Gln Gln Val Arg Ala Asn Pro
 290 295 300

Glu Leu Leu Gly Ala Phe Ile Glu Glu Thr Leu Arg Tyr Glu Pro Pro
 305 310 315 320

Phe Arg Gly His Tyr Arg His Val Arg Asn Ala Thr Thr Leu Asp Gly
 325 330 335

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Thr Glu Leu Pro Ala Asp Ser His Leu Leu Leu Leu Trp Gly Ala Ala
 340 345 350

Asn Arg Asp Pro Ala Gln Phe Glu Ala Pro Gly Glu Phe Arg Leu Asp
 355 360 365

Arg Ala Gly Gly Lys Gly His Ile Ser Phe Gly Lys Gly Ala His Phe
 370 375 380

Cys Val Gly Ala Ala Leu Ala Arg Leu Glu Ala Arg Ile Val Leu Arg
 385 390 395 400

Leu Leu Leu Asp Arg Thr Ser Val Ile Glu Ala Ala Asp Val Gly Gly
 405 410 415

Trp Leu Pro Ser Ile Leu Val Arg Arg Ile Glu Arg Leu Glu Leu Ala
 420 425 430

Val Gln

<210> 124

<211> 1302

<212> DNA

<213> Mycobacterium tuberculosis

<400> 124

gtgagacgtt cgccgaaagg ctccccgggc gcagttctcg acttgcagcg acgcgttgac	60
caggcgggtat ccgccgatca cgctgaacta atgacaattg ccaaggatgc caacacgttc	120
tttggtgccg aatccgtgca ggacccctac ccgctgtatg agcgcatgcg cgccgcaggc	180
tcggtccacc ggatcgctaa ctcggaacttc tatgccgtgt gcggttggga cgctgtcaat	240
gaggccatcg gtcgtccgga ggacttctcc tcgaatttga ccgccacgat gacctatacg	300
gccgagggca ccgctaaacc gttcgagatg gaccactcg gcggaccac acacgtgttg	360
gccaccgccg acgatcctgc ccacgccgtg caccgcaagc tcgtgctgcg tcacttggcg	420
gccaagcgga tccgcgttat ggagcagttc accgtacagg ctgccgaccg gctgtgggtc	480
gacggcatgc aggatgggtg catcgaatgg atgggcgcca tggccaatcg cctaccgatg	540

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```

atgggtcgtag ctgagctcat cggcctgccc gaccccgaca tcgcccagct ggtgaagtgg      600
ggatacgcgg ccactcagct actcgaaggg ttggtcgaaa acgatcagct cgtcgccgcg      660
ggtgtggcgt tgatggagct cagcggttac atcttcgagc agtttgaccg tgccgcggcc      720
gatccgcggg acaatctgct cggtagagctt gccaccgcct gcgcatcggg ggagctggac      780
actctcaccg cccaggtcat gatggtcacc ttgttcgccg ccggcggcga gtccacggcg      840
gcgctgctgg gcagcgcggg atggatactg gcgacacgtc ccgatatcca gcaacagggtg      900
cgcgcaacc ccgagctgct gggagcggtt atcgaagaga cgctgcgtta cgagccgcca      960
tttcgcggcc actaccgcca cgtgcgaaac gccaccacct tggacggcac ggaactgccc     1020
gcggattcgc acctgctgct gttgtggggc gcggccaacc gcgatccagc ccagttcgag     1080
gcacccggcg agttccgtct tgaccgtgca ggaggcaaag gccacatcag tttcggaaaa     1140
ggggcccact tctgtgtcgg cgctgcactg gcacgcttgg aggctcgaat cgtcttgctg     1200
ctgctgctcg atcgcacctc ggtaattgag gcagccgatg tcggcgggtg gttgcccagt     1260
atcctgggtgc gccgcatcga gcggctagag ctagctgtac aa                        1302

```

<210> 125

<211> 99

<212> PRT

<213> Mycobacterium tuberculosis

<400> 125

```

Met Ala Phe Val Leu Val Cys Pro Asp Ala Leu Ala Ile Ala Ala Gly
1              5              10              15

```

```

Gln Leu Arg His Val Gly Ser Val Ile Ala Ala Arg Asn Ala Val Ala
20              25              30

```

```

Ala Pro Ala Thr Ala Glu Leu Ala Pro Ala Ala Ala Asp Glu Val Ser
35              40              45

```

```

Ala Leu Thr Ala Thr Gln Phe Asn Phe His Ala Ala Met Tyr Gln Ala
50              55              60

```

```

Val Gly Ala Gln Ala Ile Ala Met Asn Glu Ala Phe Val Ala Met Leu
65              70              75              80

```

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<210> 126

<211> 297

<212> DNA

<213> Mycobacterium tuberculosis

[illegible]

<210> 127

<211> 778

<212> PRT

<213> Mycobacterium tuberculosis

<400> 127

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Glu Pro Pro Gly Gly Ser Pro Gly Arg His Val Arg Pro Thr Leu Ala
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Gly Thr Ser Ile Gly Phe Ala Met His Asn Ala Asn Lys Arg Ser Ala
35 40 45

Val Leu Asn Pro Leu Asp Glu Ser Asp Arg Arg Arg Phe Leu Asp Leu
50 55 60

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Ala Ala Ser Ala Asp Ile Val Val Asp Cys Gly Leu Pro Gly Gln Ala
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Ala Ala Tyr Gly Ala Ser Cys Ala Glu Leu Ala Asp Arg Tyr Arg His
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Leu Val Ala Leu Ser Ile Thr Asp Phe Gly Ala Ala Gly Pro Arg Ser
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Ser Trp Arg Ala Thr Asp Pro Val Leu Tyr Ala Met Ser Gly Ala Leu
115 120 125

Ser Arg Ser Gly Pro Thr Ala Gly Thr Pro Val Leu Pro Pro Asp Gly
130 135 140

Ile Ala Ser Ala Thr Ala Ala Val Gln Ala Ala Trp Ala Val Leu Val
145 150 155 160

Ala Tyr Phe Asn Arg Leu Arg Cys Gly Thr Gly Asp Tyr Ile Asp Phe
165 170 175

Ser Arg Phe Asp Ala Val Val Met Ala Leu Asp Pro Pro Phe Gly Ala
180 185 190

His Gly Gln Val Ala Ala Gly Ile Arg Ser Thr Gly Arg Trp Arg Gly
195 200 205

Arg Pro Lys Asn Gln Asp Ala Tyr Pro Ile Tyr Pro Cys Arg Asp Gly
210 215 220

Tyr Val Arg Phe Cys Val Met Ala Pro Arg Gln Trp Arg Gly Leu Arg
225 230 235 240

Arg Trp Leu Gly Glu Pro Glu Asp Phe Gln Asp Pro Lys Tyr Asp Val
245 250 255

Ile Gly Ala Arg Leu Ala Ala Trp Pro Gln Ile Ser Val Leu Val Ala
260 265 270

Lys Leu Cys Ala Glu Lys Thr Met Lys Glu Leu Val Ala Ala Gly Gln
275 280 285

Ala Leu Gly Val Pro Ile Thr Ala Val Leu Thr Pro Ser Arg Ile Leu
290 295 300

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Ala Ser Glu His Phe Gln Ala Val Gly Ala Ile Thr Asp Ala Glu Leu
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Val Pro Gly Val Arg Thr Gly Val Pro Thr Gly Tyr Phe Val Val Asp
325 330 335

Gly Lys Arg Ala Gly Phe Arg Thr Pro Ala Pro Ala Ala Gly Gln Asp
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Glu Pro Arg Trp Leu Ala Asp Pro Ala Pro Val Pro Pro Pro Ser Gly
355 360 365

Arg Val Gly Gly Tyr Pro Phe Glu Gly Leu Arg Ile Leu Asp Leu Gly
370 375 380

Ile Ile Val Ala Gly Gly Glu Leu Ser Arg Leu Phe Gly Asp Leu Gly
385 390 395 400

Ala Glu Val Ile Lys Val Glu Ser Ala Asp His Pro Asp Gly Leu Arg
405 410 415

Gln Thr Arg Val Gly Asp Ala Met Ser Glu Ser Phe Ala Trp Thr His
420 425 430

Arg Asn His Leu Ala Leu Gly Leu Asp Leu Arg Asn Ser Glu Gly Lys
435 440 445

Ala Ile Phe Gly Arg Leu Val Ala Glu Ser Asp Ala Val Phe Ala Asn
450 455 460

Phe Lys Pro Gly Thr Leu Thr Ser Leu Gly Phe Ser Tyr Asp Val Leu
465 470 475 480

His Ala Phe Asn Pro Arg Ile Val Leu Ala Gly Ser Ser Ala Phe Gly
485 490 495

Asn Arg Gly Pro Trp Ser Thr Arg Met Gly Tyr Gly Pro Leu Val Arg
500 505 510

Ala Ala Thr Gly Val Thr Arg Val Trp Thr Ser Asp Glu Ala Gln Pro
515 520 525

Asp Asn Ser Arg His Pro Phe Tyr Asp Ala Thr Thr Ile Phe Pro Asp

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His Val Val Gly Arg Val Gly Ala Leu Leu Ala Leu Ala Ala Leu Ile		
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His Arg Asp Arg Thr Gly Gly Gly Ala His Val His Ile Ser Gln Ala		
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Glu Val Val Val Asn Gln Leu Asp Thr Met Phe Val Ala Glu Ala Ala		
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Arg Ala Thr Asp Val Ala Glu Ile His Pro Asp Thr Ser Val His Ala		
	595	600 605
Val Tyr Pro Cys Ala Gly Asp Asp Glu Trp Cys Val Ile Ser Ile Arg		
610	615	620
Ser Asp Asp Glu Trp Arg Arg Ala Thr Ser Val Phe Gly Gln Pro Glu		
625	630	635 640
Leu Ala Asn Asp Pro Arg Phe Gly Ala Ser Arg Ser Arg Val Ala Asn		
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Arg Ser Glu Leu Val Ala Ala Val Ser Ala Trp Thr Ser Thr Arg Thr		
	660	665 670
Pro Val Gln Ala Ala Gly Ala Leu Gln Ala Ala Gly Val Ala Ala Gly		
	675	680 685
Pro Met Asn Arg Pro Ser Asp Ile Leu Glu Asp Pro Gln Leu Ile Glu		
690	695	700
Arg Asn Leu Phe Arg Asp Met Val His Pro Leu Ile Ala Arg Pro Leu		
705	710	715 720
Pro Ala Glu Thr Gly Pro Ala Pro Phe Arg His Ile Pro Gln Ala Pro		
	725	730 735
Gln Arg Pro Ala Pro Leu Pro Gly Gln Asp Ser Val Gln Ile Cys Arg		
	740	745 750
Lys Leu Leu Gly Met Thr Ala Asp Glu Thr Glu Arg Leu Ile Asn Glu		
755	760	765

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Arg Val Met Phe Gly Pro Ala Val Thr Ala
770 775

<210> 128

<211> 2334

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 128

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gccgcgtacg gggcatcgtg tgccgagttg gccgatcgt accgacacct ggtggcgtg      300
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<211> 1459

<212> PRT

<213> Mycobacterium tuberculosis

<400> 129

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Gln Leu Ala Met Glu Leu Ala Ser Ala Ala Ala Ser Phe Asn Ser Val
 35 40 45

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Thr Ser Gly Leu Val Gly Glu Ser Trp Leu Gly Pro Ser Ser Ala Ala
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Met Ala Ala Ala Val Ala Pro Tyr Leu Gly Trp Leu Ala Ala Ala Ala
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Ala Gln Ala Gln Arg Ser Ala Thr Gln Ala Ala Ala Leu Val Ala Glu
 85 90 95

Phe Glu Ala Val Arg Ala Ala Met Val Gln Pro Ala Leu Val Ala Ala
 100 105 110

Asn Arg Ser Asp Leu Val Ser Leu Val Phe Ser Asn Phe Phe Gly Gln
 115 120 125

Asn Ala Pro Ala Ile Ala Ala Ile Glu Ala Ala Tyr Glu Gln Met Trp
 130 135 140

Ala Ile Asp Val Ser Val Met Ser Ala Tyr His Ala Gly Ala Ser Ala
 145 150 155 160

Val Ala Ser Ala Leu Thr Pro Phe Thr Ala Pro Pro Gln Asn Leu Thr
 165 170 175

Asp Leu Pro Ala Gln Leu Ala Ala Ala Pro Ala Ala Val Val Thr Ala
 180 185 190

Ala Ile Thr Ser Ser Lys Gly Val Leu Ala Asn Leu Ser Leu Gly Leu
 195 200 205

Ala Asn Ser Gly Phe Gly Gln Met Gly Ala Ala Asn Leu Gly Ile Leu
 210 215 220

Asn Leu Gly Ser Leu Asn Pro Gly Gly Asn Asn Phe Gly Leu Gly Asn
 225 230 235 240

Val Gly Ser Asn Asn Val Gly Leu Gly Asn Thr Gly Asn Gly Asn Ile
 245 250 255

Gly Phe Gly Asn Thr Gly Asn Gly Asn Ile Gly Phe Gly Leu Thr Gly
 260 265 270

Asp Asn Gln Gln Gly Phe Gly Gly Trp Asn Ser Gly Thr Gly Asn Ile
 275 280 285

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Thr Gly Asn Phe Gly Ile Gly Asn Ser Gly Thr Ser Tyr Asn Thr Gly
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Ile Gly Asn Thr Gly Gln Ala Asn Thr Gly Phe Phe Asn Ala Gly Ile
 325 330 335

Ala Asn Thr Gly Ile Gly Asn Thr Gly Asn Tyr Asn Thr Gly Ser Phe
 340 345 350

Asn Leu Gly Ser Phe Asn Thr Gly Asp Phe Asn Thr Gly Ser Ser Asn
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Thr Gly Phe Phe Asn Pro Gly Asn Leu Asn Thr Gly Val Gly Asn Thr
 370 375 380

Gly Asn Val Asn Thr Gly Gly Phe Asn Ser Gly Asn Tyr Ser Asn Gly
 385 390 395 400

Phe Phe Trp Arg Gly Asp Tyr Gln Gly Leu Ile Gly Phe Ser Gly Thr
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Leu Thr Ile Pro Ala Ala Gly Leu Asp Leu Asn Gly Leu Gly Ser Val
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Gly Pro Ile Thr Ile Pro Ser Ile Thr Ile Pro Glu Ile Gly Leu Gly
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Ile Asn Ser Ser Gly Ala Leu Val Gly Pro Ile Asn Val Pro Pro Ile
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Thr Val Pro Ala Ile Gly Leu Gly Ile Asn Ser Thr Gly Ala Leu Val
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 485 490 495

Leu Ser Ala Phe Gln Val Ile Asn Val Gly Ser Ile Ser Ile Pro Ala
 500 505 510

Ser Pro Leu Ala Ile Gly Leu Phe Gly Val Asn Pro Thr Val Gly Ser

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515	520	525
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545	550	555
Ser Gly Gln Ile Gly	Pro Ile Thr Phe Leu Ser	Gly Gly Tyr Ser Leu
565	570	575
Pro Ala Ile Pro Leu Gly	Ile Asp Val Gly Gly Gly	Leu Gly Pro Phe
580	585	590
Thr Val Phe Pro Asp Gly	Tyr Ser Leu Pro Ala Ile	Pro Leu Gly Ile
595	600	605
Asp Val Gly Gly Gly	Leu Gly Pro Phe Thr	Val Phe Pro Asp Gly Tyr
610	615	620
Ser Leu Pro Ala Ile	Pro Leu Gly Ile Asp	Val Gly Gly Gly Leu Gly
625	630	635
Pro Phe Thr Val Phe	Pro Asp Gly Tyr Ser	Leu Pro Ala Ile Pro Leu
645	650	655
Gly Ile Asp Val Gly	Gly Ala Ile Gly	Pro Leu Thr Thr Pro Pro Ile
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Thr Ile Pro Ser Ile	Pro Leu Gly Ile Asp	Val Ser Gly Ser Leu Gly
675	680	685
Pro Ile Asn Ile Pro	Ile Glu Ile Ala Gly	Thr Pro Gly Phe Gly Asn
690	695	700
Ser Thr Thr Thr	Pro Ser Ser Gly	Phe Phe Asn Ser Gly Thr Gly Gly
705	710	715
Thr Ser Gly Phe Gly	Asn Val Gly Ser Gly	Gly Ser Gly Phe Trp Asn
725	730	735
Ile Ala Gly Asn Leu	Gly Asn Ser Gly	Phe Leu Asn Val Gly Pro Leu
740	745	750

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Thr Ser Gly Ile Leu Asn Phe Gly Asn Thr Val Ser Gly Leu Tyr Asn
 755 760 765

Thr Ser Thr Leu Gly Leu Ala Thr Ser Ala Phe His Ser Gly Val Gly
 770 775 780

Asn Thr Asp Ser Gln Leu Ala Gly Phe Met Arg Asn Ala Ala Gly Gly
 785 790 795 800

Thr Leu Phe Asn Phe Gly Phe Ala Asn Asp Gly Thr Leu Asn Leu Gly
 805 810 815

Asn Ala Asn Leu Gly Asp Tyr Asn Val Gly Ser Gly Asn Val Gly Ser
 820 825 830

Tyr Asn Phe Gly Ser Gly Asn Ile Gly Asn Gly Ser Phe Gly Phe Gly
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Asn Ile Gly Ser Asn Asn Phe Gly Phe Gly Asn Val Gly Ser Asn Asn
 850 855 860

Leu Gly Phe Ala Asn Thr Gly Pro Gly Leu Thr Glu Ala Leu His Asn
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Ile Gly Phe Gly Asn Ile Gly Gly Asn Asn Tyr Gly Phe Ala Asn Ile
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Gly Ser Gly Asn Ile Gly Phe Phe Asn Ser Gly Asn Gly Asn Ile Gly
 930 935 940

Phe Phe Asn Ser Gly Asn Gly Asn Val Gly Ile Gly Asn Ser Gly Asn
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Tyr Asn Thr Gly Leu Gly Asn Val Gly Asn Ala Asn Thr Gly Leu Phe
 965 970 975

Asn Thr Gly Asn Val Asn Thr Gly Ile Gly Asn Ala Gly Ser Tyr Asn
 980 985 990

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Thr Gly Ser Tyr Asn Ala Gly Asp Thr Asn Thr Gly Asp Leu Asn Pro
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Gly Trp Gly Asn Ile Gly Asp Leu Asn Thr Gly Ala Leu Ile Ser
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Val Gly Pro Ile Val Val Pro Asp Ile Thr Ile Pro Gly Ile Pro
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Leu Ser Leu Asn Ala Leu Gly Gly Val Gly Pro Ile Val Val Pro
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Asp Ile Thr Ile Pro Gly Ile Pro Leu Ser Leu Asn Ala Leu Gly
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Gly Val Gly Pro Ile Val Val Pro Asp Ile Thr Ile Pro Gly Ile
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Ile Pro Leu Thr Ile Asn Ile Arg Ile Pro Val Asn Ile Thr Leu

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Gly Pro Ile Pro Leu Ser Thr Phe Val Leu Gly Val Thr Leu Ala		
1235	1240	1245
Gly Gly Thr Leu Glu Ser Gly Ile Gln Gly Phe Ser Val Asn Pro		
1250	1255	1260
Phe Gly Leu Asn Ile Pro Leu Ser Gly Ala Thr Asn Ala Val Thr		
1265	1270	1275
Ile Pro Gly Phe Ala Ile Asn Pro Phe Gly Leu Asn Val Pro Leu		
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Ser Gly Gly Thr Ser Pro Val Thr Ile Pro Gly Phe Ala Ile Asn		
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Pro Phe Gly Leu Asn Val Pro Leu Ser Gly Gly Thr Ser Pro Val		
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Ala Asn Gly Gly Leu Gly Pro Ile Asn Ile Pro Ile Asn Ile Thr		
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Asn Ile Gly Gln Met Leu Leu Gly Phe Phe Ser Pro Gly Ala Gly
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Pro

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<211> 4377

<212> DNA

<213> Mycobacterium tuberculosis

<400> 130

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atttcccgca tcccccttac gattaacatc aggataccgg tcaacatcac tctcaacgaa 3660
cttccgttta acgtcgtgg tatcttcacg ggctacatcg gccccatccc gcttagcaca 3720
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gttaatccgt tcggtttgaa tattccgctg agcggtgcta ccaacgctgt cagcatccct 3840
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acgatccctg gtttcgcgat taatccgttt ggggtgaatg ttccgttgag cgggggcacg 3960
agcccggtta cgatccccgg cttcaccatt cccggatccc ccctgaactt gaccgccaac 4020
ggcggccttg gaccgatcaa catcccgatc aacatcacga gcgccccggg cttcggaaac 4080
tccaccacca cccgctcttc gggcttcttc aacagtggcg atggaagcgc atccggcttc 4140
ggcaacgtcg ggcccggcat ttcgggcctc tggaaccagg tgccgaacgc gctgcaaggc 4200
ggagtctcgg gaatctacaa cgtcgggcag ctggcgtcgg gcgtggcgaa cctaggcaac 4260
acggtctcgg gcttcaacaa cagcagcacc gttggtcacc tcaccgctgc gtttaactcg 4320
ggcgtcaaca acatcggcca aatgctcctg ggcttcttct caccgggtgc cgggccg 4377

<210> 131

<211> 171

<212> PRT

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<213> Mycobacterium tuberculosis

<400> 131

Val Ser Cys Thr Phe Asp Met Val Pro Glu Thr Val Asp His Leu Asp
1 5 10 15

Glu Val Gly Leu Arg Arg Val Phe Gly Cys Phe Pro Cys Gly Val Ile
20 25 30

Ala Val Cys Ala Met Val Asp Asp Gln Pro Val Gly Met Ala Ala Ser
35 40 45

Ser Phe Thr Ser Val Ser Val Asp Pro Pro Leu Val Ser Ile Cys Val
50 55 60

Gln Asn Cys Ser Thr Thr Trp Pro Lys Leu Arg Asp Arg Pro Arg Leu
65 70 75 80

Gly Val Ser Val Leu Ala Glu Gly His Asp Ala Ala Cys Met Ser Leu
85 90 95

Ser Arg Lys Glu Gly Asn Arg Phe Ala Gly Val Phe Trp Ser Glu Leu
100 105 110

Ser Ser Gly Gly Val Val Ile Ala Gly Ala Gly Ala Trp Leu Asp Cys
115 120 125

Arg Pro Tyr Ala Glu Ile Pro Ala Gly Asp His Leu Ile Ala Leu Leu
130 135 140

Glu Ile Cys Ala Val Arg Ala Asp Pro Glu Thr Pro Pro Leu Val Phe
145 150 155 160

His Gly Ser Arg Phe Arg Arg Leu Glu Ser Arg
165 170

<210> 132

<211> 513

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 132
 gtgagctgca ccttcgacat ggtcccggag accgtcgatc atctcgacga ggtcgggctg 60
 cggcgggtct tcggtctgctt tccgtgcggc gtgatcgccg tctgcgcgat ggtcgacgac 120
 cagccggctc gcatggcggc cagctcgttc acgtcggttt cagttgaccc gccgctggta 180
 tcgatctgtg tgcagaactg ttcgacgacg tggccgaagt tgcgcgaccg cccacggctc 240
 ggtgtgagcg tgctcgccga ggggcacgac gcggcctgta tgagcctgtc gcgcaaggaa 300
 ggtaaccggt tcgccggggg gttctggagc gaattgtcca gcgggggtgt ggtgatcgcc 360
 ggggccggcg cctggctgga ttgccgccg tacgcggaga tcccggcggg ggatcacctg 420
 atgcacctgc tggagatctg cgcggtgcgc gccgatcccg agacaccgcc gctggtgttt 480
 cacggtagcc ggttccgccg gttggagtct cga 513

<210> 133

<211> 233

<212> PRT

<213> Mycobacterium tuberculosis

<400> 133

Ala Ala Gln Thr Thr Thr Leu Pro Asp Glu Pro Arg Asn Gly Val Thr
 1 5 10 15

Gly Gly Ile Asp Trp Ala Arg Asp Asp His Ala Ala Ser Ile Val Asp
 20 25 30

Ala Arg Gly Arg Glu Val Arg Arg Ala Thr Ile Glu His Asn Ala Ala
 35 40 45

Gly Leu Arg Glu Leu Leu Glu Leu Leu Ser Arg Ala Gly Ala Arg Glu
 50 55 60

Val Ala Ile Glu Arg Pro Asp Gly Pro Val Val Asp Thr Leu Leu Glu
 65 70 75 80

Ala Gly Ile Thr Val Val Val Ile Ser Pro Asn Gln Leu Lys Asn Leu
 85 90 95

Arg Gly Arg Tyr Gly Ser Ala Gly Asn Lys Asp Asp Arg Phe Asp Ala

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100	105	110
Phe Val Leu Ala Asp Thr Leu Arg Thr Asp Arg Ser Arg Leu Arg Pro		
115	120	125
Leu Leu Pro Asp Thr Pro Ala Thr Ala Thr Leu Arg Arg Thr Cys Arg		
130	135	140
Pro Arg Lys Asp Leu Val Ala His Arg Val Ala Leu Ala Asn Gln Leu		
145	150	155
Arg Ala His Leu Arg Val Val Phe Pro Gly Val Val Gly Leu Phe Ala		
165	170	175
Asp Leu Asp Ser Pro Ile Ser Leu Ala Phe Leu Thr Phe Leu Pro Arg		
180	185	190
Phe Asp Cys Gln Asp Arg Ala Asp Trp Leu Ser Val Lys Arg Leu Ala		
195	200	205
Gly Trp Leu Ala Ala Ala Gly Tyr Cys Gly Arg Ala Pro Arg Pro Ala		
210	215	220
His Arg Cys Pro Ala Arg Arg His Arg		
225	230	

<210> 134

<211> 699

<212> DNA

<213> Mycobacterium tuberculosis

<400> 134

gcggcccaaa ccactaccct gcccgacgag ccgcggaacg gcgtcacggg tggaatcgat	60
tgggcgcgag atgatcacgc ggcgtcgatc gtcgatgcgc gtgggcgcga ggttcgccgc	120
gccacgatcg agcacaacgc cgccggactg cgcgagctgc tcgagctgct gagccggggcc	180
ggtgcccgcg aggtcgccat cgaacgcccg gacggcccgg tcgtggatac cctgctcgag	240
gccgggatca cgggtggtgt gatcagcccc aaccagctga agaattctgcg cggtcgttac	300
ggctcggctg gcaacaagga cgaccggttc gacgcgttcg tgctcgccga cacgttgccg	360

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accgaccggt cccggctgcg ccccttgctg cccgacaccc cggccacggc caccctgcgc 420
 cggacctgcc gccccgcaa agacctcgtc gccacacggg ttgcgttggc caatcagctg 480
 cgcgcgaccc tgcgcgtcgt ctttcgggt gtggtcgggt tgttcgctga ccttgactcg 540
 ccgatcagcc tcgcgttttt gacgtttttg ccccgtttcg actgccagga ccgcgcggac 600
 tggctgtcgg tcaagcgctt ggccggctgg ctggccgcgg ctggctactg cggccgtgct 660
 ccacgaccgg ctcaccggtg ccccgcgagg cgccaccgg 699

<210> 135

<211> 573

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 135

Val Thr His Pro Asp Arg Ala Asn Val Asn Pro Gly Ser Pro Pro Leu
 1 5 10 15

Arg Glu Thr Leu Ser Gln Leu Arg Leu Arg Glu Leu Leu Leu Glu Val
 20 25 30

Gln Asp Arg Ile Glu Gln Ile Val Glu Gly Arg Asp Arg Leu Asp Gly
 35 40 45

Leu Ile Asp Ala Ile Leu Ala Ile Thr Ser Gly Leu Lys Leu Asp Ala
 50 55 60

Thr Leu Arg Ala Ile Val His Thr Ala Ala Glu Leu Val Asp Ala Arg
 65 70 75 80

Tyr Gly Ala Leu Gly Val Arg Gly Tyr Asp His Arg Leu Val Glu Phe
 85 90 95

Val Tyr Glu Gly Ile Asp Glu Glu Thr Arg His Leu Ile Gly Ser Leu
 100 105 110

Pro Glu Gly Arg Gly Val Leu Gly Ala Leu Ile Glu Glu Pro Lys Pro
 115 120 125

Ile Arg Leu Asp Asp Ile Ser Arg His Pro Ala Ser Val Gly Phe Pro

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130		135		140
Leu His His Pro Pro Met Arg Thr Phe Leu Gly Val Pro Val Arg Ile				
145		150		155 160
Arg Asp Glu Val Phe Gly Asn Leu Tyr Leu Thr Glu Lys Ala Asp Gly				
	165		170	175
Gln Pro Phe Ser Asp Asp Asp Glu Val Leu Val Gln Ala Leu Ala Ala				
	180		185	190
Ala Ala Gly Ile Ala Val Asp Asn Ala Arg Leu Phe Glu Glu Ser Arg				
	195	200		205
Thr Arg Glu Ala Trp Ile Glu Ala Thr Arg Asp Ile Gly Thr Gln Met				
	210	215		220
Leu Ala Gly Ala Asp Pro Ala Met Val Phe Arg Leu Ile Ala Glu Glu				
225		230		235 240
Ala Leu Thr Leu Met Ala Gly Ala Ala Thr Leu Val Ala Val Pro Leu				
	245		250	255
Asp Asp Glu Ala Pro Ala Cys Glu Val Asp Asp Leu Val Ile Val Glu				
	260		265	270
Val Ala Gly Glu Ile Ser Pro Ala Val Lys Gln Met Thr Val Ala Val				
	275		280	285
Ser Gly Thr Ser Ile Gly Gly Val Phe His Asp Arg Thr Pro Arg Arg				
	290	295		300
Phe Asp Arg Leu Asp Leu Ala Val Asp Gly Pro Val Glu Pro Gly Pro				
305		310		315 320
Ala Leu Val Leu Pro Leu Arg Ala Ala Asp Thr Val Ala Gly Val Leu				
	325		330	335
Val Ala Leu Arg Ser Ala Asp Glu Gln Pro Phe Ser Asp Lys Gln Leu				
	340		345	350
Asp Met Met Ala Ala Phe Ala Asp Gln Ala Ala Leu Ala Trp Arg Leu				
	355		360	365

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Ala Thr Ala Gln Arg Gln Met Arg Glu Val Glu Ile Leu Thr Asp Arg
370 375 380

Asp Arg Ile Ala Arg Asp Leu His Asp His Val Ile Gln Arg Leu Phe
385 390 395 400

Ala Val Gly Leu Thr Leu Gln Gly Ala Ala Pro Arg Ala Arg Val Pro
405 410 415

Ala Val Arg Glu Ser Ile Tyr Ser Ser Ile Asp Asp Leu Gln Glu Ile
420 425 430

Ile Gln Glu Ile Arg Ser Ala Ile Phe Asp Leu His Ala Gly Pro Ser
435 440 445

Arg Ala Thr Gly Leu Arg His Arg Leu Asp Lys Val Ile Asp Gln Leu
450 455 460

Ala Ile Pro Ala Leu His Thr Thr Val Gln Tyr Thr Gly Pro Leu Ser
465 470 475 480

Val Val Asp Thr Val Leu Ala Asn His Ala Glu Ala Val Leu Arg Glu
485 490 495

Ala Val Ser Asn Ala Val Arg His Ala Asn Ala Thr Ser Leu Ala Ile
500 505 510

Asn Val Ser Val Glu Asp Asp Val Arg Val Glu Val Val Asp Asp Gly
515 520 525

Val Gly Ile Ser Gly Asp Ile Thr Glu Ser Gly Leu Arg Asn Leu Arg
530 535 540

Gln Arg Ala Asp Asp Ala Gly Gly Glu Phe Thr Val Glu Asn Met Pro
545 550 555 560

Thr Gly Gly Thr Leu Leu Arg Trp Ser Ala Pro Leu Arg
565 570

<210> 136

<211> 1719

<212> DNA

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<213> Mycobacterium tuberculosis

<400> 136

gtgacacacc ctgacagggc gaacgttaac cctggcagcc cgccattgcg cgagacactg	60
tgcgagcttc ggttgcgaga gctgctgctg gaagtccaag accggattga acagatcgtc	120
gaaggccgcg accggctgga tggctctgatc gacgccatct tggcgatcac atcgggactc	180
aagctcgacg ccaccctgcg cgccattgtg cataccgccg ccgagttggg ggatgccccg	240
tacggggcgc tcggggtgcg cggttacgac catagattgg tcgaattcgt ctacgagggg	300
atcgacgaag agaccggca cctcatcggc tcattgccgg aggggcgagg tgttctcggc	360
gcgctgatcg aggagccaaa gccgatccgg ctggacgata tctcgcggca tcccgcacg	420
gttggaatttc cgctgcacca tccgccgatg cggaccttcc tcgggggttc agtgcgcatc	480
cgcgacgagg tgttcggcaa tctttacttg accgagaagg cagatggcca gccgttcagc	540
gatgacgacg aggtgctggg gcaggcgctg gccgccgcgg ccgggattgc cgttgacaat	600
gcccgctctt tcgaggaatc acggaccggg gaagcgtgga tcgaggcaac ccgcgacatc	660
ggaacgcaga tgctggccgg tgcggacccg gccatggtgt ttccggtcat cgccgaggaa	720
gcgttgacgt tgatggctgg ggcagccacc ttggtggcgg tgccgctcga cgacgaagcg	780
ccggttgcg aggtcgacga cctgggtcatc gtagaggtgg ccggagagat cccccggcg	840
gtcaagcaaa tgacggttgc cgtcagcgga acgtcgatcg ggggagtctt tcacgaccgt	900
acgccccgcc ggttcgaccg gcttgacctc gcggtcgacg gcccggtgga gcccgggccc	960
gccctggtgc tgccgctgcg tgccgccgac actgttgccg gtgtgctggg cgcacttcgc	1020
agtgccgatg aacagccgtt cagcgacaaa cagctcgata tgatggccgc cttcgctgac	1080
caggctgcgc tcgcctggcg gctggcgacc gcgcagcgac agatgcgaga agtggagatc	1140
ctgaccgatc gcgaccggat cgcacgtgat ctgcatgacc acgtcatcca gcggctcttc	1200
gcagtcgggc tcaccctgca gggtgccgct ccgcgagcac gtgtccccgc cgtccgggaa	1260
tccatctaca gcagcatcga cgatctccag gaaatcattc aggagattcg atctcgcatc	1320
ttcgacctac acgccggggc ctcccggggc acgggtctgc gccaccgact ggacaaggtc	1380
atcgaccaac tcgcgatccc cgcgctgcac accacggtcc agtacacggg cccgctgtcc	1440
gttgctgaca ccgtcctggc caaccacgcc gaagcggttc tgccggaggc ggtagcaac	1500
gctgtccggc acgcgaacgc gaccagcctg gccatcaacg tcagcgtcga ggatgatgtg	1560
cgggtcgagg tcgtcgacga cgggtgcggc atctccggcg acatcaccga aagcggcctg	1620

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cgcaatctcc gccagcgtgc cgacgacgcg ggcggcgaat tcacagtcca gaacatgccg 1680

accggaggca ccttgctgcg gtggtctgca ccgctgcgc 1719

<210> 137

<211> 217

<212> PRT

<213> Mycobacterium tuberculosis

<400> 137

Ala	Asn	His	Arg	Asn	Thr	Gln	Gly	Arg	Asn	Glu	Phe	Leu	Arg	Ala	Glu
1				5					10					15	

Val	Arg	Pro	Ala	Thr	Pro	Leu	Ile	Cys	Ala	Phe	Gly	Asp	Lys	His	Lys
			20					25					30		

His	Thr	Tyr	Gly	Val	Thr	Pro	Ile	Cys	Arg	Ala	Leu	Ala	Val	His	Gly
		35					40					45			

Val	Gln	Ile	Ala	Ser	Arg	Thr	Tyr	Phe	Ala	Asp	Arg	Ala	Ala	Ala	Pro
	50					55					60				

Ser	Lys	Arg	Ala	Leu	Trp	Asp	Thr	Thr	Ile	Thr	Glu	Ile	Leu	Ala	Gly
65					70					75					80

Tyr	Tyr	Glu	Pro	Asp	Ala	Glu	Gly	Lys	Arg	Pro	Pro	Glu	Cys	Leu	Tyr
				85					90					95	

Gly	Ser	Leu	Lys	Met	Trp	Ala	His	Leu	Gln	Arg	Gln	Gly	Phe	Arg	Trp
			100					105					110		

Pro	Ser	Ala	Thr	Val	Lys	Thr	Ile	Met	Arg	Ala	Asn	Gly	Trp	Arg	Gly
			115				120					125			

Val	Pro	Leu	Ala	Ala	His	Ile	Thr	His	His	Arg	Thr	Arg	Pro	Gly	Arg
		130				135					140				

Gly	Pro	Gly	Pro	Arg	Pro	Gly	Gly	Ser	Ala	Met	Ala	Gly	Phe	Ser	Asn
145					150					155					160

Glu	Pro	Ala	Gly	Ser	Gly	Arg	Leu	His	Leu	Arg	Ala	Asp	Asp	Val	Glu

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165

170

175

Phe Arg Leu His Arg Val Arg Gly Arg Arg Leu Arg Arg Cys Asp Arg
180 185 190

Gly Leu Gly Met Leu Ala Asp Gln Arg Arg Ser Val Arg Arg Thr Arg
195 200 205

Ile Thr Pro Arg Pro Ser Arg Leu Thr
210 215

<210> 138

<211> 651

<212> DNA

<213> Mycobacterium tuberculosis

<400> 138

gcaaaccatc gaaataactca aggtcgcaac gagtttcttc gcgcggaagt gcgacccgcg 60
acaccgctga tctgtgcgtt cggcgacaag cacaagcaca cctacgggggt cacaccgatc 120
tgtcgggcac tggccgtgca cggcgtgcag atcgccctcgc gcacctatctt cgcggtatcgc 180
gcggcagcgc cttcgaaacg cgcactgtgg gacaccacaa tcaccgaaat cctggccggc 240
tactacgaac ccgacgccga gggcaaacgc ccaccggaat gcctgtacgg cagcctgaag 300
atgtggggcgc acctgcagcg ccagggtctc cgggtggcct ctgccacggg gaagacgatc 360
atgcggggcca acggttggcg cggagtgcc ctcgcagcgc acatcacaca ccaccgaacc 420
agaccgggcc gcgggccagg ccctagacct ggcggttcgg caatggcggg ctttagcaac 480
gaacctgctg gaagcggccg acttcaccta cgcgccgatg acgtggagtt ccggctacac 540
cgcgttcgtg gtcgacgcct acgccgtgt gatcgcgggc tgggaatgct cgetgaccaa 600
agacgcagcg ttcgtcgaac gcgcattacg ccacggcctt ccagactcac c 651

<210> 139

<211> 121

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 139

Pro Lys Thr Gln Arg Ser Ser Asn Ala His Tyr Ala Thr Ala Phe Gln
 1 5 10 15

Thr His Leu Gly His Pro Phe Gly Gly Ala Ile His His Arg Asp Ala
 20 25 30

Gly Ser Gln Tyr Thr Ala Ile Tyr Phe Gly Lys Thr Pro Met Leu Ala
 35 40 45

Gly Leu Arg Pro Ser Ile Gly Ile Val Gly Asp Ala Leu Asp Asn Ala
 50 55 60

Leu Cys Glu Thr Thr Thr Gly Pro His Arg Thr Glu Cys Ser His Gly
 65 70 75 80

Ser Pro Phe Arg Ser Gly Pro Ile Arg Thr Leu Ala Asp Leu Glu Asp
 85 90 95

Ile Ala Ser Ala Trp Val Glu His Thr Cys His Thr Gln Gln Gly Val
 100 105 110

Arg Ile Pro Gly Arg Leu Gln Pro Ala
 115 120

<210> 140

<211> 363

<212> DNA

<213> Mycobacterium tuberculosis

<400> 140

ccaaagacgc agcggttcgtc gaacgcgcac tacgccacgg ccttccagac tcacctaggt 60
 caccggtttg ggggagctat tcatcatcgc gacgccggaa gtcagtatac tgcaatatat 120
 ttccggcaaga caccgatgct agccgggctg cggccgtcga taggcattgt tggcgacgcc 180
 ctogacaacg ccttatgtga aaccacgaca gggccccaca ggaccgaatg cagccacggc 240
 agcccgtttc gtagcggggc gatccgcacc ctggctgacc tggaagacat cgcctcggcg 300
 tgggtggagc acacctgtca cacacaacaa ggtgtgcgaa taccggggag gcttcaacct 360
 gcg 363

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<210> 141

<211> 375

<212> PRT

<213> Mycobacterium tuberculosis

<400> 141

Met Gly Ser Arg Arg Phe Asp Ala Glu Val Tyr Ala Arg Arg Leu Ala
 1 5 10 15

Leu Ala Ala Ala Ala Thr Ala Asp Ala Gly Leu Ala Gly Leu Val Ile
 20 25 30

Thr Pro Gly Tyr Asp Leu Cys Tyr Leu Ile Gly Ser Arg Ala Glu Thr
 35 40 45

Phe Glu Arg Leu Thr Ala Leu Val Leu Pro Ala Ala Gly Ala Pro Ala
 50 55 60

Val Val Leu Pro Arg Leu Glu Leu Ala Ala Leu Lys Gln Ser Ala Ala
 65 70 75 80

Ala Glu Leu Gly Leu Arg Val Cys Asp Trp Val Asp Gly Asp Asp Pro
 85 90 95

Tyr Gly Leu Val Ser Ala Val Leu Gly Gly Ala Pro Val Ala Thr Ala
 100 105 110

Val Thr Asp Ser Met Pro Ala Leu His Met Leu Pro Leu Ala Asp Ala
 115 120 125

Leu Gly Val Leu Pro Val Leu Ala Thr Asp Val Leu Arg Arg Leu Arg
 130 135 140

Met Val Lys Glu Glu Thr Glu Ile Asp Ala Leu Arg Lys Ala Gly Ala
 145 150 155 160

Ala Ile Asp Arg Val His Ala Arg Val Pro Glu Phe Leu Val Pro Gly
 165 170 175

Arg Thr Glu Ala Asp Val Ala Ala Asp Ile Ala Glu Ala Ile Val Ala

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180	185	190
Glu Gly His Ser Glu Val Ala Phe Val Ile Val Gly Ser Gly Pro His		
195	200	205
Gly Ala Asp Pro His His Gly Tyr Ser Asp Arg Glu Leu Arg Glu Gly		
210	215	220
Asp Ile Val Val Val Asp Ile Gly Gly Thr Tyr Gly Pro Gly Tyr His		
225	230	235
Ser Asp Ser Thr Arg Thr Tyr Ser Ile Gly Glu Pro Asp Ser Asp Val		
245	250	255
Ala Gln Ser Tyr Ser Met Leu Gln Arg Ala Gln Arg Ala Ala Phe Glu		
260	265	270
Ala Ile Arg Pro Gly Val Thr Ala Glu Gln Val Asp Ala Ala Ala Arg		
275	280	285
Asp Val Leu Ala Glu Ala Gly Leu Ala Glu Tyr Phe Val His Arg Thr		
290	295	300
Gly His Gly Ile Gly Leu Cys Val His Glu Glu Pro Tyr Ile Val Ala		
305	310	315
Gly Asn Asp Leu Val Leu Val Pro Gly Met Ala Phe Ser Ile Glu Pro		
325	330	335
Gly Ile Tyr Phe Pro Gly Arg Trp Gly Ala Arg Ile Glu Asp Ile Val		
340	345	350
Ile Val Thr Glu Asp Gly Ala Val Ser Val Asn Asn Cys Pro His Glu		
355	360	365
Leu Ile Val Val Pro Val Ser		
370	375	

<210> 142

<211> 1125

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 142
 atgggttctc gccgattcga cgccgaggtt tatgcacggc ggctggcttt agcggcggcc 60
 gcgacggcgg acgccggtct ggccgggtctg gtgataactc ccggctacga cctgtgttac 120
 ctcatcgggt cgcgagcgga gacgttcgag cggctcaccg cgttggtggt gccggccgcc 180
 ggtgcgccgg cggttggtgt gccgcggctg gagctcgccg ccctcaagca atccgccgca 240
 gcggaattgg gtctgcgcgt gtgcgattgg gtgcacggtg acgacccta cgggttggtg 300
 agtgccgtgt tgggcggagc tccggtagcg accgcggtca ccgattccat gccggcggtg 360
 cacatgttgc cgctggccga cgcactgggt gtgctgccgg tattggccac cgacgtgctg 420
 cgcaggctgc ggatgggtcaa ggaggaaacc gagatcgacg cgctgcgtaa ggccggcgcg 480
 gcgatcgatc gagtgcgtgc ccgagtgcg gagtttctgg tcccgggccg aacggaagcc 540
 gacgtagccg ccgacatcgc cgaagcaatt gtgcgcgaag ggcatcggga ggtagcgttc 600
 gtcacgtggt gttccggggc gcacggcgcc gaccgcgcatc acggatatc ggaccgcgaa 660
 ttgcgggagg gtgacatcgt tgtcgtcgac atcggcgcca cgtatgggcc tggataccac 720
 tccgactcca ccgaacctc cagcatcgcc gagcctgatt ctgatgtagc gcagtcatat 780
 tcgatgttgc agcgagccca gcgggcggcg ttcgaggcca tccgccagg ggtgacagcg 840
 gagcaggtgg acgccgcgc gcgtgacgtg ctgcgcgagg cggggtcgc ggagtatttt 900
 gtgcaccgca ccgggcacgg catcgggctg tgcgtgcacg aggagcccta tatcgtcgcc 960
 ggcaatgacc tgggtgttgg tcccggcatg gcgttttcca tcgagccggg aatctatttc 1020
 ccgggcgggt ggggcgccc catcgaggac atcgtgatcg tgaccgagga cggtgctgtg 1080
 tctgtcaaca actgcccgcg cgagttgatc gtggtgccgg tgtcc 1125

<210> 143

<211> 244

<212> PRT

<213> Mycobacterium tuberculosis

<400> 143

Met Ser Gly Pro Gln Gly Ser Asp Pro Arg Gln Pro Trp Gln Pro Pro
 1 5 10 15

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Gly Gln Gly Ala Asp His Ser Ser Asp Pro Thr Val Ala Ala Gly Tyr
 20 25 30

Pro Trp Gln Gln Gln Pro Thr Gln Glu Ala Thr Trp Gln Ala Pro Ala
 35 40 45

Tyr Thr Pro Gln Tyr Gln Gln Pro Ala Asp Pro Ala Tyr Pro Gln Gln
 50 55 60

Tyr Pro Gln Pro Thr Pro Gly Tyr Ala Gln Pro Glu Gln Phe Gly Ala
 65 70 75 80

Gln Pro Thr Gln Leu Gly Val Pro Gly Gln Tyr Gly Gln Tyr Gln Gln
 85 90 95

Pro Gly Gln Tyr Gly Gln Pro Gly Gln Tyr Gly Gln Pro Gly Gln Tyr
 100 105 110

Ala Pro Pro Gly Gln Tyr Pro Gly Gln Tyr Gly Pro Tyr Gly Gln Ser
 115 120 125

Gly Gln Gly Ser Lys Arg Ser Val Ala Val Ile Gly Gly Val Ile Ala
 130 135 140

Val Met Ala Val Leu Phe Ile Gly Ala Val Leu Ile Leu Gly Phe Trp
 145 150 155 160

Ala Pro Gly Phe Phe Val Thr Thr Lys Leu Asp Val Ile Lys Ala Gln
 165 170 175

Ala Gly Val Gln Gln Val Leu Thr Asp Glu Thr Thr Gly Tyr Gly Ala
 180 185 190

Lys Asn Val Lys Asp Val Lys Cys Asn Asn Gly Ser Asp Pro Thr Val
 195 200 205

Lys Lys Gly Ala Thr Phe Glu Cys Thr Val Ser Ile Asp Gly Thr Ser
 210 215 220

Lys Arg Val Thr Val Thr Phe Gln Asp Asn Lys Gly Thr Tyr Glu Val
 225 230 235 240

Gly Arg Pro Gln

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<210> 144

<211> 732

<212> DNA

<213> Mycobacterium tuberculosis

<400> 144

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gaccattcct cggaccccac cgtggccgcg ggatatccct ggagcagca gccgaccag      120
gaggcgacgt ggcaggcccc ggcgtacaca ccgcagtacc aacagccggc tgaccggcg      180
taccgcgagc agtaccgcga gccacacccc ggctatgcgc agcccgaaca gttcggtgca      240
cagccccccc agctcggcgt gcccggtcag tacggccaat accagcagcc gggccaatat      300
ggccagccgg gacagtacgg ccagcccggc cagtacgcac cgcccggtca gtaccccggg      360
caatacggcc cgtatggcca gtcgggtcag gggtcgaagc gttcggttgc ggtgatcggc      420
ggcgtgatcg ccgtgatggc cgtgctgttc atcggcgcgg ttctaatact cggcttctgg      480
gcacccggat tcttcgtcac caccaagctg gacgtcatta aggcgcaggc cgggtgtgcag      540
caggttctca ccgatgagac caccgggtac ggcgccaaga acgtcaaaga cgtcaagtgc      600
aacaacggtt cagaccccac ggtcaaaaag ggcgccacct tcgaatgcac ggtgagcatc      660
gacggcacct caaagcgcgt gaccgtgacc ttccaggaca acaagggcac ctacgaggtc      720
ggccggccac ag                                         732

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<210> 145

<211> 308

<212> PRT

<213> Mycobacterium tuberculosis

<400> 145

```

Val Arg Ala Ala Gly Leu Leu Lys Arg Leu Asn Pro Arg Asn Arg Arg
1           5           10           15

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Ser Arg Val Asn Pro Asp Ala Thr Met Ser Leu Val Asp His Leu Thr
          20           25           30

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Glu Leu Arg Thr Arg Leu Leu Ile Ser Leu Ala Ala Ile Leu Val Thr
 35 40 45

Thr Ile Phe Gly Phe Val Trp Tyr Ser His Ser Ile Phe Gly Leu Asp
 50 55 60

Ser Leu Gly Glu Trp Leu Arg His Pro Tyr Cys Ala Leu Pro Gln Ser
 65 70 75 80

Ala Arg Ala Asp Ile Ser Ala Asp Gly Glu Cys Arg Leu Leu Ala Thr
 85 90 95

Ala Pro Phe Asp Gln Phe Met Leu Arg Leu Lys Val Gly Met Ala Ala
 100 105 110

Gly Ile Val Leu Ala Cys Pro Val Trp Phe Tyr Gln Leu Trp Ala Phe
 115 120 125

Ile Thr Pro Gly Leu Tyr Gln Arg Glu Arg Arg Phe Ala Val Ala Phe
 130 135 140

Val Ile Pro Ala Ala Val Leu Phe Val Ala Gly Ala Val Leu Ala Tyr
 145 150 155 160

Leu Val Leu Ser Lys Ala Leu Gly Phe Leu Leu Thr Val Gly Ser Asp
 165 170 175

Val Gln Val Thr Ala Leu Ser Gly Asp Arg Tyr Phe Gly Phe Leu Leu
 180 185 190

Asn Leu Leu Val Val Phe Gly Val Ser Phe Glu Phe Pro Leu Leu Ile
 195 200 205

Val Met Leu Asn Leu Ala Gly Leu Leu Thr Tyr Glu Arg Leu Lys Ser
 210 215 220

Trp Arg Arg Gly Leu Ile Phe Ala Met Phe Val Phe Ala Ala Ile Phe
 225 230 235 240

Thr Pro Gly Ser Asp Pro Phe Ser Met Thr Ala Leu Gly Ala Ala Leu
 245 250 255

Thr Val Leu Leu Glu Leu Ala Ile Gln Ile Ala Arg Val His Asp Lys
 260 265 270

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Arg Lys Ala Lys Arg Glu Ala Ala Ile Pro Asp Asp Glu Ala Ser Val
 275 280 285

Ile Asp Pro Pro Ser Pro Val Pro Ala Pro Ser Val Ile Gly Ser His
 290 295 300

Asp Asp Val Thr
 305

<210> 146

<211> 924

<212> DNA

<213> Mycobacterium tuberculosis

<400> 146

```

gtgcgcgccg ccggtcttct caaacggctc aaccacgta acaggcgag ccggtcaat      60
cctgacgcga cgatgtcgct ggtcgaccac ctgaccgagt tacgcaccag gttgctgac      120
tccctggccg cgatcttggg caccacaatc ttccgggttcg tctggtattc gcattcgatt      180
ttcgggttgg acagcctcgg agagtggctg cggcatccct actgtgccct gccgcagtcg      240
gcccgggcgg atatcagcgc cgacggagag tgccgtttgt tggccaccgc gccgttcgac      300
cagttcatgt tgcggctcaa ggtcgggatg gccgccggca ttgtgctggc ttgcccggtg      360
tggttctacc agctgtgggc gttcatcacg cctggtctct accagagggg gcgccgcttc      420
gcggtggcct tcgtgatccc agcagcgggt ctgttcgctg ccggtgccgt actggcctac      480
ctggtgttgt ccaaggcggt gggctttttg ttgaccgtcg gcagcgacgt gcaggtgacc      540
gcgctgtctg gcgaccgcta ctttggcttt ctgctcaacc tgctgggtgg gttcggggtc      600
agcttcgaat tccccctgct gatcgtgatg ctgaacctgg cgggcctgct gacctatgag      660
cggtccaagt cttggcgggc cgggttgatc tttgcgatgt tcgtcttcgc ggcgatcttc      720
acgcccggat ccgatccgtt ctgatgacc gcgctcgggt cggcgttgac cgtgctgcta      780
gagctcgcca ttcagatcgc ccgcgtgcat gacaagcgaa aagccaagcg cgaagccgcg      840
attcccgacg acgaagcttc ggtcatcgac ccgccctcgc cggtgccggc gccatcggtc      900
atcggatctc atgacgacgt caccg                                     924

```

<210> 147

-182-

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 147

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
 20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 148

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 148

atgtcagggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccgt 120
 ctacttggtg ttggctgctg gcgagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggccccgggac cagcaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300

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gccgagctcg accggccagc acgc

324

<210> 149

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 149

Met	Ser	Gly	Gly	Ser	Ser	Arg	Arg	Tyr	Pro	Pro	Glu	Leu	Arg	Glu	Arg
1				5					10					15	

Ala	Val	Arg	Met	Val	Ala	Glu	Ile	Arg	Gly	Gln	His	Asp	Ser	Glu	Trp
			20					25					30		

Ala	Ala	Ile	Ser	Glu	Val	Ala	Arg	Leu	Leu	Gly	Val	Gly	Cys	Ala	Glu
		35					40					45			

Thr	Val	Arg	Lys	Trp	Val	Arg	Gln	Ala	Gln	Val	Asp	Ala	Gly	Ala	Arg
	50					55					60				

Pro	Gly	Thr	Thr	Thr	Glu	Glu	Ser	Ala	Glu	Leu	Lys	Arg	Leu	Arg	Arg
65					70					75				80	

Asp	Asn	Ala	Glu	Leu	Arg	Arg	Ala	Asn	Ala	Ile	Leu	Lys	Thr	Ala	Ser
				85				90						95	

Ala	Phe	Phe	Ala	Ala	Glu	Leu	Asp	Arg	Pro	Ala	Arg
			100					105			

<210> 150

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 150

atgtcagggtg	gttcatcgag	gaggtacccg	ccggagctgc	gtgagcgggc	ggtcgcgatg	60

gtcgcagaga	tccgcggtca	gcacgattcg	gagtgggcag	cgatcagtga	ggtcgccccgt	120

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ctacttggtg ttggctgcgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
gccggcgcac ggcccgggac cacgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
gccgagctcg accggccagc acgc 324

<210> 151

<211> 414

<212> PRT

<213> Mycobacterium tuberculosis

<400> 151

Val Asn Asp Asn Gln Leu Ala Pro Val Ala Arg Pro Arg Ser Pro Leu
1 5 10 15

Glu Leu Leu Asp Thr Val Pro Asp Ser Leu Leu Arg Arg Leu Lys Gln
20 25 30

Tyr Ser Gly Arg Leu Ala Thr Glu Ala Val Ser Ala Met Gln Glu Arg
35 40 45

Leu Pro Phe Phe Ala Asp Leu Glu Ala Ser Gln Arg Ala Ser Val Ala
50 55 60

Leu Val Val Gln Thr Ala Val Val Asn Phe Val Glu Trp Met His Asp
65 70 75 80

Pro His Ser Asp Val Gly Tyr Thr Ala Gln Ala Phe Glu Leu Val Pro
85 90 95

Gln Asp Leu Thr Arg Arg Ile Ala Leu Arg Gln Thr Val Asp Met Val
100 105 110

Arg Val Thr Met Glu Phe Phe Glu Glu Val Val Pro Leu Leu Ala Arg
115 120 125

Ser Glu Glu Gln Leu Thr Ala Leu Thr Val Gly Ile Leu Lys Tyr Ser
130 135 140

Arg Asp Leu Ala Phe Thr Ala Ala Thr Ala Tyr Ala Asp Ala Ala Glu

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145		150		155		160
Ala Arg Gly Thr Trp Asp Ser Arg Met Glu Ala Ser Val Val Asp Ala						
		165		170		175
Val Val Arg Gly Asp Thr Gly Pro Glu Leu Leu Ser Arg Ala Ala Ala						
		180		185		190
Leu Asn Trp Asp Thr Thr Ala Pro Ala Thr Val Leu Val Gly Thr Pro						
		195		200		205
Ala Pro Gly Pro Asn Gly Ser Asn Ser Asp Gly Asp Ser Glu Arg Ala						
		210		215		220
Ser Gln Asp Val Arg Asp Thr Ala Ala Arg His Gly Arg Ala Ala Leu						
		225		230		235
Thr Asp Val His Gly Thr Trp Leu Val Ala Ile Val Ser Gly Gln Leu						
		245		250		255
Ser Pro Thr Glu Lys Phe Leu Lys Asp Leu Leu Ala Ala Phe Ala Asp						
		260		265		270
Ala Pro Val Val Ile Gly Pro Thr Ala Pro Met Leu Thr Ala Ala His						
		275		280		285
Arg Ser Ala Ser Glu Ala Ile Ser Gly Met Asn Ala Val Ala Gly Trp						
		290		295		300
Arg Gly Ala Pro Arg Pro Val Leu Ala Arg Glu Leu Leu Pro Glu Arg						
		305		310		315
Ala Leu Met Gly Asp Ala Ser Ala Ile Val Ala Leu His Thr Asp Val						
		325		330		335
Met Arg Pro Leu Ala Asp Ala Gly Pro Thr Leu Ile Glu Thr Leu Asp						
		340		345		350
Ala Tyr Leu Asp Cys Gly Gly Ala Ile Glu Ala Cys Ala Arg Lys Leu						
		355		360		365
Phe Val His Pro Asn Thr Val Arg Tyr Arg Leu Lys Arg Ile Thr Asp						
		370		375		380

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Phe Thr Gly Arg Asp Pro Thr Gln Pro Arg Asp Ala Tyr Val Leu Arg
 385 390 395 400

Val Ala Ala Thr Val Gly Gln Leu Asn Tyr Pro Thr Pro His
 405 410

<210> 152

<211> 1242

<212> DNA

<213> Mycobacterium tuberculosis

<400> 152

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gtgaacgaca atcagttggc tccagttgcc cgcccgaggt cgccgctcga actgctggac      60
actgtgcccc attcgtgct gcggcggttg aagcagtact cgggccggct ggccaccgag      120
gcagtttcgg ccatgcaaga acggttgccg ttcttcgccg acctagaagc gtcccagcgc      180
gccagcgtgg cgctgggtgg gcagacggcc gtggtcaact tcgtcgaatg gatgcacgac      240
ccgcacagtg acgtcggcta taccgcgcag gcattcgagc tggtgcccca ggatctgacg      300
cgacgggatcg cgctgcgcca gaccgtggac atggtgcggg tcaccatgga gttcttcgaa      360
gaagtcgtgc ccctgctcgc ccgttcgaa gagcagttga ccgccctcac ggtgggcatt      420
ttgaaataca gccgcgacct ggcattcacc gccgccacgg cctacgccga tgcggccgag      480
gcacgaggca cctgggacag ccgatggag gccagcgtgg tggacgcggt ggtacgcggc      540
gacaccggtc ccgagctgct gtcccgggcg gccgcgctga attgggacac caccgcgccg      600
gcgaccgtac tgggtgggaac tccggcgccc ggtccaaatg gtcacaacag cgacggcgac      660
agcgagcggg ccagccagga tgtccgcgac accgcggctc gccacggccg cgctgcgctg      720
accgacgtgc acggcacctg gctgggtggcg atcgtctccg gccagctgtc gccaaccgag      780
aagttcctca aagacctgct ggcagcattc gccgacgcc cggtgggtcat cggccccacg      840
gcgcccattg tgaccgcggc gcaccgcagc gctagcgagg cgatctccgg gatgaacgcc      900
gtcgccggct ggcgcggagc gccgcggccc gtgctggcta gggaactttt gccgaacgc      960
gccctgatgg gcgacgcctc ggcgatcgtg gccctgcata ccgacgtgat gcggccccta     1020
gccgatgccg gaccgacgct catcgagacg ctagacgcat atctggattg tggcggcgcg     1080
attgaagctt gtgccagaaa gttgttcgtt catccaaaca cagtgcggta ccggctcaag     1140
cggatcaccg acttcaccgg gcgcgatccc acccagccac gcgatgccta tgtccttcgg     1200

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-187-

gtggcggcca ccgtgggtca actcaactat ccgacgccgc ac

1242

<210> 153

<211> 312

<212> PRT

<213> Mycobacterium tuberculosis

<400> 153

Met	Pro	Leu	Ser	Ser	Arg	Met	Pro	Gly	Leu	Thr	Cys	Phe	Glu	Ile	Phe
1				5					10					15	

Leu	Ala	Ile	Ala	Glu	Ala	Gly	Ser	Leu	Gly	Gly	Ala	Ala	Arg	Glu	Leu
			20					25					30		

Gly	Leu	Thr	Gln	Gln	Ala	Val	Ser	Arg	Arg	Leu	Ala	Ser	Met	Glu	Ala
		35						40				45			

Gln	Ile	Gly	Val	Arg	Leu	Ala	Ile	Arg	Thr	Thr	Arg	Gly	Ser	Gln	Leu
	50					55					60				

Thr	Pro	Ala	Gly	Ile	Val	Val	Ala	Glu	Trp	Ala	Ala	Arg	Leu	Leu	Glu
65					70					75					80

Val	Ala	Asp	Glu	Ile	Asp	Ala	Gly	Leu	Gly	Ser	Leu	Arg	Thr	Glu	Gly
				85					90					95	

Arg	Gln	Arg	Ile	Arg	Val	Val	Ala	Ser	Gln	Thr	Ile	Ala	Glu	Gln	Leu
			100						105				110		

Met	Pro	His	Trp	Met	Leu	Ser	Leu	Arg	Ala	Ala	Asp	Met	Arg	Arg	Gly
		115					120					125			

Gly	Thr	Val	Pro	Glu	Val	Ile	Leu	Thr	Ala	Thr	Asn	Ser	Glu	His	Ala
	130					135					140				

Ile	Ala	Ala	Val	Arg	Asp	Gly	Ile	Ala	Asp	Leu	Gly	Phe	Ile	Glu	Asn
145					150					155				160	

Pro	Cys	Pro	Pro	Thr	Gly	Leu	Gly	Ser	Val	Val	Val	Ala	Arg	Asp	Glu
				165					170					175	

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Leu Val Val Val Val Pro Pro Gly His Lys Trp Ala Arg Arg Ser Arg
 180 185 190

Val Val Ser Ala Arg Glu Leu Ala Gln Thr Pro Leu Val Thr Arg Glu
 195 200 205

Pro Asn Ser Gly Ile Arg Asp Ser Leu Thr Ala Ala Leu Arg Asp Thr
 210 215 220

Leu Gly Glu Asp Met Gln Gln Ala Pro Pro Val Leu Glu Leu Ser Ser
 225 230 235 240

Ala Ala Ala Val Arg Ala Ala Val Leu Ala Gly Ala Gly Pro Ala Ala
 245 250 255

Met Ser Arg Leu Ala Ile Ala Asp Asp Leu Ala Phe Gly Arg Leu Leu
 260 265 270

Ala Val Asp Ile Pro Ala Leu Asn Leu Arg Arg Gln Leu Arg Ala Ile
 275 280 285

Trp Val Gly Gly Arg Thr Pro Pro Ala Gly Ala Ile Arg Asp Leu Leu
 290 295 300

Ser His Ile Thr Ser Arg Ser Thr
 305 310

<210> 154

<211> 936

<212> DNA

<213> Mycobacterium tuberculosis

<400> 154

atgccgctca gctctcgat gcccgactc acctgcttcg aaatctttct ggccatcgct	60
gaggccggca gtcttggcgg cgccgcacgc gaactcgggt tgactcaaca agctgtgtca	120
aggcggctcg catcgatgga ggcccagatc ggggtgcat tggccatccg gacgacacgt	180
ggctcccaac tcacgcctgc cggcatcgtc gtcgccgaat gggcggcccg cttgctcgaa	240
gtcgccgacg agatcgatgc cggcctcggc tcgctgcgca ccgaaggccg ccagcgcac	300
agagtgggtg ccagccagac gatagccgaa cagctgatgc cgcattggat gctgtccttg	360

-189-

cgggccgccg acatgcgccg cgggtggtact gtccttgagg taatcctgac cgccaccaat 420
 agcgagcatg cgatcgagc cgttcgtgac ggcatcgag atcttggatt catcgaaaac 480
 ccctgtcctc ccacgggatt aggcagcgtt gtggttgac gcgacgaact ggtcgtcgtc 540
 gtgccgccgg gtcacaagtg ggcccgcgag tcacgagtag tgagcgcccg ggagctcgtc 600
 cagacgcctt tgggtgactcg cgaaccgaac tctggcatcc gcgattcact caccgcggcg 660
 ttacgtgaca cgctcgggga ggacatgcag caagcgccac cggtgctgga attatcatcg 720
 gctgcggccg tgcggggccg ggtcttggcc ggcgctggac cggctgcgat gagccggcta 780
 gcgatatccg atgacctggc gttcggtcga ttactcgcgg tcgacatccc cgcgttgaac 840
 ctgcggcgcc agcttcgagc catctgggtc ggtgggcgca ccccgccggc gggtgcgata 900
 cgagacctgc tcagccacat cacttcccg agcacg 936

<210> 155

<211> 74

<212> PRT

<213> Mycobacterium tuberculosis

<400> 155

Val Asn Pro Gly Phe Asp Ala Val Asp Gln Glu Thr Ala Ala Ala Gln
 1 5 10 15

Ala Val Ala Asp Ala His Gly Val Pro Phe Leu Gly Ile Arg Gly Met
 20 25 30

Ser Asp Gly Pro Gly Asp Pro Leu His Leu Pro Gly Phe Pro Val Gln
 35 40 45

Phe Phe Val Tyr Lys Gln Ile Ala Ala Asn Asn Ala Ala Arg Val Thr
 50 55 60

Glu Ala Phe Leu Gln Asn Trp Ala Gly Val
 65 70

<210> 156

<211> 222

<212> DNA

-190-

<213> Mycobacterium tuberculosis

<400> 156

```

gtgaacccccg gcttcgacgc ggttgaccag gagacggcag ccgcgcaggc ggtcgccgat      60
gcacacggcg tcccgttcct gggaattcgc ggtatgtccg acgggcccgg cgacccgctg      120
catctgccgg gcttccccgt ccagttcttc gtttacaagc agattgcggc caacaacgcc      180
gcccgggtca ccgaagcctt cctgcagaac tgggccggcg tc                          222

```

<210> 157

<211> 114

<212> PRT

<213> Mycobacterium tuberculosis

<400> 157

```

Val Val Ala Ala Leu His Ala Gly Lys Ala Val Thr Ile Ala Pro Gln
1              5              10              15

Ser Met Thr Leu Thr Thr Gln Gln Ala Ala Asp Leu Leu Gly Val Ser
          20              25              30

Arg Pro Thr Val Val Arg Leu Ile Lys Ser Gly Glu Leu Ala Ala Glu
          35              40              45

Arg Ile Gly Asn Arg His Arg Leu Val Leu Asp Asp Val Leu Ala Tyr
          50              55              60

Arg Glu Ala Arg Arg Gln Arg Gln Tyr Asp Ala Leu Ala Glu Ser Ala
65              70              75              80

Met Asp Ile Asp Ala Asp Glu Asp Pro Glu Val Ile Cys Glu Gln Leu
          85              90              95

Arg Glu Ala Arg Arg Val Val Ala Ala Arg Arg Arg Thr Glu Arg Arg
          100              105              110

Arg Ala

```

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<210> 158

<211> 342

<212> DNA

<213> Mycobacterium tuberculosis

<400> 158

```

gtggtggctg cgctgcacgc cggcaaggcg gtgaccatcg cgccgcagag catgacgctg      60
accacccagc aggccgccga ccttctcggg gtgagtcgtc cgaccgtggt gcgtctgata      120
aagagcggcg agctggccgc cgagcgcata gggaatcgcc accggctcgt gctcgacgac      180
gtgttggcct accgggaggg ccgccggcag cgccagtacg acgcgcttgc cgagagcgca      240
atggacatcg acgccgacga ggatcccag gtgatttgcg agcagttgcg tgaggcgcgg      300
cgtgttgcg ccgcgcgcc tagaactgag cggcggcgcg cc                          342

```

<210> 159

<211> 221

<212> PRT

<213> Mycobacterium tuberculosis

<400> 159

```

Met Thr Asn Leu Ala Asp Ala Thr Gln Ala Thr Met Ala Leu Val Glu
1          5          10          15

Arg His Ala Ala His Asn Tyr Ser Pro Leu Pro Val Val Ala Ala Ser
          20          25          30

Ala Glu Gly Ala Trp Ile Ala Asp Ile Asp Gly Leu Arg Tyr Leu Asp
          35          40          45

Trp Leu Ala Ala Tyr Ser Ala Val Asn Leu Gly His Arg Asn Pro Ala
          50          55          60

Ser Thr Ala Thr Ala His Ala Gln Val Asp Thr Val Thr Leu Leu Asn
65          70          75          80

Arg Ala Leu His Ala Asp Arg Leu Gly Pro Leu Gly Ala Ala Leu Ala
          85          90          95

```

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Gln Leu Cys Gly Lys Asp Val Val Leu Pro Met Asn Ser Asp Ala Glu
 100 105 110

Ala Val Glu Ser Gly Leu Arg Val Ala Arg Lys Trp Gly Ala Asp Val
 115 120 125

Asn Gly Leu Pro Ala Gly Arg His Asp Ile Ile Leu Ala Asn Asn Asn
 130 135 140

Phe His Gly His Thr Ser Ser Val Val Ser Phe Ser Ser Asp Pro Ala
 145 150 155 160

Ala Gly Ser Gly Val Glu Pro Ser Thr Pro Gly Leu Arg Ser Val Pro
 165 170 175

Phe Gly Asp Ala Ala Ala Pro Ala Gln Thr Ile Asp Asp Asn Thr Val
 180 185 190

Ala Asp Leu Leu Glu Pro Ile Pro Gly Gln Ala Gly Ile Ile Val Pro
 195 200 205

Ala Asp Asp Tyr Leu Pro Ala Ala Ser Ser Thr Thr Cys
 210 215 220

<210> 160

<211> 663

<212> DNA

<213> Mycobacterium tuberculosis

<400> 160

atgacaaatc tcgcggatgc cactcaggcc actatggcac tggtcgaaag gcatgcagcg	60
cacaattatt cgccgctgcc tgtggtggcg gccagcgctg aggggtgcgtg gatcgccgat	120
atcgacggcc tgcgctacct ggactggctg gctgcgctact cggcgggtcaa ccttggccat	180
cgcaaccccc cgagcaccgc cacggctcat gcccaagtcg acaccgtcac cctgctgaat	240
cgggccttgc atgccgaccg actcggggccg ttggggcgccg cgcttgccca gctgtgcggc	300
aaagacgtgg tgttgccaat gaactctgat gctgaagcgg tggagagcgg tcttagggtc	360
gcccgcgaagt ggggagccga cgtcaacggc ctccccgcgg gccggcacga tatcattttg	420

-193-

gcaaacaaca actttcatgg ccacaccagc agtggtcgta gcttctcgtc ggaccgggt 480
 gcgggcagcg gcgtcgaacc ttctaccccg ggactccgct cggtagcggt tggcgatgct 540
 gcggcaccgg cgcagacaat cgacgacaac accgtcgctg acctgctega gccgattccc 600
 ggccaggcgg gcatcatcgt cccggccgac gactacctgc cggtgcgctc gagcacaacg 660
 tgc 663

<210> 161

<211> 302

<212> PRT

<213> Mycobacterium tuberculosis

<400> 161

Met Glu Asn Thr Gln Arg Pro Ser Phe Asp Cys Glu Ile Arg Ala Lys
 1 5 10 15

Tyr Arg Trp Phe Met Thr Asp Ser Tyr Val Ala Ala Ala Arg Leu Gly
 20 25 30

Ser Pro Ala Arg Arg Thr Pro Arg Thr Arg Arg Tyr Ala Met Thr Pro
 35 40 45

Pro Ala Phe Phe Ala Val Ala Tyr Ala Ile Asn Pro Trp Met Asp Val
 50 55 60

Thr Ala Pro Val Asp Val Gln Val Ala Gln Ala Gln Trp Glu His Leu
 65 70 75 80

His Gln Thr Tyr Leu Arg Leu Gly His Ser Val Asp Leu Ile Glu Pro
 85 90 95

Ile Ser Gly Leu Pro Asp Met Val Tyr Thr Ala Asn Gly Gly Phe Ile
 100 105 110

Ala His Asp Ile Ala Val Val Ala Arg Phe Arg Phe Pro Glu Arg Ala
 115 120 125

Gly Glu Ser Arg Ala Tyr Ala Ser Trp Met Ser Ser Val Gly Tyr Arg
 130 135 140

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Pro Val Thr Thr Arg His Val Asn Glu Gly Gln Gly Asp Leu Leu Met
 145 150 155 160

Val Gly Glu Arg Val Leu Ala Gly Tyr Gly Phe Arg Thr Asp Gln Arg
 165 170 175

Ala His Ala Glu Ile Ala Ala Val Leu Gly Leu Pro Val Val Ser Leu
 180 185 190

Glu Leu Val Asp Pro Arg Phe Tyr His Leu Asp Thr Ala Leu Ala Val
 195 200 205

Leu Asp Asp His Thr Ile Ala Tyr Tyr Pro Pro Ala Phe Ser Thr Ala
 210 215 220

Ala Gln Glu Gln Leu Ser Ala Leu Phe Pro Asp Ala Ile Val Val Gly
 225 230 235 240

Ser Ala Asp Ala Phe Val Phe Gly Leu Asn Ala Val Ser Asp Gly Leu
 245 250 255

Asn Val Val Leu Pro Val Ala Ala Met Gly Phe Ala Ala Gln Leu Arg
 260 265 270

Ala Ala Gly Phe Glu Pro Val Gly Val Asp Leu Ser Glu Leu Leu Lys
 275 280 285

Gly Gly Gly Ser Val Lys Cys Cys Thr Leu Glu Ile His Pro
 290 295 300

<210> 162

<211> 906

<212> DNA

<213> Mycobacterium tuberculosis

<400> 162

atggaaaata cgcaacgacc atcgtttgat tgtgaaatca gagccaaata tcgttggttt 60

atgacggatt cctacgtcgc tgctgcccgt ctaggggtcac ctgcacgccg cccccccgg 120

acgcggcggt atgcaatgac cccgccggcc ttctttgccg tcgcatacgc gatcaacccc 180

tggatggacg tcaccgcgcc agtcgacgtc caagtcgcgc aagcacagtg ggagcacctc 240

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caccagacct atcttcggct aggccacagc gtggatctga tcgagcccat ttccgggtta      300
ccggacatgg tgtacaccgc caacgggtggg ttcatcgcgc acgacatcgc cgtggtcgcc      360
cggttccgggt tccccgaacg agctgggtgag tctagagcct atgccagctg gatgtcctcg      420
gtcggatata gcccggtgac caccgcccac gtcaacgagg gacagggcga cctgctgatg      480
gttggcgaaa ggggtgttggc gggctacggc ttctgcacag accagcgcgc acacgccgaa      540
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cacctggaca ccgcgctggc cgtgctcgac gaccacacga tcgcctacta cccgccggcg      660
ttcagtacgg cagcgcagga acagttgtcg gcgctgttcc ccgacgcgat tgtggtcggc      720
agtgccgacg cgttcgtgtt cggactcaac gccgtctctg acggtctgaa cgtagtgttt      780
ccggtcgcgg ccatgggttt tgcggcgag ttacgcgag ccggcttcga gccggtcggt      840
gtcgatctgt ccgagctgct caagggcggc ggttccgtca agtgctgcac gctggagata      900
caccca                                           906

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<210> 163

<211> 652

<212> PRT

<213> Mycobacterium tuberculosis

<400> 163

```

Met Val Glu Ser Gly Thr Gly Ile Pro Leu Pro Ala Ser Cys Trp Ser
1              5              10              15

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Arg Thr Arg Ser Arg Arg Cys Met Pro Lys Asp Ser Ser Pro His Trp
                20              25              30

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```

Ile Trp His Ser Ser Ala Ala Arg Ala Ala Leu Tyr Val Arg Gly Lys
        35              40              45

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Arg Arg Pro Asp Gly Gln Gly Arg Arg Ser Cys Ala Leu Arg Asn Arg
        50              55              60

```

```

Gly Arg Thr Pro Ala Thr Gly Pro Gly Pro Gly Gln Ser Pro Ser Pro
65              70              75              80

```

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Val Gly Ala Arg Gln Pro Ala Leu Pro Ser Arg Arg Pro Leu Asn Pro

```

95

Asp Pro Phe Tyr Leu Gly Asn Arg His Ala Arg Arg Arg Gly Arg Glu
305 310 315 320

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Tyr Asp Glu Phe Val Ser Arg Tyr Ile Glu Thr Ala Gln Arg Leu Phe
 325 330 335

Pro Arg Ala Ile Leu His Phe Glu Asp Phe Gly Pro Ala Asn Ala Arg
 340 345 350

Lys Ile Leu Asp Thr Tyr Gly Thr Asp Tyr Cys Val Phe Asn Asp Asp
 355 360 365

Met Gln Gly Thr Gly Ala Val Val Leu Ala Ala Val Tyr Ser Gly Leu
 370 375 380

Lys Val Thr Gly Ile Pro Leu Arg Asp Gln Thr Ile Val Val Phe Gly
 385 390 395 400

Ala Gly Thr Ala Gly Met Gly Ile Ala Asp Gln Ile Arg Asp Ala Met
 405 410 415

Val Ala Asp Gly Ala Thr Leu Glu Gln Ala Val Ser Gln Ile Trp Pro
 420 425 430

Ile Asp Arg Pro Gly Leu Leu Phe Asp Asp Met Asp Asp Leu Arg Asp
 435 440 445

Phe Gln Val Pro Tyr Ala Lys Asn Arg His Gln Leu Gly Val Ala Val
 450 455 460

Gly Asp Arg Val Gly Leu Ser Asp Ala Ile Lys Ile Ala Ser Pro Thr
 465 470 475 480

Ile Leu Leu Gly Cys Ser Thr Val Tyr Gly Ala Phe Thr Lys Glu Val
 485 490 495

Val Glu Ala Met Thr Ala Ser Cys Lys His Pro Met Ile Phe Pro Leu
 500 505 510

Ser Asn Pro Thr Ser Arg Met Glu Ala Ile Pro Ala Asp Val Leu Ala
 515 520 525

Trp Ser Asn Gly Arg Ala Leu Leu Ala Thr Gly Ser Pro Val Ala Pro
 530 535 540

Val Glu Phe Asp Glu Thr Thr Tyr Val Ile Gly Gln Ala Asn Asn Val
 545 550 555 560

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Leu Ala Phe Pro Gly Ile Gly Leu Gly Val Ile Val Ala Gly Ala Arg
 565 570 575

Leu Ile Thr Arg Arg Met Leu His Ala Ala Lys Ala Ile Ala His
 580 585 590

Gln Ala Asn Pro Thr Asn Pro Gly Asp Ser Leu Leu Pro Asp Val Gln
 595 600 605

Asn Leu Arg Ala Ile Ser Thr Thr Val Ala Glu Ala Val Tyr Arg Ala
 610 615 620

Ala Val Gln Asp Gly Val Ala Ser Arg Thr His Asp Asp Val Arg Gln
 625 630 635 640

Ala Ile Val Asp Thr Met Trp Leu Pro Ala Tyr Asp
 645 650

<210> 164

<211> 1956

<212> DNA

<213> Mycobacterium tuberculosis

<400> 164

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gcagcgctgt acgttcgctg caaacgccga cccgatggcc aagggcgctg atcgtgcgct	180
ctgcgaaatc gtggccgaac gccggcaact ggacctggac ctggccaaag cccaagtccg	240
gtcggcgctc gccaaaccagc gttaccatcg cgacgtccat taaaccagc acggtcacga	300
acggaggttg tgatgagcga cggccgctg ccacggatcc cggccgctt gtccgcacca	360
agtctcaacc gtggagtcgg cttcaccac gcgcagcggc ggcggctggg gctgaccggc	420
cggcttcctg cggccgtgct cagctcgac caacaggccg aacgcgtatg gcatcagttg	480
cagagcttgg ccaccgagct gggccgcaac ctgcttctcg aacagctgca ctaccgccac	540
gaggtgctgt acttcaaggt gctggccgac catttgccc aactgatgcc ggtggtgtac	600
acgcccaccg ttggcgaggc aatccaacgc ttctccgacg aataccgcgg gcaacgcgga	660

-199-

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ctgttttctga gcatcgacga acccgacgaa atcgaggaag ccttcaacac gttggggctg      720
gggcccgagg acgtcgacct gatcgtgtgc accgatgccg aggcgatcct gggatatcgt      780
gactgggggtg tgggtggcat ccagatcgct gtgggcaaat tggccctcta caccgcgggc      840
ggcggcgctg atccgcgcgc ctgcctcgcg gtgtctctgg atgtcggcac cgacaatgag      900
cagctgctgg ccgatccgtt ctatctgggc aatcgccacg cccggcggcg cggtcgggaa      960
tacgacgagt tcgtcagtcg ctatatcgaa acggctcaac ggttatttcc gcgtgccatt     1020
ctgcatttcg aggacttcgg gccggcgaac gcgcggaaga tcctagacac atacggcacg     1080
gattactgcg tgttcaacga tgacatgcaa ggaaccggcg cggtggtctt ggccgccgta     1140
tacagcggtc tgaaggttac cggtatcccg ctgcgcgatc agacaatagt cgtcttcggc     1200
gcaggcaccg cagggatggg gatcgccgat cagatccggg acgcgatggt ggcagacggt     1260
gccacgctcg agcaggcggg gtcccagatc tggccgatcg acaggccggg cctgttgttc     1320
gacgacatgg atgacctgcg cgacttccaa gtgccgtacg cgaaaaaccg ccaccagctc     1380
gggtgtggccg tcggggatcg ggtcgggctg agcgacgcga tcaagatcgc atcgcccact     1440
atcctgctcg gctgctcaac ggtctacgga gcgttcacca aagagggtgg cgaggcgatg     1500
acggcgctct gcaaacaccc gatgatcttt ccgctgtcca acccgacgtc gcgcatggaa     1560
gccatccccg ccgacgtgct ggcgtggtcg aatggcaggg cgctgcttgc caccggcagc     1620
ccagtcgccc cagtggaatt cgacgaaacc acctacgtca tcggtcaggc caacaacgtg     1680
ttggcgtttc ccggcatcgg actgggcgtc attgtcgctg gtgcccgggt gataaccagg     1740
cgcatgctgc atgcagcagc gaaggccatt gcgcaccagg ccaatccgac aaatcccgga     1800
gactcgctgt tgccgatgt ccaaaatctg cgggccatct cgacaacggg cgccgaagct     1860
gtctatcggg ccgccgtcca agacgggggtg gttccagga cgcacgacga cgtcaggcag     1920
gccatagtcg acaccatgtg gctcccggca tatgac                                1956

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<210> 165

<211> 356

<212> PRT

<213> Mycobacterium tuberculosis

<400> 165

Met Leu Ser Leu Thr Leu Ser Glu Ala Ser Cys Ile Ala Ser Ala Ser

-200-

1	5	10	15
Arg Trp Arg His Ile Ile Pro Ala Gly Val Val Cys Ala Leu Ile Ala	20	25	30
Gly Ile Gly Val Gly Cys His Gly Gly Pro Ser Asp Val Val Gly Arg	35	40	45
Ala Gly Pro Asp Arg Ala His Thr Ser Ile Thr Leu Val Ala Tyr Ala	50	55	60
Val Pro Glu Pro Gly Trp Ser Ala Val Ile Pro Ala Phe Asn Ala Ser	65	70	75
Glu Gln Gly Arg Gly Val Gln Val Ile Thr Ser Tyr Gly Ala Ser Ala	85	90	95
Asp Gln Ser Arg Gly Val Ala Asp Gly Lys Pro Ala Asp Leu Val Asn	100	105	110
Phe Ser Val Glu Pro Asp Ile Ala Arg Leu Val Lys Ala Gly Lys Val	115	120	125
Asp Lys Asp Trp Asp Ala Asp Ala Thr Lys Gly Ile Pro Phe Gly Ser	130	135	140
Val Val Thr Phe Val Val Arg Ala Gly Asn Pro Lys Asn Ile Arg Asp	145	150	155
Trp Asp Asp Leu Leu Arg Pro Gly Ile Glu Val Ile Thr Pro Ser Pro	165	170	175
Leu Ser Ser Gly Ser Ala Lys Trp Asn Leu Leu Ala Pro Tyr Ala Ala	180	185	190
Lys Ser Asp Gly Gly Arg Asn Asn Gln Ala Gly Ile Asp Phe Val Asn	195	200	205
Thr Leu Val Asn Glu His Val Lys Leu Arg Pro Gly Ser Gly Arg Glu	210	215	220
Ala Thr Asp Val Phe Val Gln Gly Ser Gly Asp Val Leu Ile Ser Tyr	225	230	235
			240

Glu Asn Glu Ala Ile Ala Thr Glu Arg Ala Gly Lys Pro Val Gln His
245 250 255

Val Thr Pro Pro Gln Thr Phe Lys Ile Glu Asn Pro Leu Ala Val Val
260 265 270

Ala Thr Ser Thr His Leu Gly Ala Ala Thr Ala Phe Arg Asn Phe Gln
275 280 285

Tyr Thr Val Gln Ala Gln Lys Leu Trp Ala Gln Ala Gly Phe Arg Pro
290 295 300

Val	Asp	Pro	Ala	Val	Ala	Ala	Asp	Phe	Ala	Asp	Leu	Phe	Pro	Val	Pro
305					310					315					320

Ala Lys Leu Trp Thr Ile Ala Asp Leu Gly Gly Trp Gly Ser Val Asp
325 330 335

Pro Gln Leu Phe Asp Lys Ala Thr Gly Ser Ile Thr Lys Ile Tyr Leu
340 345 350

Arg Ala Thr Gly
355

<210> 166

<211> 1068

<212> DNA

<213> Mycobacterium tuberculosis

<400>	166						
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ggccccagcg	acgtggtcgg	ccgtgcggga	ccggaccgtg	cgcatacgag	catcacccctg		180
gtcgcctacg	ccgtcccgga	acccggtctg	agtgcggtga	ttcccgcggt	caacgcttcc		240
gaacagggcc	ggggagtcca	ggtgattacc	tcatatggcg	cgtcggccga	ccagtcgcgc		300
ggtgttgccg	acggtaaacc	ggccgacctg	gtgaacttct	cggtcgaacc	ggacatcgct		360
cgcctggtca	aggccggcaa	ggttgacaag	gactgggacg	ccgatgccac	caagggcatc		420
ccgttcgggt	cggtggtgac	gtttgtggtc	cgcgcgggta	acccgaagaa	catcagagat		480

-202-

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 caagcgggga tcgactttgt caatacattg gtgaatgaac acgtcaaatt gcgccccggg 660
 tcggggcggg aagccaccga tgtttttgtc cagggcagcg gtgacgtgtt gatcagctac 720
 gagaacgaag ccatcgccac cgagcgggcg ggcaaaccgg tgcagcacgt cccccgccg 780
 cagacgttca agatcgaaaa tccgttgcc gtagtggcgga ccagcacaca ccttgagcg 840
 gcgaccgcat tcagaaactt ccagtacacc gtgcaggcgc agaagttatg ggcgaggcc 900
 ggtttcggc cggtcgatcc ggcggtcgcc gccgattttg ccgacctgtt tccggtgccg 960
 gcgaaactgt ggacgatcgc cgacctcggg ggctggggca gcgtggatcc tcagctgttc 1020
 gacaaggcga ccggcagcat caccaagatt tatctgcggg ccaccgga 1068

<210> 167

<211> 514

<212> PRT

<213> Mycobacterium tuberculosis

<400> 167

Met Gly Phe Gly Ala Ser Arg Leu Asp Val Arg Leu Val Pro Ala Ala
 1 5 10 15

Leu Val Ser Trp Ile Val Thr Ala Ala Gly Ile Val Trp Pro Ile Gly
 20 25 30

Asn Val Cys Ala Leu Cys Cys Val Val Val Ala Leu Gly Gly Gly Ala
 35 40 45

Leu Trp Trp Cys Val Ala Arg Arg Ser Trp His Ala Pro Arg Leu Gly
 50 55 60

Ser Ile Ser Ala Gly Leu Val Ala Val Gly Met Val Gly Ala Gly Tyr
 65 70 75 80

Gly Leu Ala Val Ala Leu Arg Ser Glu Ala Val Asp Arg His Pro Ile
 85 90 95

Thr Val Ala Phe Gly Thr Ser Ala Leu Val Thr Val Thr Pro Ser Glu

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100	105	110
Ser Pro Val Ser Leu Gly Arg Gly Arg Leu Met Phe Arg Ala Thr Val		
115	120	125
Gln Arg Leu Arg Asp Asp Glu Thr Ser Gly Arg Val Val Val Phe Ala		
130	135	140
Arg Ala Leu Asp Phe Gly Glu Leu Met Val Gly Gln Pro Val Gln Phe		
145	150	155 160
Arg Ala Arg Ile Ser Arg Pro Ala Arg His Asp Leu Thr Val Ala Val		
165	170	175
Phe Asn Ala Thr Gly Arg Pro Thr Val Gly Arg Ala Gly Pro Val His		
180	185	190
Arg Ala Ala His Ile Val Arg His Arg Phe Ala Ala Ala Val Arg Glu		
195	200	205
Val Leu Pro Ala Asp Gln Ala Thr Met Leu Pro Ala Leu Val Leu Gly		
210	215	220
Asp Thr Ser Thr Val Thr Ala Leu Thr Ser Arg Glu Phe Arg Ala Ala		
225	230	235 240
Gly Leu Thr His Leu Thr Ala Val Ser Gly Ala Asn Val Thr Ile Val		
245	250	255
Cys Ala Ala Ala Leu Val Ser Ala Arg Leu Ile Gly Pro Arg Ala Ala		
260	265	270
Val Val Cys Ala Ala Val Ala Leu Val Ala Phe Val Ile Leu Val Gln		
275	280	285
Pro Thr Ala Ser Val Leu Arg Ala Ala Val Met Gly Ala Ile Ala Leu		
290	295	300
Val Gly Met Leu Ser Ala Arg Arg Arg Gln Ala Ile Pro Ala Leu Ser		
305	310	315 320
Gly Ser Val Leu Val Leu Leu Ala Ala Ala Pro His Leu Ala Val Asp		
325	330	335

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Ile Gly Phe Ala Leu Ser Val Ala Ala Thr Gly Ala Leu Val Val Ile
 340 345 350

Ala Pro Val Trp Ser Arg Arg Leu Val Asp Arg Gly Cys Pro Lys Val
 355 360 365

Leu Ala Asp Ala Leu Ala Val Ala Ala Ala Ala Gln Leu Val Thr Ala
 370 375 380

Pro Leu Val Ala Ala Ile Ser Gly Arg Val Ser Leu Val Ala Val Val
 385 390 395 400

Ala Asn Leu Ala Val Ala Ala Val Ile Ala Pro Ile Thr Val Leu Gly
 405 410 415

Ser Val Ala Ala Val Leu Val Val Pro Trp Pro Ala Gly Ala Gln Val
 420 425 430

Leu Ile Arg Phe Thr Gly Pro Glu Val Trp Trp Val Leu Arg Val Ala
 435 440 445

His Trp Ala Ser Gly Val Pro Ala Ala Thr Val Pro Val Ala Ala Gly
 450 455 460

Leu Pro Gly Val Leu Leu Val Gly Gly Ala Thr Val Phe Thr Val Ala
 465 470 475 480

Gln Trp Arg Trp Arg Trp Phe Arg Ala Ala Met Cys Lys Thr Met Ala
 485 490 495

Val Ala Val Ile Cys Leu Leu Ala Trp Ser Leu Ser Gly Leu Val Gly
 500 505 510

Pro Ser

<210> 168

<211> 1542

<212> DNA

<213> Mycobacterium tuberculosis

-205-

<400> 168

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atgggcttcg ggcgcgtccc tttggacgta cgcctgggtcc cggcggcgcgt ggtcagctgg      60
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gtggtggccc tcggcggcgg cgcactgtgg tgggtgtgtgg cgcgccggtc gtggcacgct      180
ccgcgactgg gttcgatcag cgcgggcctg gtcgcgggtcg gtatggtggg cgcgggggtac      240
gggcttgccg tcgcgttgcg ctccgaggcg gtcgatcgcc acccaatcac cgtggcattt      300
ggcacctccg cgctggtcac ggtcaccccc agcgagagcc cagtgtcgct ggggcggggc      360
cggttgatgt tccgggcgac ggttcaacgg ctgcgggatg acgagacatc cggccgggta      420
gtggttttcg cgcgagcgcg ggacttcggc gagctgatgg tcggacagcc cgtccagttc      480
cgcgcgcgta tcagtcgccc ggcgcgtcac gacctgacgg tcgcggtggt caatgcgacc      540
ggtcggccga ccgtgggccc tgccggcccc gtacaccgcg ccgctcacat cgtccgccat      600
cgattcgcgg ccgcggttcg tgagggtgctg cccgctgacc aggccacgat gttgccggcc      660
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ctggttttcg cacggttgat cggaccgcgt gcggccgtgg tgtgcgcggc cgtcgcgttg      840
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gccattgcc tcgtggggat gctgtctgcg cgcgggcggc aggcgattcc agctttgtcg      960
ggtagcgtgc tggttttgct ggctgccgct ccccatcttg ctgtggacat cggcttcgcg     1020
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gtcgaccgcg gatgtccgaa ggtgctggcc gatgccctcg cagtgcgggc ggccgcgcag     1140
ctggtgacgg cgcactgggt ggccgccatc tccggccggg tcagtctggt ggccgtggtg     1200
gccaatctgg cgggtggcggc cgtgatcgcg ccgatcaccg tgctgggcag cgttgccggc     1260
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gtggccgcag gtctgcccgg cgtactgctg gtcgggtggc ccaccgtgtt cacggttgcg     1440
cagtggcgcg ggcgctggtt tcgcgcggcc atgtgcaaaa cgatggcggg ggccgtcata     1500
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<210> 169

<211> 139

-206-

<212> PRT

<213> Mycobacterium tuberculosis

<400> 169

Val Leu Gln Arg Thr Asn Val Val Gln Pro Leu Asn Thr Leu Arg Met
 1 5 10 15

Val Trp Ile Gln Val Ala Gly Ile Ile Pro Ala Thr Ala Gly Ile Ala
 20 25 30

Ala Thr Val Tyr Ala Gln Leu Ala Met Gly Asp Ser Trp Arg Ile Gly
 35 40 45

Val Asp Glu Gln Glu Asn Thr Thr Leu Val Arg Thr Gly Pro Phe Lys
 50 55 60

Trp Val Arg His Pro Ile Tyr Thr Ala Met Met Ala Phe Gly Leu Gly
 65 70 75 80

Leu Leu Leu Val Thr Pro Asn Leu Val Ala Leu Ala Gly Phe Ile Leu
 85 90 95

Leu Val Ala Thr Leu Glu Val His Val Arg Arg Val Glu Glu Pro Tyr
 100 105 110

Leu Leu Arg Thr His Ser Ala Val Tyr Arg Gly Tyr Thr Ala Ser Val
 115 120 125

Gly Arg Phe Val Pro Gly Val Gly Leu Ile Arg
 130 135

<210> 170

<211> 417

<212> DNA

<213> Mycobacterium tuberculosis

<400> 170

gtgctgcagc ggaccaacgt tgtccaaccg ctgaatactc tgcgcatggt ctggattcag 60

gttgccggca taatcccggc gacggccggg atcgcggccca cggtttacgc ccagcttgcg 120

-207-

atgggcgatt cgtggcggat cgggggtggac gagcaggaga acaccactct ggtgcgcacc 180
 ggcccgttta aatgggtgcg tcaccccatc tacacggcca tgatggcggt tggcctcggg 240
 ctgttgctgg tgactccgaa tctcgttgcc ctgcgccgggt ttatcctgct cggtgccacg 300
 ctcgaggtgc atgtccgccg cgtcgaagaa ccctacctgt tgcggacgca cagtgccgtc 360
 taccgcggct acaccgccag cgtcggcccg ttcgtcccgg gtgtgggggt gatccgc 417

<210> 171

<211> 161

<212> PRT

<213> Mycobacterium tuberculosis

<400> 171

Val Val Gly His Ile Val Asn Asp Leu Gln Arg Arg Lys Val Gly Asp
 1 5 10 15

Gln Glu Val Val Lys Phe Arg Val Ala Ser Asn Ser Arg Arg Arg Thr
 20 25 30

Ser Asp Gly Gly Trp Glu Pro Gly Asn Ser Leu Phe Ile Thr Val Asn
 35 40 45

Cys Trp Gly Arg Leu Val Thr Gly Val Gly Ala Ala Leu Gly Lys Gly
 50 55 60

Ala Pro Val Ile Val Val Gly His Val Tyr Thr Ser Glu Tyr Glu Asp
 65 70 75 80

Arg Asp Gly Ile Arg Arg Ser Ser Leu Glu Met Arg Ala Thr Ser Val
 85 90 95

Gly Pro Asp Leu Ser Arg Val Ile Val Arg Ile Glu Lys Pro Ala Tyr
 100 105 110

Thr Gly Pro Ser Ala Gly Asp Leu Pro Ala Ala Thr Gly Thr Gly Ala
 115 120 125

Ala Gly Ala Ala Asp Ala Pro Ala Ser Ala Ala Asp Ser Val Ser Asp
 130 135 140

-208-

Val Val Val Asp Asp Ala Ile Thr Gly His Asn Pro Leu Pro Ile Ser
 145 150 155 160

Ala

<210> 172

<211> 483

<212> DNA

<213> Mycobacterium tuberculosis

<400> 172

gtgggtcggtc acatcgtcaa cgatttgcag cgccgcaaag tcggtgatca agaggtcgtc 60
 aagttccggg tggccagcaa ttcgcgccgg cgcaccagcg acggcggttg ggagcccggc 120
 aactcgctgt ttatcaccgt caattgctgg ggaaggctgg tcaccggggt gggcgcagca 180
 ttgggcaagg ggcaccgggt gattgtgggt ggacacgtgt acaccagtga atatgaggac 240
 cgggacggca ttctcgctc gtcgctggag atgcggggcga cgtcggtagg gccggatttg 300
 tcgcgcgtga tcgtgcgcat cgaaaagccg gcctacaccg gtccaagcgc cggtgatctc 360
 ccggccgcca cggggaccgg ggcggccgggt gccgccgacg cccagcgtc ggcagccgac 420
 tcggtttccg atgtcgtggt cgacgacgcc atcactggcc acaaccccct gcccatatcg 480
 gct 483

<210> 173

<211> 256

<212> PRT

<213> Mycobacterium tuberculosis

<400> 173

Met Ala Gln Tyr Asp Pro Val Leu Leu Ser Val Asp Lys His Val Ala
 1 5 10 15

Leu Ile Thr Val Asn Asp Pro Asp Arg Arg Asn Ala Val Thr Asp Glu
 20 25 30

-209-

Met Ser Ala Gln Leu Arg Ala Ala Ile Gln Arg Ala Glu Gly Asp Pro
 35 40 45

Asp Val His Ala Val Val Val Thr Gly Ala Gly Lys Ala Phe Cys Ala
 50 55 60

Gly Ala Asp Leu Ser Ala Leu Gly Ala Gly Val Gly Asp Pro Ala Glu
 65 70 75 80

Pro Arg Leu Leu Arg Leu Tyr Asp Gly Phe Met Ala Val Ser Ser Cys
 85 90 95

Asn Leu Pro Thr Ile Ala Ala Val Asn Gly Ala Ala Val Gly Ala Gly
 100 105 110

Leu Asn Leu Ala Leu Ala Ala Asp Val Arg Ile Ala Gly Pro Ala Ala
 115 120 125

Leu Phe Asp Ala Arg Phe Gln Lys Leu Gly Leu His Pro Gly Gly Gly
 130 135 140

Ala Thr Trp Met Leu Gln Arg Ala Val Gly Pro Gln Val Ala Arg Ala
 145 150 155 160

Ala Leu Leu Phe Gly Met Cys Phe Asp Ala Glu Ser Ala Val Arg His
 165 170 175

Gly Leu Ala Leu Met Val Ala Asp Asp Pro Val Thr Ala Ala Leu Glu
 180 185 190

Leu Ala Ala Gly Pro Ala Ala Ala Pro Arg Glu Val Val Leu Ala Ser
 195 200 205

Lys Ala Thr Met Arg Ala Thr Ala Ser Pro Gly Ser Leu Asp Leu Glu
 210 215 220

Gln His Glu Leu Ala Lys Arg Leu Glu Leu Gly Pro Gln Ala Lys Ser
 225 230 235 240

Val Gln Ser Pro Glu Phe Ala Ala Arg Leu Ala Ala Ala Gln His Arg
 245 250 255

<210> 174

-210-

<211> 768

<212> DNA

<213> Mycobacterium tuberculosis

<400> 174

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atccaacgcg ccgaaggcga ccccgacgta cacgccgtag tcgtgaccgg ggcgggcaag      180
gccttctgcg ccggggccga cctgagtgcg ctgggcgcgc gggtcggcga tccagccgag      240
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gccttattgt tcggcatgtg cttcgacgcc gaatccgctg tgcggcacgg cttggcgcta      540
atgggttgccg acgatcccgt caccgcggcg ctggagctgg ccgccggggc cgcagccgcc      600
ccgcgcgagg tcgtgctggc gagcaaagcc accatgcgcg ccacagccag ccccggatcg      660
ctggaccttg agcaacacga actcgccaaa cgcttagaac ttgggccgca ggcgaaatcg      720
gtccagtcgc ccgagttcgc cgctcgcttg gctgccgctc aacacagg                      768

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<210> 175

<211> 547

<212> PRT

<213> Mycobacterium tuberculosis

<400> 175

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Val Ala Ala Ala Glu Val Val Asp Pro Asn Arg Leu Ser Tyr Asp Arg
1           5           10           15

Gly Pro Ser Ala Pro Ser Leu Leu Glu Ser Thr Ile Gly Ala Asn Leu
          20           25           30

Ala Ala Thr Ala Ala Arg Tyr Gly His Arg Glu Ala Leu Val Asp Met
35           40           45

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Val Ala Arg Arg Arg Phe Asn Tyr Ser Glu Leu Leu Thr Asp Val His
50 55 60

Arg Leu Ala Thr Gly Leu Val Arg Ala Gly Ile Gly Pro Gly Asp Arg
65 70 75 80

Val Gly Ile Trp Ala Pro Asn Arg Trp Glu Trp Val Leu Val Gln Tyr
85 90 95

Ala Thr Ala Glu Ile Gly Ala Ile Leu Val Thr Ile Asn Pro Ala Tyr
100 105 110

Arg Val Arg Glu Val Glu Tyr Ala Leu Arg Gln Ser Gly Val Ala Met
115 120 125

Val Ile Ala Val Ala Ser Phe Lys Asp Ala Asp Tyr Ala Ala Met Leu
130 135 140

Ala Glu Val Gly Pro Arg Cys Pro Asp Leu Ala Asp Val Ile Leu Leu
145 150 155 160

Glu Ser Asp Arg Trp Asp Ala Leu Ala Gly Ala Glu Pro Asp Leu Pro
165 170 175

Ala Leu Gln Gln Thr Ala Ala Arg Leu Asp Gly Ser Asp Pro Val Asn
180 185 190

Ile Gln Tyr Thr Ser Gly Thr Thr Ala Tyr Pro Lys Gly Val Thr Leu
195 200 205

Ser His Arg Asn Ile Leu Asn Asn Gly Tyr Leu Val Gly Glu Leu Leu
210 215 220

Gly Tyr Thr Ala Gln Asp Arg Ile Cys Ile Pro Val Pro Phe Tyr His
225 230 235 240

Cys Phe Gly Met Val Met Gly Asn Leu Ala Ala Thr Ser His Gly Ala
245 250 255

Ala Met Val Ile Pro Ala Pro Gly Phe Asp Pro Ala Ala Thr Leu Arg
260 265 270

Ala Val Gln Asp Glu Arg Cys Thr Ser Leu Tyr Gly Val Pro Thr Met

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275	280	285
Phe Ile Ala Glu Leu Gly	Leu Pro Asp Phe Thr Asp	Tyr Glu Leu Gly
290	295	300
Ser Leu Arg Thr Gly	Ile Met Ala Gly Ala Ala Cys	Pro Val Glu Val
305	310	315
Met Arg Lys Val	Ile Ser Arg Met His Met	Pro Gly Val Ser Ile Cys
325	330	335
Tyr Gly Met Thr Glu Thr	Ser Pro Val Ser Thr Gln Thr	Arg Ala Asp
340	345	350
Asp Ser Val Asp Arg Arg	Val Gly Thr Val Gly Arg	Val Gly Pro His
355	360	365
Leu Glu Ile Lys Val Val	Asp Pro Ala Thr Gly Glu Thr	Val Pro Arg
370	375	380
Gly Val Val Gly Glu Phe	Cys Thr Arg Gly Tyr Ser	Val Met Ala Gly
385	390	395
Tyr Trp Asn Asp Pro Gln	Lys Thr Ala Glu Val Ile	Asp Ala Asp Gly
405	410	415
Trp Met His Thr Gly Asp	Leu Ala Glu Met Asp Pro	Ser Gly Tyr Val
420	425	430
Arg Ile Ala Gly Arg Ile	Lys Asp Leu Val Val Arg	Gly Gly Glu Asn
435	440	445
Ile Ser Pro Arg Glu Ile	Glu Glu Leu Leu His Thr	His Pro Asp Ile
450	455	460
Val Asp Gly His Val Ile	Gly Val Pro Asp Ala Lys	Tyr Gly Glu Glu
465	470	475
Leu Met Ala Val Val Lys	Leu Arg Asn Asp Ala Pro	Glu Leu Thr Ile
485	490	495
Glu Arg Leu Arg Glu Tyr	Cys Met Gly Arg Ile Ala	Arg Phe Lys Ile
500	505	510

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Pro Arg Tyr Leu Trp Ile Val Asp Glu Phe Pro Met Thr Val Thr Gly
 515 520 525

Lys Val Arg Lys Val Glu Met Arg Gln Gln Ala Leu Glu Tyr Leu Arg
 530 535 540

Gly Gln Gln
 545

<210> 176

<211> 1641

<212> DNA

<213> Mycobacterium tuberculosis

<400> 176

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gtggcagccg cggaagtcgt agacccaat cggctttcct atgatcgcg tccgagtgcg      60
ccatcattgc tcgagtcgac catcgggcgc aacctcgag cgaccgctgc caggtagcga      120
catcggaag cactcgtgga catggtggcc cggcgacggt tcaattacag cgaactgctg      180
actgacgtgc accggctggc gacggggctg gtgcgggcgg ggatcgggcc gggcgatcgg      240
gtcggcatct gggcgccgaa ccggtgggag tgggtgctcg tccagtacgc gaccgctgag      300
atcggcgcga tcctagtac cataaacccc gcctatcggg tccgcgaagt ggagtatgcg      360
cttaggcagt ccggtgtcgc gatggtgatt gccgtagcga gtttcaagga tgcggactat      420
gccgcgatgc tggccgaggt tgggccgcga tgccccgatc tggccgacgt gattttgctg      480
gaaagcgatc gctgggacgc gctggcgggg gccgagcccc atctgcctgc gctgcagcag      540
accgcggcga ggctagacgg cagtgatccg gtaaaccatc aatacacctc cggcacaacg      600
gcatacccca aggggtgtcac gctaagccac cgcaatatcc tcaacaacgg ctacctggtg      660
ggcgagctgc tcgggtacac cgcacaagat cggatttgca tcccggtgcc cttctaccac      720
tgcttcggca tggtaatggg aaatctggcg gccaccagtc acggggcggc catggtgatc      780
ccggcgccgg gctttgaccc tgcggccacg ctgcgcgcgg tgcaggacga gcgatgcacc      840
agcttgtagc gcgtgccgac gatgttcac gccgagctgg gcctgccgga cttcaccgac      900
tacgaactgg gcagtctgcg caccgggatt atggccggcg ccgcgtgccc ggtcgaggtg      960
atgcgcaagg tgatctcacg catgcatatg cccgggggtct cgatctgcta tggaatgacc     1020
gaaacgtcac cggtttccac gcagacgcgc gccgacgact cggtggtatc acgggtcggc     1080

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acgggtcgggtc ggggtgggtcc acaccttgag atcaaggtgg tggatccggc cacgggagag 1140
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 tactggaatg acccgagaa gactgcggag gtgatcgacg ccgacgggtg gatgcacacc 1260
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 gagtactgca tgggccgcat cgcgcgattc aagatcccg cgtacctgtg gatcgtcgac 1560
 gagttccga tgaccgtcac cggcaaagta cgcaaagtgg agatgcgaca acaggcgctc 1620
 gaatacctcc gcggccaaca g 1641

<210> 177

<211> 463

<212> PRT

<213> Mycobacterium tuberculosis

<400> 177

Val His Leu Ala His Arg Val Ala Ser Ser Arg Asp Thr Pro Ser Ser
 1 5 10 15

Ser Ala Thr Pro Asn Ala Val Ser Gly Ser Ala Ser Asn Ala Ala Asp
 20 25 30

Arg Pro Cys Leu Val Arg Pro Pro Thr Ala Pro Pro Trp Ala His Gly
 35 40 45

Pro Arg Leu Arg Arg Asp Pro Thr Gly Gly Gly Ser Thr Pro Ser Ile
 50 55 60

Val Leu Ser Arg Ser Thr Asp Arg Ser Lys Asp Gly His Arg Ile Val
 65 70 75 80

Pro Ala Gly Ala Arg Lys Ser Gly Val Arg Ala Ser Thr Gly Arg Leu
 85 90 95

Pro Ser Thr Arg Lys Thr Thr Arg Ser Pro Asp Cys Arg Pro Ser Ala

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100	105	110
Ser Arg Thr Ala Phe Gly Thr Val Thr Cys Pro Phe Asp Val Thr Met		
115	120	125
Gly Ser Ser Glu Cys Leu Leu His Arg Cys Arg Thr Pro Pro Val Pro		
130	135	140
Ser His Ser Val Glu Leu Leu Val Ala Ala Asn Pro Ala Glu Asp Ser		
145	150	155 160
Arg Leu Pro Tyr Leu Ile Arg Leu Pro Val Gly Ala Gly Leu Val Phe		
165	170	175
Ala Thr Ser Asp Val Trp Pro Arg Thr Lys Ala Leu Tyr Cys His Arg		
180	185	190
Leu Asp Ile Ala Asp Trp Pro Ala Asp Pro Val Val Val Asp Arg Val		
195	200	205
Glu Leu Arg Ser Cys Ser Arg Arg Gly Ala Ala Ile Asp Val Val Ala		
210	215	220
Ala Arg Ala Arg Glu Asn Arg Ser Gln Leu Val His Thr Met Ala Arg		
225	230	235 240
Gly Arg Gln Val Val Phe Trp Gln Ser Pro Lys Thr Arg Lys Gln Ser		
245	250	255
Arg Pro Gly Val Arg Thr Pro Thr Ala Arg Ala Ala Gly Ile Pro Glu		
260	265	270
Leu His Ile Val Val Asp Ala His Glu Arg Tyr Pro Tyr Thr Phe Ala		
275	280	285
Asp Lys Pro Ala Lys Thr Thr Arg Glu Ala Leu Pro Cys Gly Asp Tyr		
290	295	300
Gly Leu Lys Val Ala Gly Gln Leu Val Ala Ala Val Glu Arg Lys Ala		
305	310	315 320
Leu Ala Asp Leu Thr Ser Gly Val Leu Asn Gly Asn Leu Lys Tyr Gln		
325	330	335

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Leu Thr Glu Leu Ala Ala Leu Pro Arg Ala Ala Val Val Val Glu Asp
 340 345 350

Arg Tyr Ser Glu Ile Phe Ala His Ser Phe Ala Arg Pro Thr Ala Ile
 355 360 365

Ala Asp Gly Leu Ala Glu Leu Gln Ile Gly Phe Pro Asn Val Pro Ile
 370 375 380

Val Phe Cys Gln Thr Arg Lys Leu Ala Gln Glu Tyr Thr Tyr Arg Tyr
 385 390 395 400

Leu Ala Ala Ala Leu Thr Trp Phe Val Asp Asp Ala Asp Ala Thr Thr
 405 410 415

Val Phe Glu Pro Ala Ala Ala Glu Pro Glu Pro Ser Ser Ala Glu Leu
 420 425 430

Arg Ala Trp Ala Lys Ser Val Gly Leu Pro Val Ser Asp Arg Gly Arg
 435 440 445

Leu Arg Pro Gln Ile Leu Gln Ala Trp Arg Ala Ala His Pro Arg
 450 455 460

<210> 178

<211> 1389

<212> DNA

<213> Mycobacterium tuberculosis

<400> 178

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 acagcaccgc cctggggtca cggtcgcggg ctccgccggg atccgaccgg cggcgggtca 180
 accccctcga tcgtcttgag ccggtcgaca gaccgatcga aagacggcca ccggatcgtc 240
 ccggcagggg cgaggaagtc cggcgtccga gcaagcaccg ggcgattgcc ctcaacgcgg 300
 aagacaacct gatcaccga ttgcaggccg agcgcgtcgc gcaccgcttt cggaaccgtc 360
 acctgcccct tcgacgtgac gatgggttcg tcggagtgcc tgcttcaccg ttgccgtacg 420
 ccgcccgtac cctcacactc tgtggagctg ctcgtcgccg ccaaccccg tgaagactcg 480

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cgcctgccct acctgatccg gctgccggtg ggcgcgggac tggctcttcgc cacctcagac 540
 gtgtggccgc gcaccaaggc gctgtattgc catcgccctcg acatcgccga ctggcccgcgc 600
 gaccccgctcg tcgtcgaccg ggtcgagcta cgcagctgca gccgccgggg cgcgcccatc 660
 gacgtcgtcg ccgcccgcgc gcgggagaac cgatcgcaac tggtgacacac catggcgcgcg 720
 ggccgccagg tgggtgttctg gcagagcccc aaaacgcgca aacagtcgcg gccgggctg 780
 cgcacccccca ccgcccgcgc cgccggcatc cccgagctgc acatcgctgt cgacgcccac 840
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 tgccggcgact acggcctgaa agtggccggc caactcgtgg cggccgtcga gcgtaaagcg 960
 ttggcggacc ttactttctg cgtgctgaac ggcaacctga aataccaact gaccgaactg 1020
 gccgcgctgc cacggggcgc cgtggtggtc gaggaccgct actcggagat cttcgcgcac 1080
 tccttcgccc gcccgacggc gatcgccgat gggctggccg aattgcagat cggctttccc 1140
 aacgtgccga tcgtgttctg ccaaaccgcg aagctcgccc aggaatacac ctaccgctat 1200
 ctageccgcg ccctcacctg gttcgtcgac gatgccgacg ccaccacggg tttcgagccg 1260
 gctgccgccg agcccagacc cagcagcgcc gagctgcgcg cgtggggcaa aagcgtcggc 1320
 ctgccggtgt ccgaccgggg gcgcctgcgc ccgcagatcc tgcaggcctg gcgagccgcc 1380
 catccccgg 1389

<210> 179

<211> 134

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 179

Val Ile Ala Pro Asp Thr Ser Val Leu Val Ala Gly Phe Ala Thr Trp
 1 5 10 15

His Glu Gly His Glu Ala Ala Val Arg Ala Leu Asn Arg Gly Val His
 20 25 30

Leu Ile Ala His Ala Ala Val Glu Thr Tyr Ser Val Leu Thr Arg Leu
 35 40 45

Pro Pro Pro His Arg Ile Ala Pro Val Ala Val His Ala Tyr Leu Ala

50

55

60

Gly Leu Thr Asp His Leu Ala Glu His Asp Val Thr Gly Gly Ala Thr
85 90 95

Tyr Asp Ala Leu Val Gly Phe Thr Ala Lys Ala Ala Gly Ala Lys Leu
100 105 110

Leu Thr Arg Asp Leu Arg Ala Val Glu Thr Tyr Glu Arg Leu Arg Val
115 120 125

Glu Val Glu Leu Val Thr
130

<210> 180

<211> 402

<212> DNA

<213> Mycobacterium tuberculosis

<400> 180

gtgatcgcac	cagacaccag	cgtgctgggt	gccggattcg	cgacctggca	cgaagggcac	60
gaggccgcgcg	tgcgcgcgct	caaccgtggc	gtccatctga	tcgcgcacgc	ggctgtggaa	120
acctattcgg	tcttgaccgcg	gctaccaccg	cgcctcgtc	ttgcccctgt	tgcgcgccac	180
gcctacttgg	cggacatcac	ctccagcaac	tacctggcac	tggatgcctg	ctcatatcgc	240
ggcttgaccg	accacctcgc	cgcgcacgat	gtcaccgggtg	gcgcaacctc	cgatgccttg	300
gtcggcttca	cggcgaaaagc	tgcgggcgc	aagctgctga	ctcgcgcacct	gcgcgcggtc	360
gaaacgtacg	agcgattgcg	ggtcgagggt	gagctgggtga	cc		402

<210> 181

<211> 405

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 181

Val Thr Glu Asn Pro Tyr Leu Val Gly Leu Arg Leu Ala Gly Lys Lys
 1 5 10 15

Val Val Val Val Gly Gly Gly Thr Val Ala Gln Arg Arg Leu Pro Leu
 20 25 30

Leu Ile Ala Ser Gly Ala Asp Val His Val Ile Ala Pro Ser Val Thr
 35 40 45

Pro Ala Val Glu Ala Met Asp Gln Ile Thr Leu Ser Val Arg Asp Tyr
 50 55 60

Arg Asp Gly Asp Leu Asp Gly Ala Trp Tyr Ala Ile Ala Ala Thr Asp
 65 70 75 80

Asp Ala Arg Val Asn Val Ala Val Val Ala Glu Ala Glu Arg Arg Arg
 85 90 95

Ile Phe Cys Val Arg Ala Asp Ile Ala Val Glu Gly Thr Ala Val Thr
 100 105 110

Pro Ala Ser Phe Ser Tyr Ala Gly Leu Ser Val Gly Val Leu Ala Gly
 115 120 125

Gly Glu His Arg Arg Ser Ala Ala Ile Arg Ser Ala Ile Arg Glu Ala
 130 135 140

Leu Gln Gln Gly Val Ile Thr Ala Gln Ser Ser Asp Val Leu Ser Gly
 145 150 155 160

Gly Val Ala Leu Val Gly Gly Gly Pro Gly Asp Pro Glu Leu Ile Thr
 165 170 175

Val Arg Gly Arg Arg Leu Leu Ala Gln Ala Asp Val Val Val Ala Asp
 180 185 190

Arg Leu Ala Pro Pro Glu Leu Leu Ala Glu Leu Pro Pro His Val Glu
 195 200 205

Val Ile Asp Ala Ala Lys Ile Pro Tyr Gly Arg Ala Met Ala Gln Asp
 210 215 220

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Ala Ile Asn Ala Val Leu Ile Glu Arg Ala Arg Ser Gly Asn Phe Val
 225 230 235 240

Val Arg Leu Lys Gly Gly Asp Pro Phe Val Phe Ala Arg Gly Tyr Glu
 245 250 255

Glu Val Leu Ala Cys Ala His Ala Gly Ile Pro Val Thr Val Val Pro
 260 265 270

Gly Val Thr Ser Ala Ile Ala Val Pro Ala Met Ala Gly Val Pro Val
 275 280 285

Thr His Arg Ala Met Thr His Glu Phe Val Val Val Ser Gly His Leu
 290 295 300

Ala Pro Gly His Pro Glu Ser Leu Val Asn Trp Asp Ala Leu Ala Ala
 305 310 315 320

Leu Thr Gly Thr Ile Val Leu Leu Met Ala Val Glu Arg Ile Glu Leu
 325 330 335

Phe Val Asp Val Leu Leu Lys Gly Gly Arg Thr Ala Asp Thr Pro Val
 340 345 350

Leu Val Val Gln His Gly Thr Thr Ala Ala Gln Gln Thr Leu Arg Ala
 355 360 365

Thr Leu Ala Asp Thr Pro Glu Lys Val Arg Ala Ala Gly Ile Arg Pro
 370 375 380

Pro Ala Ile Ile Val Ile Gly Ala Val Val Gly Leu Ser Gly Val Arg
 385 390 395 400

Gly Leu Asn Asn Ser
 405

<210> 182

<211> 1215

<212> DNA

<213> Mycobacterium tuberculosis

-221-

<400> 182
 gtgaccgaga acccctatct ggtcgggtta cggctggctg gcaagaaggt cgtcgtggtt 60
 ggcgggggca cggtcgcca gcgccggta cccctgctga tcgccagtgg cgcggacgtg 120
 cacgtgatcg cccccagcgt ccccccgcc gtcgaggcga tggaccagat caccttgctg 180
 gtgctgact accgcgacgg cgaccttgac ggcgcctggg atgcgatcg ggccaccgat 240
 gacgcgcggg tgaacgtggc tgtcgtcgcc gaggcggagc gccgacggat cttttgcgtc 300
 cgggccgata tcgcggtgga ggggacggcg gtgaccccg cgtcattcag ctatgcgggc 360
 ctgtcgtggg ggggtgctcg cggtggtgag caccgccgtt cggcggcgat ccgctcggca 420
 atccgggagg cgttgacgca gggcgtcatc actgcgcaga gttccgacgt cctcagcggc 480
 ggagtggcgt tggtcggcgg cggccccggc gatcccgaac tgatcacggt tcgcggtcgc 540
 cggctgcttg cccaggccga tgtcgtggtc gccgaccggc tcgccccgcc cgaactgctg 600
 gccgagctgc cgccgcacgt agaagtcac gacgcggcca agatcccta cggccggggc 660
 atggcccagg acgcgatcaa cgctgtcctg atcgaacggg ccagatccgg caactttgtg 720
 gtccgtctca aagggggcga ccccttcgtg ttcgccggg gctatgaaga agtgctggca 780
 tgtgcccacg ccggaatccc ggtcacctg gtgtcagggtg tgacgagtgc catagccgtg 840
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 ctgctaaagg gtggccgaac tgcggatacg ccggtactgg tggttcaaca cggaacgacc 1080
 gccgtcaac agacgttgcg ggccaccctt gccgacacgc cggagaaggt ccgcgcggcg 1140
 gggatccgac ctcccgcgat catcgtgatc ggggctgtag tcggcctgag cggcgttcgg 1200
 ggtttaaaca attct 1215

<210> 183

<211> 591

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 183

Met Pro Ala Pro Arg Met Pro Arg Val Ala Leu Val Ala Val Leu Leu
 1 5 10 15

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Ile Thr Val Gln Leu Val Val Arg Val Val Leu Ala Phe Gly Gly Tyr
 20 25 30

Phe Tyr Trp Asp Asp Leu Ile Leu Val Gly Arg Ala Gly Thr Gly Gly
 35 40 45

Leu Leu Ser Pro Ser Tyr Leu Phe Asp Asp His Asp Gly His Val Met
 50 55 60

Pro Gly Ala Phe Leu Val Ala Gly Ala Ile Ile Arg Val Ala Pro Leu
 65 70 75 80

Val Trp Thr Gly Pro Ala Ile Ser Leu Val Val Leu Gln Leu Leu Glu
 85 90 95

Ser Leu Ala Leu Leu Arg Ala Leu Tyr Val Ile Ser Ser Trp Arg Pro
 100 105 110

Val Leu Leu Ile Pro Leu Thr Phe Ala Leu Phe Thr Pro Leu Ala Val
 115 120 125

Pro Gly Phe Ala Trp Trp Ala Ala Ala Leu Asn Ser Leu Pro Met Leu
 130 135 140

Ala Ala Leu Ala Trp Val Cys Ala Asp Ala Ile Leu Leu Val Arg Thr
 145 150 155 160

Gly Asn His Arg Tyr Ala Val Thr Gly Val Leu Val Tyr Leu Gly Gly
 165 170 175

Leu Leu Phe Phe Glu Lys Ala Ala Val Ile Pro Phe Val Ser Phe Ala
 180 185 190

Val Ala Ala Leu Gln Cys His Val Arg Gly Asp Arg Ser Ala Leu Ala
 195 200 205

Thr Val Trp Arg Ala Gly Val Arg Leu Trp Thr Pro Ser Leu Ala Leu
 210 215 220

Thr Val Gly Trp Val Ala Leu Tyr Leu Ala Val Val Asp Gln Arg Arg
 225 230 235 240

Trp Ser Ser Asp Leu Ser Met Thr Trp Asp Leu Leu Cys Arg Ser Val

255

Thr Thr Thr Thr Gln Leu Arg Met Phe Thr Ser Thr Gly Arg Leu Val
465 470 475 480

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Asp Ala Lys Val Thr Trp Val Arg Thr Ile Ile Ala Gly Pro Val Pro
 485 490 495

Gln Cys Gly Tyr Phe Val Gln Pro Asp Arg Pro Glu Arg Leu Ile Leu
 500 505 510

Asp Gly Pro Leu Leu Pro Gly Asp Trp Thr Val Glu Leu Asn Tyr Leu
 515 520 525

Ala Asn Ser Asp Gly Ser Met Ala Leu Ala Leu Ser Asp Gly Pro Glu
 530 535 540

Arg Lys Val Pro Val His Pro Gly Leu Asn Arg Val Tyr Ala Arg Leu
 545 550 555 560

Pro Gly Ala Gly Asp Ala Ile Thr Val Arg Ala Asn Thr Thr Ala Leu
 565 570 575

Ser Leu Cys Ile Gly Ala Ala Pro Val Gly Phe Leu Ala Pro Ala
 580 585 590

<210> 184

<211> 1773

<212> DNA

<213> Mycobacterium tuberculosis

<400> 184

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gtcggcaggg ccggcactgg gggcctgttg tcgccgtcgt acctgttcga cgaccacgac	180
ggccacgtga tgcccgggtgc cttcctgggt gcgggcgcca ttatccgggt ggcacccctg	240
gtgtggaccg gaccagcgat cagcctggtg gtgctgcagc tgctggagtc gctggcggtg	300
ctgcgcgcgt tgtatgtgat atcgagctgg cggccggtac tcctgatccc attgacgttc	360
gcgctgttca caccgctagc ggtgccgggg ttgcgctggt gggcggctgc gctcaactcg	420
ctgccgatgc tggccgcgct ggcgtgggtg tgcgccgatg ccatacctgct ggtgcggacc	480
ggcaaccacc gctacgccgt caccggtgtc ctggtttacc tcggtggcct gctgttcttc	540
gagaaggccg cggatgatccc gttcgtctcc ttcgcggtgg ccgcgctgca gtgccatgtg	600

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cgcgggcgacc ggtcagcttt ggcgacgggtg tggcggggccc gtgtccgggtt gtggacgccc 660
 tcgctggcac tgaccgtcgg ctgggtagcc ctttatctgg cggtggtgga tcaacggcga 720
 tggagttccg atctgtcgat gacgtgggat ctgctgtgcc gttcggtcac ccacggcata 780
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 ctgtcactgg tccgcaagcg acgcatcggc ccggtgtggc tgaccgcggc cggctacgcg 960
 gtggcctgcc aggtgccgat ctttctgatg cgctcgtcgc cgttcaccgc gctcgagttg 1020
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 gcgctgcagg cacccaatcg cgccggcacc cgctggctgg acgcctcgcc ggcccagacc 1140
 gttgcgacag tcgcttcggc cgtgttggtt ttgaccagca gcctgtattc gaccgcgacg 1200
 tttctggcca gttggcgtga caaccacc gagggatacc tgaagaacgc ccaggcaagt 1260
 ctggccgcgg ccgcgtcagg tgcgcgcta ctggatcagg aagtcgatcc gctgggtgtg 1320
 caacgagtgg cctggccgga gaacttgcc agccacatgt tcgccctgct gcgcgtccga 1380
 ccggaattcg ctacgacaac aacacaattg agaatgttca ccagcacagg tcggctggtc 1440
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 ttcgtccagc cggaccggcc ggaacgtctg atcctcgacg gcccttgct gcccggcgac 1560
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 gacggacctg agcgggaagg tccggtgcat ccgggtctca atcgggtgta cggccggcta 1680
 ccaggggccc gcgacgcaat cacggtgcga gccaacacca ccgcgctttc gctgtgcac 1740
 ggagcggcgc cgggtgggatt tctggcaccg gcc 1773

<210> 185

<211> 498

<212> PRT

<213> Mycobacterium tuberculosis

<400> 185

Met Thr Glu Thr Val Thr Arg Thr Ala Ala Pro Ala Val Val Gly Lys
 1 5 10 15

Leu Ser Thr Leu Asp Arg Phe Leu Pro Val Trp Ile Gly Ser Ala Met

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20	25	30
Ala Ala Gly Leu Leu Leu Gly Arg Trp Ile Pro Gly Leu His Thr Ala		
35	40	45
Leu Glu Gly Val Gln Leu Asp Gly Ile Ser Leu Pro Ile Ala Leu Gly		
50	55	60
Leu Leu Ile Met Met Tyr Pro Val Leu Ala Lys Val Arg Tyr Asp Arg		
65	70	75 80
Leu Asp Thr Val Thr Gly Asp Arg Lys Leu Leu Leu Ser Ser Leu Leu		
	85 90	95
Leu Asn Trp Val Leu Gly Pro Ala Leu Met Phe Ala Leu Ala Trp Leu		
	100 105	110
Leu Leu Ala Asp Leu Pro Glu Tyr Arg Thr Gly Leu Ile Ile Val Gly		
	115 120	125
Leu Ala Arg Cys Ile Ala Met Val Ile Ile Trp Asn Asp Leu Ala Cys		
	130 135	140
Gly Asp Arg Glu Ala Ala Ala Val Leu Val Ala Leu Asn Ser Ile Phe		
145	150	155 160
Gln Val Ala Met Phe Ala Ala Leu Gly Trp Phe Tyr Leu Ser Val Leu		
	165	170 175
Pro Gly Trp Leu Gly Leu Glu Gln Thr Thr Ile Ala Thr Ser Pro Trp		
	180 185	190
Gln Ile Ala Lys Ser Val Leu Ile Phe Leu Gly Ile Pro Leu Leu Ala		
	195 200	205
Gly Tyr Leu Ser Arg Arg Ile Gly Glu Lys Thr Lys Gly Arg Asn Trp		
	210 215	220
Tyr Glu Ser Arg Phe Leu Pro Lys Val Gly Pro Trp Ala Leu Tyr Gly		
225	230	235 240
Leu Leu Phe Thr Ile Val Ile Leu Phe Ala Leu Gln Gly Asp Gln Ile		
	245	250 255

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Thr Gly Arg Pro Leu Asp Val Ala Arg Ile Ala Leu Pro Leu Leu Ala
 260 265 270

Tyr Phe Ala Ile Met Trp Val Gly Gly Tyr Leu Leu Gly Ala Ala Leu
 275 280 285

Arg Leu Gly Tyr Arg Arg Thr Thr Thr Leu Ala Phe Thr Ala Ala Ser
 290 295 300

Asn Asn Phe Glu Leu Ala Ile Ala Val Ala Ile Ala Thr Tyr Gly Ala
 305 310 315 320

Thr Ser Gly Gln Ala Leu Ala Gly Val Val Gly Pro Leu Ile Glu Val
 325 330 335

Pro Val Leu Val Gly Leu Val Tyr Val Ser Leu Ala Leu Arg Asn Arg
 340 345 350

Leu Ala Gly Pro Asn Ala Thr His Asp Ala Asp Lys Pro Ser Val Leu
 355 360 365

Phe Val Cys Val His Asn Ala Gly Arg Ser Gln Met Ala Ala Gly Leu
 370 375 380

Leu Thr His Leu Ala Gly Asp Arg Ile Glu Val Arg Ser Ala Gly Thr
 385 390 395 400

Glu Pro Ala Gly Gln Val Asn Pro Thr Ala Val Ala Ala Met Ala Glu
 405 410 415

Met Gly Ile Asp Ile Thr Ala Asn Ala Pro Thr Leu Leu Thr Gly Gly
 420 425 430

Gln Val Gln Ser Ser Asp Val Val Ile Thr Met Gly Cys Gly Asp Ala
 435 440 445

Cys Pro Tyr Phe Pro Gly Val Ser Tyr Arg Asn Trp Lys Leu Pro Asp
 450 455 460

Pro Ala Gly Gln Pro Leu Asp Val Val Arg Met Ile Arg Asp Asp Ile
 465 470 475 480

Ala Asp Arg Val Gln Ala Leu Ile Ala Glu Leu Leu Ala Thr Ala Lys
 485 490 495

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Thr Arg

<210> 186

<211> 1494

<212> DNA

<213> Mycobacterium tuberculosis

<400> 186

atgacggaga	cggtcacccg	caccgccgcc	ccggcgggtg	tgggcaaact	ctcgacgctg	60
gaccgcttct	tgccggtgtg	gatcgggtcg	gcaatggccg	ccgggctact	actgggccgg	120
tggattcccc	gcctgcacac	cgccctagaa	ggggttcagc	tcgacgggat	ttcgctgccg	180
atcgcgctag	gcctgctgat	catgatgtat	ccggtgctgg	ccaagggtcg	ctacgaccgc	240
ctcgacaccc	tcaccggtga	ccgcaagctg	ctactcagct	cgctgctgct	gaactgggta	300
ctggggcccc	cgttgatgtt	cgcgctggct	tggctgctac	tggcggatct	gcccgagtac	360
cgcaccgggc	tgatcatcgt	gggcctggct	cgctgcatcg	ccatggtgat	catctggaac	420
gacctggcct	gcgggggatcg	cgaagccgcc	gccgtgctcg	tcgcgttgaa	ctcgatcttt	480
caggtggcca	tgttcgccgc	gctcggctgg	ttctacctgt	cggtgctacc	gggttggtcg	540
ggcctcgagc	agaccaccat	cgccacatcc	ccgtggcaga	tcgccaagtc	ggtgctgata	600
ttcctcggca	tcccgtgct	ggccggctac	ctgtcgcggc	ggatcggcga	aaagaccaag	660
ggccgcaact	ggtatgaatc	ccgcttcctg	ccaagggtgg	gaccgtgggc	gctctacggt	720
ttgctgttca	ccatcgatgat	tctctttgcg	ctgcaaggag	atcagatcac	cggccgaccg	780
ctggacgtcg	cacgcattgc	gctgccgctg	ctggcctact	tcgccatcat	gtgggtaggc	840
ggctacctac	tgggggcggc	gctgcggcta	gggtatcggc	gcaccaccac	gctggcggtc	900
accgccgcga	gcaacaactt	cgagctggcc	atcgcggtgg	ccatcgccac	ctacggcgcc	960
acctccgggc	aagccctggc	cggagtcgtc	gggcccctga	tcgaggtacc	cgtoctggtg	1020
gggttggtct	atgtgtccct	ggcgtgcgc	aaccgcctcg	ccggtcccaa	cgcgaccac	1080
gatgccgaca	aaccagcgt	cctattcgtc	tgtgtgcaca	acgccggacg	ttcccagatg	1140
gccgcggggc	tattgacca	cttggccggt	gaccgcatcg	aagtccgttc	ggccggaacc	1200
gagcccgccg	gtcaggtcaa	tccgacggct	gtggccgcga	tggccgaaat	gggcatcgat	1260

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atcacccgcca atgccccccac attgctcacc ggcgggcagg tccagtcacg cgacgtcgtc 1320
 atcacgatgg gctgcggcga tgcctgccct tacttcccgg gtgtctccta ccgcaactgg 1380
 aaactaccgg atcccgccgg ccagcccctc gacgttggtc gcatgatccg cgacgacatc 1440
 gcagaccgcg tccaagccct gatcgccgag ctgctggcca ccgccaagac caga 1494

<210> 187

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 187

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
 1 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
 20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
 35 40 45

Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 188

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

-230-

<400> 188
 atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtcgcagaga tccgcgggtca gcacgattcg gaggggcag cgatcagtga ggtcgcccggt 120
 ctacttggtg ttggctgcgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac caccgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 189

<211> 475

<212> PRT

<213> Mycobacterium tuberculosis

<400> 189

Met Ala Asp Ile Pro Tyr Gly Arg Asp Tyr Pro Asp Pro Ile Trp Cys
 1 5 10 15

Asp Glu Asp Gly Gln Pro Met Pro Pro Val Gly Ala Glu Leu Leu Asp
 20 25 30

Asp Ile Arg Ala Phe Leu Arg Arg Phe Val Val Tyr Pro Ser Asp His
 35 40 45

Glu Leu Ile Ala His Thr Leu Trp Ile Ala His Cys Trp Phe Met Glu
 50 55 60

Ala Trp Asp Ser Thr Pro Arg Ile Ala Phe Leu Ser Pro Glu Pro Gly
 65 70 75 80

Ser Gly Lys Ser Arg Ala Leu Glu Val Thr Glu Pro Leu Val Pro Arg
 85 90 95

Pro Val His Ala Ile Asn Cys Thr Pro Ala Tyr Leu Phe Arg Arg Val
 100 105 110

Ala Asp Pro Val Gly Arg Pro Thr Val Leu Tyr Asp Glu Cys Asp Thr
 115 120 125

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Leu Phe Gly Pro Lys Ala Lys Glu His Glu Glu Ile Arg Gly Val Ile
 130 135 140

Asn Ala Gly His Arg Lys Gly Ala Val Ala Gly Arg Cys Val Ile Arg
 145 150 155 160

Gly Lys Ile Val Glu Thr Glu Glu Leu Pro Ala Tyr Cys Ala Val Ala
 165 170 175

Leu Ala Gly Leu Asp Asp Leu Pro Asp Thr Ile Met Ser Arg Ser Ile
 180 185 190

Val Val Arg Met Arg Arg Arg Ala Pro Thr Glu Pro Val Glu Pro Trp
 195 200 205

Arg Pro Arg Val Asn Gly Pro Glu Ala Glu Lys Leu His Asp Arg Leu
 210 215 220

Ala Asn Trp Ala Ala Ala Ile Asn Pro Leu Glu Ser Gly Trp Pro Ala
 225 230 235 240

Met Pro Asp Gly Val Thr Asp Arg Arg Ala Asp Val Trp Glu Ser Leu
 245 250 255

Val Ala Val Ala Asp Thr Ala Gly Gly His Trp Pro Lys Thr Ala Arg
 260 265 270

Ala Thr Ala Glu Thr Asp Ala Thr Ala Asn Arg Gly Ala Lys Pro Ser
 275 280 285

Ile Gly Val Leu Leu Leu Arg Asp Ile Arg Arg Val Phe Ser Asp Arg
 290 295 300

Asp Arg Met Arg Thr Ser Asp Ile Leu Thr Gly Leu Asn Arg Met Glu
 305 310 315 320

Glu Gly Pro Trp Gly Ser Ile Arg Arg Gly Asp Pro Leu Asp Ala Arg
 325 330 335

Gly Leu Ala Thr Arg Leu Gly Arg Tyr Gly Ile Gly Pro Lys Phe Gln
 340 345 350

His Ser Gly Gly Glu Pro Pro Tyr Lys Gly Tyr Ser Arg Thr Gln Phe
 355 360 365

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Glu Asp Ala Trp Ser Arg Tyr Leu Ser Ala Asp Asp Glu Thr Pro Glu
 370 375 380

Glu Arg Asp Leu Ser Val Ser Ala Val Ser Ala Val Ser Pro Pro Val
 385 390 395 400

Gly Asp Pro Gly Asp Ala Thr Gly Ala Thr Asp Ala Thr Asp Leu Pro
 405 410 415

Glu Ala Gly Asp Leu Pro Tyr Glu Pro Pro Ala Pro Asn Gly His Pro
 420 425 430

Asn Gly Asp Ala Pro Leu Cys Ser Gly Pro Gly Cys Pro Asn Lys Leu
 435 440 445

Leu Ser Thr Glu Ala Lys Ala Ala Gly Lys Cys Arg Pro Cys Arg Gly
 450 455 460

Arg Ala Ala Ala Ser Ala Arg Asp Gly Ala Arg
 465 470 475

<210> 190

<211> 1425

<212> DNA

<213> Mycobacterium tuberculosis

<400> 190

atggctgaca tcccctacgg ccgtgactat cccgaccgga tctggtgtga cgaggacggc	60
cagccgatgc cgccggtcgg cgccgaattg ctcgacgaca ttagggcatt cttgcggcgg	120
ttcgtagtct atccaagcga ccatgaactg atcgcgaca ccctctggat tgcgcattgc	180
tggtttatgg aggcgtggga ctcaacgccc cgaatcgctt ttttgtcacc ggaacccggc	240
tctggcaaga gccgcgcact cgaagtcacg gaaccgctag tgccccggcc ggtgcatgcc	300
atcaactgca caccggccta cctgttccgt cgggtggccg atccggtcgg gcggccgacc	360
gtcctgtacg acgagtgtga caccctgttt ggcccgaag ctaaagaaca cgaggaaatt	420
cgcggcgtga tcaacgccgg ccaccgaag ggagccgtcg cgggccgtg cgtcatccgc	480
ggcaagatcg ttgagaccga ggaactgcca gcgtactgtg cggtcgcctt ggccggcctc	540

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gacgacctgc ccgacaccat catgtctcgg tcgatcgtgg tgaggatgcg caggagggca 600
 ccaaccgaac ccgtggagcc gtggcgcccc cgcgtcaacg gccccgaggg cgagaagctg 660
 cacgaccggt tggcgaactg ggcgcccgcc attaacccgc tggaaagcgg ttggccggcg 720
 atgccggacg gggtgaccga ccggcgcgcc gacgtctggg agtccctggg tgcgggttgc 780
 gacaccgcgg gggggcactg gccc aaaacc gcccggtgcaa ccgcagaaac ggatgcaacc 840
 gcaaatcgag gagccaagcc cagcataggc gtgctgctgc tgcgggatat ccgtcgagtc 900
 ttcagcgacc gggaccggat gcgcaccagc gacatcctga ccggactgaa ccggatggag 960
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 cggctcggca gatacggcat cgggccgaag ttccagcaca gtggtggcga accaccctac 1080
 aaagggattt cgcggaccca gttcgaggat gcgtgggtccc ggtatctctc tgccgacgac 1140
 gaaacccccg aggaacgaga tttatcggtt tccgcggttt ccgcggtttc accgccggtt 1200
 ggcgatcccc gtgatgcaac cggcgcaacc gatgcaaccg atctcccgga ggcgggagac 1260
 ttgccgtacg agccgccggc gccc aacggg caccccaacg gcgacgcgcc gctgtgctcc 1320
 gggccgggat gccc aacaa gtcctcagt actgaggcca aggccgccgg caaatgccgg 1380
 ccctgccgag gtcgagcggc ggctagcgct cgggacggcg cccga 1425

<210> 191

<211> 429

<212> PRT

<213> Mycobacterium tuberculosis

<400> 191

Val Ser Val Val Ala Val Thr Ile Phe Val Ala Ala Tyr Val Leu Ile
 1 5 10 15

Ala Ser Asp Arg Val Asn Lys Thr Met Val Ala Leu Thr Gly Ala Ala
 20 25 30

Ala Val Val Val Leu Pro Val Ile Thr Ser His Asp Ile Phe Tyr Ser
 35 40 45

His Asp Thr Gly Ile Asp Trp Asp Val Ile Phe Leu Leu Val Gly Met
 50 55 60

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Met Ile Ile Val Gly Val Leu Arg Gln Thr Gly Val Phe Glu Tyr Thr
 65 70 75 80

Ala Ile Trp Ala Ala Lys Arg Ala Arg Gly Ser Pro Leu Arg Ile Met
 85 90 95

Ile Leu Leu Val Leu Val Ser Ala Leu Ala Ser Ala Leu Leu Asp Asn
 100 105 110

Val Thr Thr Val Leu Leu Ile Ala Pro Val Thr Leu Leu Val Cys Asp
 115 120 125

Arg Leu Asn Ile Asn Thr Thr Ser Phe Leu Met Ala Glu Val Phe Ala
 130 135 140

Ser Asn Ile Gly Gly Ala Ala Thr Leu Val Gly Asp Pro Pro Asn Ile
 145 150 155 160

Ile Val Ala Ser Arg Ala Gly Leu Thr Phe Asn Asp Phe Met Leu His
 165 170 175

Leu Thr Pro Leu Val Val Ile Val Leu Ile Ala Leu Ile Ala Val Leu
 180 185 190

Pro Arg Leu Phe Gly Ser Ile Thr Val Glu Ala Asp Arg Ile Ala Asp
 195 200 205

Val Met Ala Leu Asp Glu Gly Glu Ala Ile Arg Asp Arg Gly Leu Leu
 210 215 220

Val Lys Cys Gly Ala Val Leu Val Leu Val Phe Ala Ala Phe Val Ala
 225 230 235 240

His Pro Val Leu His Ile Gln Pro Ser Leu Val Ala Leu Leu Gly Ala
 245 250 255

Gly Met Leu Ile Val Val Ser Gly Leu Thr Arg Ser Glu Tyr Leu Ser
 260 265 270

Ser Val Glu Trp Asp Thr Leu Leu Phe Phe Ala Gly Leu Phe Ile Met
 275 280 285

Val Gly Ala Leu Val Lys Thr Gly Val Val Asn Asp Leu Ala Arg Ala
 290 295 300

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Ala Thr Gln Leu Thr Gly Gly Asn Ile Val Ala Thr Ala Phe Leu Ile
 305 310 315 320

Leu Gly Val Ser Ala Pro Ile Ser Gly Ile Ile Asp Asn Ile Pro Tyr
 325 330 335

Val Ala Thr Met Thr Pro Leu Val Ala Glu Leu Val Ala Val Met Gly
 340 345 350

Gly Gln Pro Ser Thr Asp Thr Pro Trp Trp Ala Leu Ala Leu Gly Ala
 355 360 365

Asp Phe Gly Gly Asn Leu Thr Ala Ile Gly Ala Ser Ala Asn Val Val
 370 375 380

Met Leu Gly Ile Ala Arg Arg Ala Gly Ala Pro Ile Ser Phe Trp Glu
 385 390 395 400

Phe Thr Arg Lys Gly Ala Val Val Thr Ala Val Ser Ile Ala Leu Ala
 405 410 415

Ala Ile Tyr Leu Trp Leu Arg Tyr Phe Val Leu Leu His
 420 425

<210> 192

<211> 1287

<212> DNA

<213> Mycobacterium tuberculosis

<400> 192

gtgagcgtcg tcgcggtcac catcttcgtg gcggcctacg ttctgattgc cagcgatcgc 60
 gtcaacaaga cgatggtggc gctgaccggc gcggcggccg tggctgtcct accagtgatc 120
 acatcccacg acatcttcta ttcccacgac accggaatcg actgggacgt cattttcttg 180
 ttggtgggca tgatgatcat cgtcggagtg ctgcggcaga cgggggtggt cgaatacacc 240
 gcgatctggg ccgccaagcg cgcccgcggc tcgccgctac gcatcatgat cctgctggta 300
 ttggtgagcg cgttggcgtc agccttgctg gataacgtca ccacggtggt gttgatcgcg 360
 ccggtcacgc tattggtgtg cgaccgggta aacatcaaca cgacgtcggt cctgatggcc 420

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gaagtcttcg cctccaacat tgggtggcgcc gcgacgttgg tgggtgaccc gccgaacatc      480
atcgtggcca gccgggcggg attgacgttc aacgacttca tgctgcactt gacaccgctg      540
gtagtcattg tgctgatcgc cctcatcgct gtgctgcccc gcctgttcgg ctcgatcacg      600
gtcgaagccg atcgaattgc cgatgtcatg gcgctcgacg aggggtgaagc catccgcgac      660
cgcggactgc tgggtcaaatg tggcgccgtg ctgggtgctgg tggtcgcggc ctctgctgcc      720
catccggtgc tgcacatcca gccttctcta gtggcgctgc tgggcgctgg gatgctgac      780
gtgggtctcg gtctgacgcg atccgagtat ctatccagcg tcgagtggga cacgctgctg      840
tttttcgccg ggctgttcat tatggtcgga gcgctgggtca agaccggtgt cgtcaacgat      900
ctcgcgcggg cagcgaccca gctgaccggc ggcaatattg tggccaccgc gttcctaata      960
ctcggcgtct ccgccccgat ctcggaatt atcgacaaca ttccctacgt cgccacgatg     1020
acgcccctcg tcgcggagct ggtcgcggtc atgggggggtc aaccagcac cgacaccccc     1080
tggtgggcgc tggccctggg tgccgacttc ggcggaacc tgaccgcaat cggcgccagc     1140
gcgaacgtcg tcatgtcgg aatcgcccg cgcgcaggag ctcccatctc gttctgggag     1200
ttcacccgca aaggggcggg ggtcacggcc gtctcgatcg cgctcgcggc gatctacctg     1260
tggttgcggt acttcgtgtt gttgcac                                           1287

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<210> 193

<211> 237

<212> PRT

<213> Mycobacterium tuberculosis

<400> 193

```

Met Thr Arg Leu Val Pro Ala Leu Arg Leu Glu Leu Thr Leu Gln Val
1           5           10           15

```

```

Arg Gln Lys Phe Leu His Ala Ala Val Phe Ser Gly Leu Ile Trp Leu
20           25           30

```

```

Ala Val Leu Leu Pro Met Pro Val Ser Leu Arg Pro Val Ala Glu Pro
35           40           45

```

```

Tyr Val Leu Val Gly Asp Ile Ala Ile Ile Gly Phe Phe Phe Val Gly
50           55           60

```

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Gly Thr Val Phe Phe Glu Lys Gln Glu Arg Thr Ile Gly Ala Ile Val
65 70 75 80

Ser Thr Pro Leu Arg Phe Trp Glu Tyr Leu Ala Ala Lys Leu Thr Val
85 90 95

Leu Leu Ala Ile Ser Leu Phe Val Ala Val Val Val Ala Thr Ile Val
100 105 110

His Gly Leu Gly Tyr His Leu Leu Pro Leu Val Ala Gly Ile Val Leu
115 120 125

Gly Thr Leu Leu Met Leu Leu Val Gly Phe Ser Ser Ser Leu Pro Phe
130 135 140

Ala Ser Val Thr Asp Trp Phe Leu Ala Ala Val Ile Pro Leu Ala Ile
145 150 155 160

Met Leu Ala Pro Pro Val Val His Tyr Ser Gly Leu Trp Pro Asn Pro
165 170 175

Val Leu Tyr Leu Ile Pro Thr Gln Gly Pro Leu Leu Leu Leu Gly Ala
180 185 190

Ala Phe Asp Gln Val Ser Leu Ala Pro Trp Gln Val Gly Tyr Ala Val
195 200 205

Val Tyr Pro Ile Val Cys Ala Ala Gly Leu Cys Arg Ala Ala Lys Ala
210 215 220

Leu Phe Gly Arg Tyr Val Val Gln Arg Ser Gly Val Leu
225 230 235

<210> 194

<211> 711

<212> DNA

<213> Mycobacterium tuberculosis

<400> 194

atgacccggt tgggtgcctgc gctgcggctc gagctgacgc tacagggtgcg gcagaagttc 60

ttgcatgccg ccgttttctc cggactgatt tggctggcag tgctgctgcc gatgccggtc 120

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```

agcctgcgcc cggtcgccga accctatgtc ctgggtgggtg atatcgcgat catcgggttc      180
ttcttcgtcg gcgggaccgt gttcttcgag aagcaggagc gcacgatcgg cgcgatcgtc      240
tcgacgccgc tcgcggttctg ggagtacctg gctgccaaac taactgtgct gctggcgatc      300
tcgctgttcg ttgcggttgt cgtggccacc atcgttcacg ggcttgggta ccacctgctg      360
ccgctgggtg ccggcatcgt gctgggcaca ctgctgatgc tgctggtcgg cttcagttcc      420
tcgttgccgt tcgcctcggg gaccgattgg ttcttgggcg cggtcatccc gctcgcgac      480
atgctggcgc cgcgggtggt gcactactcc ggctgtggc ccaaccggg gctttacctc      540
atccccaccc aggggccgct gctcttgctc ggcgcggcgt tcgatcaggt gagcttggcg      600
ccctggcagg tcgggtatgc ggtggtctac ccaatcgtgt gtgcggcggg attgtgccgg      660
gcggccaagg cgctattcgg ccgttatgtc gtgcaaagat cgggtgtgct g              711

```

<210> 195

<211> 657

<212> PRT

<213> Mycobacterium tuberculosis

<400> 195

```

Val Ser Lys Leu Ser Thr Ala Ala Arg Arg Leu Leu Ile Gly Arg Pro
1              5              10              15

```

```

Phe Arg Ser Asp Arg Leu Ser His Thr Leu Leu Pro Lys Arg Ile Ala
                20              25              30

```

```

Leu Pro Val Phe Ala Ser Asp Ala Met Ser Ser Ile Ala Tyr Ala Pro
              35              40              45

```

```

Glu Glu Ile Phe Leu Val Leu Ser Val Ala Gly Leu Ala Ala Tyr Ser
50              55              60

```

```

Met Ala Pro Leu Ile Gly Leu Ala Val Ala Ala Val Leu Leu Val Val
65              70              75              80

```

```

Val Ser Ser Tyr Arg Gln Asn Val His Ala Tyr Pro Ser Gly Gly Gly
              85              90              95

```

```

Asp Tyr Glu Val Val Thr Thr Asn Leu Gly Ala Thr Gly Gly Leu Val

```

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100	105	110
Val Ala Ser Ala Leu Met Val Asp Tyr Val Leu Thr Val Ala Val Ser		
115	120	125
Ile Ser Ser Ala Ala Ser Asn Ile Gly Ser Val Ser Pro Phe Val Tyr		
130	135	140
Glu His Lys Val Leu Phe Ala Val Gly Ala Ile Val Leu Ile Met Ala		
145	150	155 160
Met Asn Leu Arg Gly Val Arg Glu Ser Gly Leu Ala Phe Ala Ile Pro		
	165	170 175
Thr Tyr Ala Phe Ile Ala Gly Ile Gly Thr Met Leu Val Trp Gly Leu		
	180	185 190
Phe Arg Ile Phe Val Leu Gly Asn Pro Val Arg Ala Glu Ser Ala Ala		
	195	200 205
Phe Glu Met His Ala Glu His Gly Gln Ile Val Gly Phe Ala Leu Val		
	210	215 220
Phe Leu Val Ala Arg Ser Phe Ser Ser Gly Cys Ala Ala Leu Thr Gly		
225	230	235 240
Val Glu Ala Ile Ser Asn Gly Val Pro Ala Phe Gln Lys Pro Lys Ser		
	245	250 255
Arg Asn Ala Ala Thr Thr Leu Leu Met Leu Gly Ile Ile Ala Val Ser		
	260	265 270
Met Phe Met Gly Met Ile Val Leu Ala Val Glu Thr Gly Val Gln Val		
	275	280 285
Val Asp Asp Pro Asp Thr Gln Leu Thr Gly Ala Pro Pro Gly Tyr Gln		
	290	295 300
Gln Lys Thr Leu Val Ala Gln Leu Ala Gln Ala Val Phe Gly Gly Phe		
305	310	315 320
Tyr Leu Gly Phe Leu Leu Ile Ala Ala Val Thr Ala Leu Ile Leu Val		
	325	330 335

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Leu Ala Ala Asn Thr Ala Phe Asn Gly Phe Pro Val Leu Gly Ser Val
 340 345 350

Leu Ala Gln His Ser Tyr Leu Pro Arg Gln Leu His Thr Arg Gly Asp
 355 360 365

Arg Leu Ala Phe Ser Asn Gly Ile Leu Phe Leu Ala Ala Ala Ala Ile
 370 375 380

Gly Ala Val Val Ala Phe Arg Ala Glu Leu Thr Ala Leu Ile Gln Leu
 385 390 395 400

Tyr Ile Val Gly Val Phe Ile Ser Phe Thr Met Ser Gln Val Gly Met
 405 410 415

Val Arg His Trp Thr Arg Leu Leu Ser Ala Glu Thr Asp Pro Arg Ala
 420 425 430

Arg Arg Ala Met Leu Arg Ser Arg Ala Val Asn Thr Val Gly Phe Val
 435 440 445

Ser Thr Gly Thr Val Leu Leu Ile Val Leu Val Thr Lys Phe Leu Ala
 450 455 460

Gly Ala Trp Ile Ala Ile Val Ala Met Gly Gly Phe Phe Met Met Met
 465 470 475 480

Lys Leu Ile His Arg His Tyr Asp Ala Val Asn Arg Glu Leu Ala Glu
 485 490 495

Gln Ala Glu Glu Ala Glu Ile Thr Leu Pro Ser Arg Asn His Ala Val
 500 505 510

Val Leu Val Ser Lys Leu His Leu Pro Thr Leu Arg Ala Leu Thr Tyr
 515 520 525

Ala Arg Ala Thr Arg Pro Asp Val Leu Glu Ala Val Thr Val Asn Val
 530 535 540

Asp Asp Ala Glu Thr Arg Glu Leu Val Arg Gln Trp Gln Asp Ser Asp
 545 550 555 560

Val Ser Val Pro Leu Lys Val Ile Ala Ser Pro Tyr Arg Glu Ile Thr
 565 570 575

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Arg Pro Val Leu Asp Tyr Val Lys Arg Val Ser Lys Glu Ser Pro Arg
 580 585 590

Thr Val Val Thr Val Phe Ile Pro Glu Tyr Val Val Gly Arg Trp Trp
 595 600 605

Glu Gln Leu Leu His Asn Gln Ser Ala Leu Arg Leu Lys Gly Arg Leu
 610 615 620

Leu Phe Met Pro Gly Val Met Val Thr Ser Val Pro Trp Gln Leu Thr
 625 630 635 640

Ser Ser Glu Arg Ile Lys Thr Leu Gln Pro His Ala Ala Pro Gly Asp
 645 650 655

Thr

<210> 196

<211> 1971

<212> DNA

<213> Mycobacterium tuberculosis

<400> 196

```

gtgtccaaac tttcaaccgc ggcgcgtcgg ttgctgatcg gccggccggt tcgcagtgac      60
cggctcagtc acaccttggt gcccaagcgg atcgcccttgc cgggtgttcgc ctcggatgcg      120
atgtcgtcga tagcctacgc ccccgaggag atattttctgg tgctctcggg gcccggcctg      180
gcggcctatt cgatggcgcc gttgatcggc ctggcggtcg ccgcggttct gctcgtggtg      240
gtgtctagtt accggcagaa cgtgcacgct taccctccg gtgggggcga ctacgaggtt      300
gtcaccacca acctgggtgc taccggcggg ctctgtggtg ccagcgccct gatggtggat      360
tacgtttctca ccgttgctgt ttcgatatcg tcggcggcgt ccaacatcgg ctctgtgagc      420
ccgttcgtgt acgagcacia ggtgttggtt gccgtcggcg cgatcgtgct gatcatggcg      480
atgaacttgc gtgggggttcg ggaatccggg ttggcgttcg cgatcccgac ctatgcgttc      540
atcgccggaa tcggcaccat gctcgtgtgg gggttgttcc ggattttcgt gctgggcaat      600
ccggttcggg ccgagtcgcg ggcttttgaa atgcacgcag agcacggcca gatcgtcggg      660

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ccgggttatc agcaaaagac gctggtcgca caactggcgc aggccgtggt cgggggcttt 960
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<210> 197

<211> 549

<212> PRT

<213> Mycobacterium tuberculosis

<400> 197

Val Ser Thr Thr Ser Ala Arg Pro Glu Arg Pro Lys Leu Arg Ala Leu

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1	5	10	15
Thr Gly Arg Val Gly Gly Gln Ala Leu Gly Gly Leu Leu Gly Leu Pro	20	25	30
Arg Ala Thr Thr Arg Tyr Thr Val Gly His Val Arg Val Pro Met Arg	35	40	45
Asp Gly Val Gln Leu Val Ala Asp His Tyr Ala Pro Ala Thr Ser Gln	50	55	60
Pro Val Gly Thr Leu Leu Val Arg Gly Pro Tyr Gly Arg Arg Phe Pro	65	70	75
Phe Ser Leu Val Phe Ala Arg Ile Tyr Ala Ala Arg Gly Tyr His Val	85	90	95
Val Leu Gln Ser Val Arg Gly Thr Phe Gly Ser Gly Gly Val Phe Glu	100	105	110
Pro Met Val Asn Glu Ala Ala Asp Gly Ala Asp Thr Val Ala Trp Leu	115	120	125
Arg Glu Gln Pro Trp Phe Thr Gly Arg Phe Gly Thr Ile Gly Leu Pro	130	135	140
Tyr Leu Gly Phe Thr Gln Trp Ala Leu Leu His Asp Pro Pro Pro Glu	145	150	155
Leu Ala Ala Ala Val Ile Thr Val Gly Pro His Asp Phe Arg Ala Ser	165	170	175
Val Trp Gly Thr Gly Ser Phe Thr Val Asn Asp Phe Leu Gly Trp Ser	180	185	190
Asp Leu Val Ser His Gln Glu Asp Pro Gly Arg Ile Arg Ala Gly Ile	195	200	205
Arg Gln Leu Thr Ala Pro Arg Arg Val Ala Arg Thr Ala Ala Thr Leu	210	215	220
Pro Leu Gly Glu Ser Ala Arg Thr Leu Leu Gly Thr Gly Ala Pro Trp	225	230	235
			240

Phe	Glu	Ser	Trp	Val	Glu	His	Thr	Asp	Arg	Asp	Asp	Pro	Phe	Trp	Asp	
				245					250					255		
Arg	Leu	Arg	Phe	Pro	Ala	Ala	Leu	Asp	Arg	Val	Gln	Val	Pro	Val	Leu	
				260					265					270		
Leu	Val	Gly	Gly	Trp	Gln	Asp	Ile	Phe	Leu	Arg	Gln	Thr	Leu	Gln	Gln	
				275					280					285		
Tyr	Arg	His	Leu	Arg	Asp	Arg	Gly	Val	His	Val	Ala	Leu	Thr	Val	Gly	
				290					295					300		
Pro	Trp	Thr	His	Thr	Gln	Met	Leu	Thr	Lys	Gly	Leu	Ala	Thr	Gly	Ala	
305				310				315				320				
Arg	Glu	Ser	Leu	Asp	Trp	Leu	Asp	Ala	His	Leu	Gly	Arg	Ala	Pro	Ala	
				325					330					335		
Leu	Arg	Pro	Ser	Pro	Val	Arg	Val	Phe	Val	Thr	Gly	Gln	Gly	Trp	Arg	
				340					345					350		
His	Leu	Pro	Asp	Trp	Pro	Pro	Ala	Thr	Thr	Glu	Arg	Ala	Trp	Tyr	Leu	
				355					360					365		
Gln	Pro	Gly	Gly	Arg	Leu	Gly	Glu	Ser	Ala	Pro	Ala	Ser	Gly	Thr	Pro	
				370					375					380		
Pro	Ala	Thr	Phe	Arg	Tyr	His	Pro	Ala	Asp	Pro	Thr	Pro	Thr	Thr	Gly	
385				390				395				400				
Gly	Pro	Leu	Leu	Ser	Ser	Asn	Gly	Gly	Tyr	Arg	Asp	Asp	Ser	Arg	Leu	
				405					410					415		
Ala	Thr	Arg	Ala	Asp	Val	Leu	Cys	Phe	Thr	Gly	Ala	Pro	Leu	Thr	His	
				420					425					430		
Asp	Leu	Cys	Val	His	Gly	Asn	Pro	Val	Val	Glu	Leu	Val	His	Ser	Ser	
				435					440					445		
Asp	Asn	Pro	Tyr	Val	Asp	Val	Phe	Val	Arg	Val	Ser	Glu	Val	Asp	Ala	
				450					455					460		
Lys	Gly	Arg	Ser	Arg	Asn	Val	Ser	Asp	Gly	Tyr	Arg	Arg	Leu	Gly	Asp	
465				470				475				480				

Arg Ala Asp Ser Arg Ile Arg Val Leu Ile Ala Gly Ser Trp Phe Pro
500 505 510

Arg Tyr Ala Arg Asn Leu Gly Thr Pro Glu Pro Ile Leu Thr Gly Arg
515 520 525

Gln Leu Lys Pro Ala Thr His Ala Val His Phe Gly Arg Ser Arg Leu
530 535 540

Leu Leu Pro Val Gly
545

<210> 198

<211> 1647

<212> DNA

<213> Mycobacterium tuberculosis

<400>	198						
gtgagtacca	cctccgctcg	gcccgagcgg	cccaagctgc	gcgccctgac	cggacgagtc		60
gggtgggcagg	ccctgggcgg	actgttggg	ctgccccgcg	caaccacccg	ctacaccgtc		120
ggtcacgtcc	gagtcgccat	gcgcgacggc	gtccagctgg	tggccgacca	ctacgcaccc		180
gccacgtcgc	agcccgtcgg	caccctgctg	gtgcgtgggc	catacgggcg	ccggtttccg		240
ttttcgctgg	tgtttgccag	gatttacgcc	gcccgcgggt	atcacgtcgt	gctgcagagc		300
gtgcgcggga	cgttcgggtc	cgggtggcgtg	ttcgagccca	tgggtcaacga	ggccgcccac		360
ggcgccgata	cgggtggcgtg	gctgcgtgaa	cagccctgg	tcaccggccg	gttcgggcacc		420
atcggcctgc	cctatctggg	tttcacccag	tgggcgttgc	tgcacgatcc	gcccccgag		480
ctggccgcgg	ccgtgatcac	ggtggggccg	cacgacttcc	gggcctcgg	gtggggcacc		540
ggatcgttta	cgggtcaacga	cttcctgggc	tggagcgatc	tggtttccca	ccaggaagac		600
cccggtcgca	tccgggccgg	aatccgccag	ctcaccgcgc	cgcgacgggt	ggcgcggaag		660
gccgccacgt	tgccgctggg	tgagtcggcc	cggacgctgc	tcggcacggg	tgcgccgtgg		720
ttcgaatcct	gggtggaaca	caccgaccgc	gacgatccgt	tctggggaccg	actgcggttt		780

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ccccccgcgt tggaccgcgt ccaggccccg gtgctgctcg tcggcggctg gcaggacatc      840
ttcctgcggc agacgctgca gcagtaccgg cacctgcgcg accgggggtgt gcacgtcgcg      900
ctgacggctcg gtccctggac acacacccag atgctcacca aggggctggc caccggcgct      960
cgggaatcgt tggactggtt ggacgcccac ctcggccggg cgccggcgct gcgccccagc     1020
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accaccgagc gggcggtgta cctgcagccc ggtggccgcc tgggtgagag cgctccggct     1140
tccggcacgc caccggcgac gtttcgctac caccgcgccg acccgacacc gaccaccggt     1200
ggtccgctac tgtcatcaa cggcggttac cgcgacgaca gccggctggc cacgcgcgcc     1260
gatgtgctgt gcttcaccgg ggcgcccctc acccacgacc tctgcgtgca cggaaacccc     1320
gtcgtcgagc tgggtgcacag ctcggaacaac ccctacgtcg acgtgttcgt tcgggtcagc     1380
gaggtggacg cgaagggccg gtcccgaat gtcagcgacg gctaccggcg ccttgggtgac     1440
gcgcccggagc tgggtccgct cgagctggac gccatcgccc accgattccg cgccgactcc     1500
cgcatccggg tgctgatcgc cggtagttgg tttccccgct atgcgcgaaa cctcggcacc     1560
ccggaaccga tactcaccgg acggcagctc aagccggcta cccacgcggt gcatttcggg     1620
cgctcccggc tgctgctgcc cgtcggc                                     1647

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<210> 199

<211> 469

<212> PRT

<213> Mycobacterium tuberculosis

<400> 199

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Val Ala Val Gly Asp Asp Glu Glu Lys Val Arg Ala Glu Arg Ala Arg
1              5              10              15

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Ala Ile Gly Leu Phe Arg Tyr Gln Leu Ile Trp Glu Ala Ala Asp Ala
20              25              30

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Ala His Ser Thr Lys Gln Arg Gly Lys Met Val Arg Glu Leu Ala Ser
35              40              45

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Arg Glu His Thr Asp Pro Phe Gly Arg Arg Val Arg Ile Ser Arg Gln
50              55              60

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Thr Ile Asp Arg Trp Ile Arg Gly Trp Arg Ala Gly Gly Phe Asp Ala
65 70 75 80

Leu Val Pro Asn Pro Arg Gln Cys Thr Pro Arg Thr Pro Ala Glu Val
85 90 95

Leu Glu Leu Ala Val Ala Leu Arg Arg Glu Asn Pro Gln Arg Thr Ala
100 105 110

Ala Ala Ile Arg Arg Ile Leu Arg Thr Gln Leu Gly Trp Ala Pro Asp
115 120 125

Glu Arg Thr Leu Gln Arg Asn Phe His Arg Leu Gly Leu Thr Gly Ala
130 135 140

Thr Thr Gly Ser Ala Pro Ala Val Phe Gly Arg Phe Glu Ala Glu His
145 150 155 160

Pro Asn Ala Leu Trp Thr Gly Asp Val Leu His Gly Ile Arg Ile Asp
165 170 175

Leu Arg Lys Thr Tyr Leu Phe Ala Phe Leu Asp Asp His Ser Arg Leu
180 185 190

Val Pro Gly Tyr Arg Trp Gly His Ala Glu Asp Thr Val Arg Leu Ala
195 200 205

Ala Ala Leu Arg Pro Ala Leu Ala Ser Arg Gly Val Pro Asn Ala Val
210 215 220

Tyr Val Asp Asn Gly Ser Pro Tyr Val Asp Ala Trp Leu Leu Arg Ala
225 230 235 240

Cys Ala Lys Leu Gly Val Arg Leu Val His Ser Thr Pro Gly Arg Pro
245 250 255

Gln Gly Arg Gly Lys Ile Glu Arg Phe Phe Arg Thr Val Arg Glu Gln
260 265 270

Phe Leu Val Glu Ile Thr Gly Glu Pro Asp Val Val Gly Arg His Tyr
275 280 285

Val Ala Asp Leu Ala Glu Leu Asn Arg Leu Phe Thr Ala Trp Val Glu
290 295 300

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Thr Val Tyr His Arg Ser Val His Ser Glu Thr Gly Gln Thr Pro Leu
 305 310 315 320

Ala Arg Trp Ser Ala Gly Gly Pro Ile Pro Leu Pro Ala Pro Glu Thr
 325 330 335

Leu Thr Glu Ala Phe Leu Trp Glu Glu His Arg Arg Val Thr Lys Thr
 340 345 350

Ala Thr Val Ser Leu His Gly Asn Arg Tyr Glu Ile Asp Pro Ala Leu
 355 360 365

Val Gly Arg Lys Val Glu Leu Val Phe Asp Pro Phe Asp Leu Thr Arg
 370 375 380

Ile Glu Val Arg Leu Ala Gly Ala Pro Met Arg Arg Ala Ile Pro Tyr
 385 390 395 400

His Ile Gly Arg His Ser His Pro Lys Ala Lys Pro Glu Thr Pro Thr
 405 410 415

Ala Pro Pro Lys Pro Ser Gly Ile Asp Tyr Ala Gln Leu Ile Glu Thr
 420 425 430

Ala His Ala Ala Glu Leu Ala Arg Gly Val Asn Tyr Thr Ala Leu Thr
 435 440 445

Gly Ala Ala Asp Gln Ile Pro Gly Gln Leu Asp Leu Leu Thr Gly Gln
 450 455 460

Glu Ala Gln Pro Lys
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<210> 200

<211> 1407

<212> DNA

<213> Mycobacterium tuberculosis

<400> 200

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60

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atcagccgcc aaaccatcga ccgctggatc cggggctggc gggccggcgg gttcgacgcg 240
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ggcgtcaact acaccgccct caccggggct gccgatcaga tccccggcca gctcgacctg 1380
ctcaccggcc aggaggccca accgaaa 1407

<210> 201

<211> 270

<212> PRT

<213> Mycobacterium tuberculosis

<400> 201

-250-

Met Met His Lys Leu Ile Ser Tyr Tyr Gly Phe Ser Arg Met Pro Phe
 1 5 10 15

Gly Arg Asp Leu Ala Pro Gly Met Leu His Arg His Ser Ala His Asn
 20 25 30

Glu Ala Val Ala Arg Ile Gly Trp Cys Ile Ala Asp Arg Arg Ile Gly
 35 40 45

Val Ile Thr Gly Glu Val Gly Ala Gly Lys Thr Val Ala Val Arg Ala
 50 55 60

Ala Leu Ala Ser Leu Asp Arg Ser Arg His Thr Ile Ile Tyr Leu Pro
 65 70 75 80

Asp Pro Thr Val Gly Val Gln Gly Ile His His Arg Ile Val Ala Ser
 85 90 95

Leu Gly Gly Gln Pro Leu Thr His His Ala Thr Leu Ala Pro Gln Ala
 100 105 110

Ala Asp Ala Leu Ala Ala Glu Gln Ala Glu Arg Gly Arg Thr Pro Val
 115 120 125

Val Val Val Glu Glu Ala His Leu Leu Gly Tyr Asp Gln Leu Glu Ala
 130 135 140

Leu Arg Leu Leu Thr Asn His Asp Leu Asp Ser Ser Ser Pro Phe Ala
 145 150 155 160

Cys Leu Leu Ile Gly Gln Pro Thr Leu Arg Arg Arg Met Lys Leu Gly
 165 170 175

Val Leu Ala Ala Leu Asp Gln Arg Ile Gly Leu Arg Tyr Ala Met Pro
 180 185 190

Pro Met Thr Asp Thr Asn Thr Gly Ser Tyr Leu Arg His His Leu Lys
 195 200 205

Leu Ala Gly Arg Asp Asp Ala Leu Phe Ser Asp Asp Ala Ile Gly Leu
 210 215 220

Ile His Gln Thr Ser Arg Gly Tyr Pro Arg Ala Val Asn Asn Leu Ala
 225 230 235 240

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Leu Gln Ala Leu Val Ala Ala Phe Ala Ala Asp Lys Ala Ile Val Asp
245 250 255

Glu Ser Thr Thr Arg Thr Ala Ile Ala Glu Val Thr Ala Asp
260 265 270

<210> 202

<211> 810

<212> DNA

<213> Mycobacterium tuberculosis

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tgcctcgccg	accgccgcat	cggcgctcatc	accggcggaag	tcggcgcccg	caagaccgtc	180
gccgtgcgcg	ccgcactagc	gagcctggat	cgcagccgcc	acaccatcat	ctacctgccc	240
gacccacccg	tcggcgcca	gggcatccac	caccgcatcg	tcgcctcgct	cggcggacaa	300
cccctcacc	accacgccac	cctggcccca	caggccgccc	acgcgctagc	cgccgaacaa	360
gccgagcgcg	gacgcacccc	cgctcgtggc	gtcgaggaag	cgcacctgct	cggctatgac	420
caactggagg	cgttcgggct	cttgacaaat	cacgacctcg	actcgtcaag	cccgttcgcc	480
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cttgaccagc	gcctcggact	ccgatatgcc	atgccgcccc	tgaccgacac	caacaccggc	600
agctacctac	gccaccacct	caagctagcc	ggacgcgacg	atgccctgtt	ctccgacgac	660
gccatcgggt	tgatccacca	gaccagccgg	ggctaccccc	gcgcggtcaa	caacctcgcc	720
ctgcaagccc	tcgtcgccgc	cttcgccgcc	gacaaggcca	tcgtcgacga	atccaccacc	780
cgcaccgcca	tcgccgaagt	cacggcagac				810

<210> 203

<211> 303

<212> PRT

<213> Mycobacterium tuberculosis

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<400> 203

Met Ala Ala Pro Gln Arg Ala Arg Leu Arg Ser Ser Lys Glu Arg Val
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Arg Asp Tyr Ala Leu Phe Val Val Leu Val Gly Pro Asn Val Ala Leu
 20 25 30

Leu Leu Leu Phe Val Tyr Arg Pro Leu Ala Asp Asn Ile Arg Leu Ser
 35 40 45

Phe Phe Asp Trp Asn Val Ser Asp Pro Ser Ala Arg Phe Val Gly Leu
 50 55 60

Ser Asn Tyr Thr Glu Trp Phe Thr Arg Ser Asp Thr Arg Gln Ile Val
 65 70 75 80

Phe Asn Thr Ala Val Phe Thr Gly Ala Ala Val Val Gly Ser Met Val
 85 90 95

Leu Gly Leu Ala Leu Ala Met Leu Leu Asp Arg Pro Leu Arg Gly Arg
 100 105 110

Asn Leu Val Arg Ser Thr Val Phe Ala Pro Phe Val Ile Ser Gly Ala
 115 120 125

Ala Val Gly Leu Ala Ala Gln Phe Val Phe Asp Pro His Phe Gly Leu
 130 135 140

Ile Gln Asp Leu Leu Arg Arg Ile Gly Val Gly Val Pro Asp Phe Tyr
 145 150 155 160

Gln Asp Ala Arg Trp Ala Leu Phe Met Val Thr Ile Thr Tyr Val Trp
 165 170 175

Lys Asn Leu Gly Tyr Thr Phe Val Ile Tyr Leu Ala Ala Leu Gln Gly
 180 185 190

Val Arg Arg Asp Leu Leu Glu Ala Ala Glu Ile Asp Gly Ala Ser Arg
 195 200 205

Trp Ala Val Phe Arg Arg Val Leu Leu Pro Gln Leu Arg Pro Thr Thr
 210 215 220

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Phe Phe Leu Ser Ile Thr Val Leu Ile Asn Ser Leu Gln Val Phe Asp
 225 230 235 240

Val Ile Asn Val Met Thr Arg Gly Gly Pro Glu Gly Thr Gly Thr Thr
 245 250 255

Thr Met Val Tyr Gln Val Tyr Val Glu Thr Phe Arg Asn Phe Arg Ala
 260 265 270

Gly Tyr Gly Ala Thr Val Ala Thr Ile Met Phe Leu Val Leu Leu Ala
 275 280 285

Val Thr Tyr Tyr Gln Val Arg Val Met Asp Arg Gly Gln Arg Gln
 290 295 300

<210> 204

<211> 909

<212> DNA

<213> Mycobacterium tuberculosis

<400> 204

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ttggccgaca acatccggct gtcgttcttc gactggaacg tctccgatcc gtcggccccga      180
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gtgatcaacg tgatgacccg gggcgggccc gagggcaccg gcaccaccac catggtgtac      780
cagggtgtatg tggagacggt ccgcaatttc cgggccggtt atggcgccac ggtggccacg      840

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atcatgtttcc tgggtgctgct ggccgtgacg tactaccagg tgcggggtgat ggatcggggg 900
cagcggcag 909

<210> 205

<211> 695

<212> PRT

<213> Mycobacterium tuberculosis

<400> 205

Met Val Glu Ser Arg Arg Ala Ala Ala Ala Ala Ser Ala Tyr Ala Ser
1 5 10 15

Arg Cys Gly Ile Ala Pro Ala Thr Ser Gln Arg Ser Leu Ala Thr Pro
20 25 30

Pro Thr Ile Ser Val Pro Ser Gly Glu Gly Arg Cys Arg Cys His Val
35 40 45

Ala Arg Gly Ala Gly Arg Asp Pro Arg Arg Arg Leu Arg Arg Arg Arg
50 55 60

Trp Cys Gly Arg Cys Gly Tyr His Ser His Leu Thr Gly Gly Glu Phe
65 70 75 80

Asp Val Asn Arg Leu Cys Gln Gln Arg Ser Arg Glu Arg Ser Cys Gln
85 90 95

Leu Val Ala Val Pro Ala Asp Pro Arg Pro Lys Arg Gln Arg Ile Thr
100 105 110

Asp Val Leu Thr Leu Ala Leu Val Gly Phe Leu Gly Gly Leu Ile Thr
115 120 125

Gly Ile Ser Pro Cys Ile Leu Pro Val Leu Pro Val Ile Phe Phe Ser
130 135 140

Gly Ala Gln Ser Val Asp Ala Ala Gln Val Ala Lys Pro Glu Gly Ala
145 150 155 160

Val Ala Val Arg Arg Lys Arg Ala Leu Ser Ala Thr Leu Arg Pro Tyr

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	165		170		175
Arg Val Ile Gly Gly Leu Val Leu Ser Phe Gly Met Val Thr Leu Leu	180	185	190		
Gly Ser Ala Leu Leu Ser Val Leu His Leu Pro Gln Asp Ala Ile Arg	195	200	205		
Trp Ala Ala Leu Val Ala Leu Val Ala Ile Gly Ala Gly Leu Ile Phe	210	215	220		
Pro Arg Phe Glu Gln Leu Leu Glu Lys Pro Phe Ser Arg Ile Pro Gln	225	230	235	240	
Lys Gln Ile Val Thr Arg Ser Asn Gly Phe Gly Leu Gly Leu Ala Leu	245	250	255		
Gly Val Leu Tyr Val Pro Cys Ala Gly Pro Ile Leu Ala Ala Ile Val	260	265	270		
Val Ala Gly Ala Thr Ala Thr Ile Gly Leu Gly Thr Val Val Leu Thr	275	280	285		
Ala Thr Phe Ala Leu Gly Ala Ala Leu Pro Leu Leu Phe Phe Ala Leu	290	295	300		
Ala Gly Gln Arg Ile Ala Glu Arg Val Gly Ala Phe Arg Arg Arg Gln	305	310	315	320	
Arg Glu Ile Arg Ile Ala Thr Gly Ser Val Thr Ile Leu Leu Ala Val	325	330	335		
Ala Leu Val Phe Asp Leu Pro Ala Ala Leu Gln Arg Ala Ile Pro Asp	340	345	350		
Tyr Thr Ala Ser Leu Gln Gln Gln Ile Ser Thr Gly Thr Glu Ile Arg	355	360	365		
Glu Gln Leu Asn Leu Gly Gly Ile Val Asn Ala Gln Asn Ala Gln Leu	370	375	380		
Ser Asn Cys Ser Asp Gly Ala Ala Gln Leu Glu Ser Cys Gly Thr Ala	385	390	395	400	

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Pro Asp Leu Lys Gly Ile Thr Gly Trp Leu Asn Thr Pro Gly Asn Lys
 405 410 415

Pro Ile Asp Leu Lys Ser Leu Arg Gly Lys Val Val Leu Ile Asp Phe
 420 425 430

Trp Ala Tyr Ser Cys Ile Asn Cys Gln Arg Ala Ile Pro His Val Val
 435 440 445

Gly Trp Tyr Gln Ala Tyr Lys Asp Ser Gly Leu Ala Val Ile Gly Val
 450 455 460

His Thr Pro Glu Tyr Ala Phe Glu Lys Val Pro Gly Asn Val Ala Lys
 465 470 475 480

Gly Ala Ala Asn Leu Gly Ile Ser Tyr Pro Ile Ala Leu Asp Asn Asn
 485 490 495

Tyr Ala Thr Trp Thr Asn Tyr Arg Asn Arg Tyr Trp Pro Ala Glu Tyr
 500 505 510

Leu Ile Asp Ala Thr Gly Thr Val Arg His Ile Lys Phe Gly Glu Gly
 515 520 525

Asp Tyr Asn Val Thr Glu Thr Leu Val Arg Gln Leu Leu Asn Asp Ala
 530 535 540

Lys Pro Gly Val Lys Leu Pro Gln Pro Ser Ser Thr Thr Thr Pro Asp
 545 550 555 560

Leu Thr Pro Arg Ala Ala Leu Thr Pro Glu Thr Tyr Phe Gly Val Gly
 565 570 575

Lys Val Val Asn Tyr Gly Gly Gly Gly Ala Tyr Asp Glu Gly Ser Ala
 580 585 590

Val Phe Asp Tyr Pro Pro Ser Leu Ala Ala Asn Ser Phe Ala Leu Arg
 595 600 605

Gly Arg Trp Ala Leu Asp Tyr Gln Gly Ala Thr Ser Asp Gly Asn Asp
 610 615 620

Ala Ala Ile Lys Leu Asn Tyr His Ala Lys Asp Val Tyr Ile Val Val
 625 630 635 640

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Gly Gly Thr Gly Thr Leu Thr Val Val Arg Asp Gly Lys Pro Ala Thr
645 650 655

Leu Pro Ile Ser Gly Pro Pro Thr Thr His Gln Val Val Ala Gly Tyr
660 665 670

Arg Leu Ala Ser Glu Thr Leu Glu Val Arg Pro Ser Lys Gly Leu Gln
675 680 685

Val Phe Ser Phe Thr Tyr Gly
690 695

<210> 206

<211> 2085

<212> DNA

<213> Mycobacterium tuberculosis

<400> 206

atggttgagt cgagacgagc tgctgcggcg gcttcggcat acgcaagcag atgcggggatt	60
gcacccgcga cctcgcaacg ctactggcg acaccaccga cgatctcggg cccgtccggg	120
gagggccgct gccgttgcca cgctcgcaagg ggtgccggtc gtgaccacg acggcgactt	180
cgacgccgtc gatggtgtgg ccgatgtggc tatcattcgc atctgacggg tggcgagttc	240
gacgtgaacc gactctgtca acagcgctcg cgtgagcggg cctgccaact cgttgccgtc	300
ccggcagatc caagacctaa acggcaacga ataaccgatg tgttgaccct cgcactagtc	360
ggcttcctcg gcggcctcat caccggaata tcaccatgca ttctgccggg cctgccagta	420
atcttcttct cgggcgcgca gagcgtcgat gcagcgcagg tggcgaaacc cgaaggcgcc	480
gtagcagtcc ggcgcaaacg tgcgctatca gcgacattgc ggccctaccg ggtgatcggg	540
ggtctggtgc tcagtttcgg catggtcacc ctgctcgggt cggcattgct gtcagtgtg	600
catctaccgc aggacgccat ccgctggggc gcactggctg ccttggtggc aatcggcgcc	660
ggcctcattt tcccgcgggt tgaacaactt ctggaaaaac cgttctcccg tattccgcag	720
aagcaaatac tactcgcag caacggtttc gggctgggtc tagccctggg cgtgtgttat	780
gtcccctgcg ccggcccgat tctagctgcg atcgtcgtgg ccggggctac tgccaccatc	840
gggttgggaa ccgtcgtgct caccgcgaca ttcgcactcg gagccgcggt gccgttgttg	900

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ttcttcgccc tcgccggcca acggatagct gagcgggtgg gcgcttttcg gcgccgccag      960
cgtgagatca ggatcgccac cggttccgtg acgatacctgc tggcgggtggc gttgggtgttc    1020
gatctgccgg ccgcgctgca gcgggctatt cctgactaca ccgcatcgct gcagcagcag      1080
atcagcacccg gcacggagat acgggaacaa ctgaaccttg gcggcatcgt caacgcccag      1140
aacgcacagc tgtcgaattg cagcgacggg gccgcacaac tcgaaagctg cggcactgca      1200
ccagatctca aaggcatcac cggctggctc aacacgcccg gcaacaagcc gatcgacctg      1260
aaatcattgc gtggcaaggt ggtgctgatt gacttttggg cctactcctg cattaactgc      1320
caacggggcca tccccacgt cgtcggttgg tatcaggcct acaaagacag tggtttggcg      1380
gtcatcggcg tgcacacccc cgagtacgtt ttcgagaagg tcccgggcaa cgtcgccaaa      1440
ggcgcgggcca atctgggcat cagctatccg attgcgctcg acaacaacta cgccacttgg      1500
accaactacc ggaatcgcta ttggcccgcc gagtatctga tcgacgctac cgggacgggtg      1560
cggcacatca agttcggaga aggcgattac aacgtcaccg agacgttggg caggcagttg      1620
ctcaacgatg ccaagcccgg cgtcaaaactc cccagccca gcagcaccac cacgcccgac      1680
cttaccgccg gggccgcact tactcccgag acgtacttcg gagtcggcaa ggtgggtcaac      1740
tacggcgggc gcggcgcata tgacgaaggg tcggccgtgt ttgactacct gccagtttg      1800
gcagccaaca gctttgcact gcgcggccgg tgggcgctgg actatcaggg tgccacgtcc      1860
gacggcaacg acgccgctat caaattgaat taccacgcca aagacgtcta catcgttgtc      1920
ggtggcaccg gcaccctcac ggtcgtgagg gacggaaagc cagccacact accgatcagc      1980
gggcccgcga ccacccatca ggtggtcgcc ggctatcggc tggcgtccga aacacttgag      2040
gtgcggccca gcaagggggt acagggtttt tccttcacct acgga                        2085

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<210> 207

<211> 287

<212> PRT

<213> Mycobacterium tuberculosis

<400> 207

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Val Asn Glu Ala Leu Ile Gly Leu Ala Phe Ala Ala Gly Leu Val Ala
1           5           10          15

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Ala Leu Asn Pro Cys Gly Phe Ala Met Leu Pro Ala Tyr Leu Leu Leu

```

30

Ala Val Ile Ala Ala Ala Gly Arg Leu Gln Gly Ala Leu Ala Gly Trp
245 250 255

-260-

Val Asn Gln His Gly Ala Trp Pro Trp Ala Val Leu Leu Val Val Leu
 260 265 270

Val Val Gly Ala Phe Ala Gly Thr Trp Phe Arg Arg Val Arg Arg
 275 280 285

<210> 208

<211> 861

<212> DNA

<213> Mycobacterium tuberculosis

<400> 208

```

gtgaacgagg cgctgatcgg tttggcgttc gccgccgggt tggtaggctgc gctgaaccca      60
tgccgggtttg ccatgtttgcc ggcctacctg ctgttggtgg tgtatgggca ggattcggcg      120
ggccgggacgg ggccgcttag cgcagtgggc cgagcggcag ccgccacggg cgggatggcg      180
ctgggcttct tgacggtgtt cggcatcttc ggagccctga ccatttcgcg gccacggcg      240
gtgcagcgat acctgcccta tgccacgggt ctgatcgggc tggcgctcat cgcctcggc      300
gggtggctgc tgttgggacg agggctgacg gcgttgacgc cccgatccct cggcgtgcgt      360
tggtctcaa cggtagcggt gggttccatg tatggctacg gcacagcta tgcggttgct      420
tcgctgtcat gcaccatcgg gccgtttctc gcggttaccg gggcaggcct gcggggcggt      480
tcggctcgtc ggagcgtagc gatctatctg gcttatgtcg cgggcctgac cctcgttgct      540
ggcgtgcttg ccgtcgcggc cgcgaccgcg agctcggcgc tggccgaccg cctacggcga      600
atcttgccgt tcgtcaaccg gatcagtggc gcgctgctgg tggtaggtcg gctgtacgtg      660
ggttactacg gtctctacga gctgcgcctg attgccgggt tcggggcgaa tccccaggat      720
gcggtgattg ccgcggccgg ccgcctgcaa ggtgccctgg ctggctgggt taaccagcac      780
ggtgcatggc cttgggcggg gttgctgggt gtgctgggtg tcggtgcctt cgcgggtacc      840
tggtttcggc gggtagcgcg c

```

<210> 209

<211> 413

<212> PRT

<213> Mycobacterium tuberculosis

-261-

<400> 209

Met Leu Thr Val Glu Asp Trp Ala Glu Ile Arg Arg Leu His Arg Ala
 1 5 10 15

Glu Gly Leu Pro Ile Lys Met Ile Ala Arg Val Leu Gly Ile Ser Lys
 20 25 30

Asn Thr Val Lys Ser Ala Leu Glu Ser Asn Gln Gln Pro Lys Tyr Glu
 35 40 45

Arg Ala Pro Gln Gly Ser Ile Val Asp Ala Val Glu Pro Arg Ile Arg
 50 55 60

Glu Leu Leu Gln Ala Tyr Pro Thr Met Pro Ala Thr Val Ile Ala Glu
 65 70 75 80

Arg Ile Gly Trp Glu Arg Ser Ile Arg Val Leu Ser Ala Arg Val Ala
 85 90 95

Glu Leu Arg Pro Val Tyr Leu Pro Pro Asp Pro Ala Ser Arg Thr Thr
 100 105 110

Tyr Val Ala Gly Glu Ile Ala Gln Cys Asp Phe Trp Phe Pro Pro Ile
 115 120 125

Glu Leu Pro Val Gly Phe Gly Gln Thr Arg Thr Ala Lys Gln Leu Pro
 130 135 140

Val Leu Thr Met Val Cys Ala Tyr Ser Arg Trp Leu Leu Ala Met Leu
 145 150 155 160

Leu Pro Ser Arg Cys Ala Glu Asp Leu Phe Ala Gly Trp Trp Arg Leu
 165 170 175

Ile Glu Ala Leu Gly Ala Val Pro Arg Val Leu Val Trp Asp Gly Glu
 180 185 190

Gly Ala Ile Gly Arg Trp Arg Gly Gly Arg Ser Glu Leu Thr Thr Glu
 195 200 205

Cys Gln Ala Phe Arg Gly Thr Leu Ala Ala Lys Val Leu Ile Cys Arg
 210 215 220

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Pro Ala Asp Pro Glu Ala Lys Gly Leu Ile Glu Arg Ala His Asp Tyr
 225 230 235 240

Leu Glu Arg Ser Phe Leu Pro Gly Arg Val Phe Ala Ser Pro Ala Asp
 245 250 255

Phe Asn Ala Gln Leu Gly Ala Trp Leu Ala Leu Val Asn Thr Arg Thr
 260 265 270

Arg Arg Ala Leu Gly Cys Ala Pro Thr Asp Arg Ile Gly Ala Asp Arg
 275 280 285

Ala Ala Met Leu Ser Leu Pro Pro Val Ala Pro Ala Thr Gly Trp Cys
 290 295 300

Thr Ser Leu Arg Leu Pro Arg Asp His Tyr Val Arg Cys Asp Ser Asn
 305 310 315 320

Asp Tyr Ser Val His Pro Gly Val Ile Gly His Arg Val Leu Val Arg
 325 330 335

Ala Asp Leu Glu Arg Val His Val Phe Cys Asp Gly Glu Leu Val Ala
 340 345 350

Asp His Glu Arg Ile Trp Ala Val His Gln Thr Val Ser Asp Pro Ala
 355 360 365

His Val Glu Ala Ala Lys Val Leu Arg Arg Arg His Phe Ser Ala Ala
 370 375 380

Ser Pro Val Val Glu Pro Gln Val Gln Val Arg Ser Leu Ser Asp Tyr
 385 390 395 400

Asp Asp Ala Leu Gly Val Asp Ile Asp Gly Gly Val Ala
 405 410

<210> 210

<211> 1239

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 210
 atgttgactg tggagattg ggctgagatt cgccgattgc atcgcgcgga gggtttgccg 60
 atcaagatga tcgcccgggt gctggggatt tccaagaaca cggatgaagtc agcggttgaa 120
 tcaaaccagc agccgaaata tgaacgggca ccgcaggggt cgatcggtga tgcgggtgag 180
 ccgcggatcc gggagttgtt gcaggcctat ccgacgatgc cggcgacggg gatcgccgag 240
 cggatcggct gggagcgctc gattcgggtg ctctcggcgc ggggtggccga gctgcgcccg 300
 gtgtatctgc cgccggaccc ggcgtcgcgc accacgtatg tggcaggcga aattgcccag 360
 tgcgacttct ggtttccgcc gatcgagttg ccggtagggg tcgggcagac ccgcacggcc 420
 aaacagttgc cgggtctgac catggtgtgc gcctattcgc gctggctgtt ggcgatgctg 480
 ctgcccagca ggtgtgccga ggacctgttc gccggctggg ggcggctgat cgaggcggtg 540
 ggggcgggtgc cgcgggtgtt ggtgtgggat ggcgagggcg cgatcgggcg ctggcgcggc 600
 gggcggtcgg agttgaccac tgagtgtcag gcgttcgcgc gcacgctggc ggccaagggtg 660
 ctcatctgcc ggccggccga cccggaggcc aagggcctca ttgaacgggc ccacgactac 720
 ctggagcgct cgtttttgcc cgggcgggtg tttgcctcgc cggccgattt caacgcccac 780
 ctgggcgcct ggctggcgct ggtgaacacc cgcaccgcgc gggcgctggg ttgtgcgccc 840
 accgatcgca tcggcgcgga tcgggccgcg atgctgagct tgccgcgggt ggcgcgggcc 900
 accgggtggt gcacctcgct gcggctgccc cgggatcact atgtgcgctg cgattccaac 960
 gactactcgg tgcacccggg tgtgatcggg catcgggtgc tgggtgcgcgc cgacctggag 1020
 cgggtgcatg tgttctgcga cggtagctg gtcgccgacc acgagcggat ctgggcggtc 1080
 catcagacgg tctccgatcc cgcacatgtg gaggcggcga aggtgttgcg ccgcgggcac 1140
 ttcagtgcag catcaccggt agttgagccg caggtgcagg tccgctcact gagcgactac 1200
 gatgacgcgc tgggagtcga catcgatggc ggggtggcc 1239

<210> 211

<211> 153

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 211

Val Asp Val Ile Trp Ser Ala Thr Ile Ala Thr Thr Val Ala Thr Gly
 1 5 10 15

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Met Arg Lys Pro Arg Met His Gly Met Pro Pro Ile Thr Ser Gly Ser
20 25 30

Met Val Thr Arg Val Thr Arg Met Ser Ile Arg Leu Ala Gly Asp Ser
35 40 45

Thr Leu Gly Arg Phe Ser Thr Ser Arg Leu Gly Leu Ser Ser Ala Lys
50 55 60

Ser Lys Pro Glu Gly Asp Phe Gly Thr Ala Cys Gly Ala Val Ser Gly
65 70 75 80

Gly Asp Ala Gly Val Val Ala Leu Ala Glu Gly Val Asp Asp Gly Gln
85 90 95

Ser Lys Pro Gly Ala Ala Gly Gly Ala Arg Gly Val Gly Gly Phe Arg
100 105 110

Glu Ser Arg Ala Asp Cys Gly Glu Gln Phe Gly Val Ala Ser Trp Thr
115 120 125

Pro Gln Gly Glu Phe Glu Phe Gly Gly Gln Glu Ala Lys Gly Val Arg
130 135 140

Ser Ser Trp Pro Ala Ser Leu Thr Asn
145 150

<210> 212

<211> 459

<212> DNA

<213> Mycobacterium tuberculosis

<400> 212

gtggatgtca tttggtccgc gaccatcgcg accacagtcg ccaactgggat ggcgaagccc	60
cggatgcatg gcatgcctcc catcacgtcg gggtcgatgg tgacgcgggt gactcgcattg	120
tctataaggc tagccggtga cagcacgtcg gggcggttct ccaccagccg tcttggctta	180
agctcagcca agagcaagcc ggagggagat ttcggcaccg cctgcggcgc ggttttcgggc	240
ggtgacgctg gcgtggttgc gttggctgag ggtgtcgacg atggccagtc caagcccgggt	300

-265-

gccgccggtg gtgcgcgcgg tgcggtggt ttccgcgaga gccgagcggg ttgcggcgag 360
 cagttcggggg ttgcttcgtg gacgccgcag ggcgagttcg agttcgggtg tcaggaggct 420
 aagggggtgc gaagttcgtg gcccgcatcg ctgacgaat 459

<210> 213

<211> 337

<212> PRT

<213> Mycobacterium tuberculosis

<400> 213

Val Ser Val Phe Ala Thr Ala Thr Gly Ile Gly Ser Trp Pro Gly Thr
 1 5 10 15

Ala Ala Arg Glu Ala Ala Gln Val Val Val Gly Glu Leu Ala Gly Ala
 20 25 30

Leu Ala Tyr Leu Thr Glu Leu Pro Ala Arg Gly Val Gly Ala Asp Met
 35 40 45

Leu Gly Arg Ala Gly Gly Leu Leu Val Asp Val Ala Ile Asp Thr Val
 50 55 60

Pro Arg Gly Tyr Arg Ile Ala Ala Arg Pro Gly Ala Val Thr Arg Arg
 65 70 75 80

Ala Ala Ser Leu Leu Asp Glu Asp Met Asp Ala Leu Glu Glu Ala Trp
 85 90 95

Glu Thr Ala Gly Leu Arg Gly Cys Gly Arg Ala Val Lys Val Gln Ala
 100 105 110

Pro Gly Pro Val Thr Leu Val Ala Gly Leu Glu Leu Ala Asn Gly His
 115 120 125

Arg Ala Ile Thr Asp Pro Gly Ala Val Arg Asp Leu Ala Ala Ser Leu
 130 135 140

Ala Glu Gly Val Ala Ala His Arg Ala Ala Leu Ala Arg Arg Leu Asp
 145 150 155 160

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Thr Pro Val Val Val Gln Phe Asp Glu Pro Ser Leu Pro Ala Ala Leu
 165 170 175

Gly Gly Arg Leu Thr Gly Val Thr Ala Leu Ser Pro Val Ala Pro Leu
 180 185 190

Asp Glu Thr Val Ala Glu Ala Leu Leu Asp Thr Cys Ile Ala Ala Val
 195 200 205

Asp Ala Asp Val Ala Leu His Ser Cys Ser Pro Asp Leu Pro Trp Asp
 210 215 220

Leu Leu Gln Arg Ser Arg Ile Ser Ala Val Ser Val Asp Ala Ser Thr
 225 230 235 240

Leu Gln Ala Ala Asp Leu Asp Ala Val Ala Ala Phe Val Glu Ser Gly
 245 250 255

Arg Thr Val Val Leu Gly Leu Val Pro Val Thr Ala Pro Glu Arg Ala
 260 265 270

Pro Ser Met Glu Glu Val Ala Ala Ala Ala Val Ala Val Thr Asp Arg
 275 280 285

Leu Gly Val Pro Arg Ser Ala Leu Arg Asp Arg Leu Gly Val Ser Pro
 290 295 300

Ala Cys Gly Leu Ala Asn Ala Thr Gly Gln Trp Ala Arg Thr Ala Val
 305 310 315 320

Gly Leu Ala Arg Asp Val Ala Glu Ala Phe Ala Arg Asp Pro Glu Ala
 325 330 335

Ile

<210> 214

<211> 1011

<212> PRT

<213> Mycobacterium tuberculosis

-267-

<400> 214

Gly Thr Gly Ala Gly Thr Gly Thr Thr Thr Thr Cys Gly Cys Ala Ala
 1 5 10 15

Cys Gly Gly Cys Cys Ala Cys Cys Gly Gly Gly Ala Thr Cys Gly Gly
 20 25 30

Ala Thr Cys Gly Thr Gly Gly Cys Cys Gly Gly Gly Cys Ala Cys Cys
 35 40 45

Gly Cys Cys Gly Cys Gly Cys Gly Ala Gly Ala Gly Gly Cys Cys Gly
 50 55 60

Cys Gly Cys Ala Gly Gly Thr Cys Gly Thr Gly Gly Thr Cys Gly Gly
 65 70 75 80

Gly Gly Ala Gly Thr Thr Gly Gly Cys Gly Gly Gly Thr Gly Cys Ala
 85 90 95

Thr Thr Gly Gly Cys Cys Thr Ala Thr Cys Thr Cys Ala Cys Cys Gly
 100 105 110

Ala Gly Cys Thr Gly Cys Cys Cys Gly Cys Cys Ala Gly Gly Gly Gly
 115 120 125

Cys Gly Thr Cys Gly Gly Cys Gly Cys Cys Gly Ala Cys Ala Thr Gly
 130 135 140

Cys Thr Gly Gly Gly Gly Cys Gly Ala Gly Cys Cys Gly Gly Cys Gly
 145 150 155 160

Gly Ala Cys Thr Gly Cys Thr Gly Gly Thr Cys Gly Ala Cys Gly Thr
 165 170 175

Gly Gly Cys Gly Ala Thr Thr Gly Ala Cys Ala Cys Cys Gly Thr Gly
 180 185 190

Cys Cys Thr Cys Gly Thr Gly Gly Cys Thr Ala Cys Cys Gly Cys Ala
 195 200 205

Thr Cys Gly Cys Thr Gly Cys Thr Cys Gly Ala Cys Cys Cys Gly Gly
 210 215 220

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Cys Gly Cys Gly Gly Thr Gly Ala Cys Ala Cys Gly Gly Cys Gly Gly
 225 230 235 240

Gly Cys Cys Gly Cys Gly Ala Gly Cys Cys Thr Cys Cys Thr Cys Gly
 245 250 255

Ala Cys Gly Ala Gly Gly Ala Thr Ala Thr Gly Gly Ala Thr Gly Cys
 260 265 270

Cys Thr Thr Ala Gly Ala Ala Gly Ala Gly Gly Cys Cys Thr Gly Gly
 275 280 285

Gly Ala Gly Ala Cys Cys Gly Cys Gly Gly Gly Cys Cys Thr Gly Cys
 290 295 300

Gly Thr Gly Gly Cys Thr Gly Thr Gly Gly Gly Cys Gly Gly Gly Cys
 305 310 315 320

Gly Gly Thr Gly Ala Ala Gly Gly Thr Gly Cys Ala Gly Gly Cys Gly
 325 330 335

Cys Cys Cys Gly Gly Gly Cys Cys Ala Gly Thr Cys Ala Cys Ala Thr
 340 345 350

Thr Gly Gly Thr Cys Gly Cys Gly Gly Gly Gly Thr Thr Gly Gly Ala
 355 360 365

Gly Cys Thr Gly Gly Cys Cys Ala Ala Cys Gly Gly Thr Cys Ala Cys
 370 375 380

Cys Gly Gly Gly Cys Gly Ala Thr Cys Ala Cys Cys Gly Ala Cys Cys
 385 390 395 400

Cys Cys Gly Gly Ala Gly Cys Cys Gly Thr Gly Cys Gly Thr Gly Ala
 405 410 415

Cys Cys Thr Gly Gly Cys Cys Gly Cys Cys Thr Cys Gly Cys Thr Gly
 420 425 430

Gly Cys Cys Gly Ala Ala Gly Gly Cys Gly Thr Thr Gly Cys Cys Gly
 435 440 445

Cys Gly Cys Ala Thr Cys Gly Cys Gly Cys Gly Cys Gly Cys Gly Cys Thr
 450 455 460

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Gly Gly Cys Gly Cys Gly Thr Cys Gly Ala Cys Thr Thr Gly Ala Cys
 465 470 475 480

Ala Cys Ala Cys Cys Gly Gly Thr Gly Gly Thr Gly Gly Thr Gly Cys
 485 490 495

Ala Gly Thr Thr Cys Gly Ala Cys Gly Ala Gly Cys Cys Gly Thr Cys
 500 505 510

Gly Thr Thr Gly Cys Cys Gly Gly Cys Gly Gly Cys Gly Thr Thr Gly
 515 520 525

Gly Gly Cys Gly Gly Cys Cys Gly Gly Cys Thr Gly Ala Cys Cys Gly
 530 535 540

Gly Gly Gly Thr Gly Ala Cys Cys Gly Cys Gly Thr Thr Gly Ala Gly
 545 550 555 560

Cys Cys Cys Gly Gly Thr Thr Gly Cys Cys Cys Cys Gly Cys Thr Cys
 565 570 575

Gly Ala Cys Gly Ala Gly Ala Cys Gly Gly Thr Gly Gly Cys Cys Gly
 580 585 590

Ala Ala Gly Cys Gly Cys Thr Gly Cys Thr Cys Gly Ala Cys Ala Cys
 595 600 605

Thr Thr Gly Cys Ala Thr Cys Gly Cys Gly Gly Cys Thr Gly Thr Cys
 610 615 620

Gly Ala Cys Gly Cys Gly Gly Ala Cys Gly Thr Ala Gly Cys Gly Cys
 625 630 635 640

Thr Ala Cys Ala Cys Ala Gly Cys Thr Gly Cys Ala Gly Thr Cys Cys
 645 650 655

Gly Gly Ala Thr Thr Thr Gly Cys Cys Gly Thr Gly Gly Gly Ala Thr
 660 665 670

Cys Thr Gly Cys Thr Gly Cys Ala Gly Cys Gly Cys Ala Gly Cys Ala
 675 680 685

Gly Ala Ala Thr Thr Ala Gly Thr Gly Cys Gly Gly Thr Ala Thr Cys

-270-

690		695		700
Gly Gly Thr Gly Gly Ala Thr Gly Cys Gly Ala Gly Cys Ala Cys Ala				
705		710		715 720
Cys Thr Gly Cys Ala Gly Gly Cys Thr Gly Cys Gly Gly Ala Thr Thr				
	725		730	735
Thr Gly Gly Ala Thr Gly Cys Thr Gly Thr Cys Gly Cys Gly Gly Cys				
	740		745	750
Ala Thr Thr Thr Gly Thr Cys Gly Ala Gly Thr Cys Gly Gly Gly Cys				
	755		760	765
Cys Gly Ala Ala Cys Cys Gly Thr Cys Gly Thr Gly Cys Thr Gly Gly				
	770		775	780
Gly Cys Cys Thr Gly Gly Thr Cys Cys Cys Gly Gly Thr Gly Ala Cys				
	785		790	795 800
Cys Gly Cys Cys Cys Cys Gly Gly Ala Gly Cys Gly Ala Gly Cys Ala				
	805		810	815
Cys Cys Thr Thr Cys Gly Ala Thr Gly Gly Ala Ala Gly Ala Gly Gly				
	820		825	830
Thr Cys Gly Cys Thr Gly Cys Thr Gly Cys Gly Gly Cys Gly Gly Thr				
	835		840	845
Cys Gly Cys Gly Gly Thr Cys Ala Cys Cys Gly Ala Thr Cys Gly Gly				
	850		855	860
Cys Thr Cys Gly Gly Cys Gly Thr Thr Cys Cys Thr Cys Gly Cys Thr				
	865		870	875 880
Cys Gly Gly Cys Gly Cys Thr Ala Cys Gly Cys Gly Ala Thr Cys Gly				
	885		890	895
Ala Cys Thr Cys Gly Gly Cys Gly Thr Cys Ala Gly Cys Cys Cys Gly				
	900		905	910
Gly Cys Gly Thr Gly Thr Gly Gly Thr Cys Thr Gly Gly Cys Cys Ala				
	915		920	925

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Ala Thr Gly Cys Gly Ala Cys Gly Gly Gly Gly Cys Ala Gly Thr Gly
 930 935 940

Gly Gly Cys Cys Cys Gly Cys Ala Cys Cys Gly Cys Gly Gly Thr Cys
 945 950 955 960

Gly Gly Gly Cys Thr Thr Gly Cys Cys Cys Gly Thr Gly Ala Thr Gly
 965 970 975

Thr Cys Gly Cys Thr Gly Ala Gly Gly Cys Gly Thr Thr Cys Gly Cys
 980 985 990

Gly Cys Gly Gly Gly Ala Cys Cys Cys Ala Gly Ala Gly Gly Cys Cys
 995 1000 1005

Ala Thr Cys
 1010

<210> 215

<211> 81

<212> PRT

<213> Mycobacterium tuberculosis

<400> 215

Val Thr Ala Pro Val Trp Leu Ala Ser Pro Pro Glu Val His Ser Ala
 1 5 10 15

Leu Leu Ser Ala Gly Pro Gly Pro Gly Ser Leu Gln Ala Ala Ala Ala
 20 25 30

Gly Trp Ser Ala Leu Ser Ala Glu Tyr Ala Ala Val Ala Gln Glu Leu
 35 40 45

Ser Val Val Val Ala Ala Val Gly Ala Gly Val Trp Gln Gly Pro Ser
 50 55 60

Ala Glu Leu Phe Val Ala Ala Tyr Val Pro Tyr Val Ala Trp Leu Val
 65 70 75 80

Gln

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<210> 216

<211> 243

<212> DNA

<213> Mycobacterium tuberculosis

<400> 216

```

gtgacggcgc cgggtgtggtt ggcgtcgccg ccggagggtgc attcggcgct gctaagtgtct      60
gggtccggggc cgggttcgtt gcaggcggcc gcggcgggggt ggagcgcgtt aagcgcgcgag      120
tacgccgctg tggcgcaaga gttgagcgtg gtggtggccg cgggtgggggc cggggtgtgg      180
cagggtccca gtgctgagtt gtttgtggcc gcctatgtgc cgtatgtggc gtggttggtg      240
cag                                                                                   243

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<210> 217

<211> 254

<212> PRT

<213> Mycobacterium tuberculosis

<400> 217

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Val Pro Glu Phe Val Asn Val Val Val Ser Asp Gly Ser Gln Asp Ala
1           5           10          15

Gly Leu Ala Met Leu Leu Leu Ser Arg Pro Pro Thr Asn Ala Met Thr
20          25          30

Arg Gln Val Tyr Arg Glu Val Val Ala Ala Ala Asn Glu Leu Gly Arg
35          40          45

Arg Asp Asp Val Ala Ala Val Ile Leu Tyr Gly Gly His Glu Ile Phe
50          55          60

Ser Ala Gly Asp Asp Met Pro Glu Leu Arg Thr Leu Ser Ala Gln Glu
65          70          75          80

Ala Asp Thr Ala Ala Arg Ile Arg Gln Gln Ala Val Asp Ala Val Ala
85          90          95

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Ala Ile Pro Lys Pro Thr Val Ala Ala Ile Thr Gly Tyr Ala Leu Gly
 100 105 110

Ala Gly Leu Thr Leu Ala Leu Ala Ala Asp Trp Arg Val Ser Gly Asp
 115 120 125

Asn Val Lys Phe Gly Ala Thr Glu Ile Leu Ala Gly Leu Ile Pro Ser
 130 135 140

Gly Asp Gly Met Ala Arg Leu Thr Arg Ala Ala Gly Pro Ser Arg Ala
 145 150 155 160

Lys Glu Leu Val Phe Ser Gly Arg Phe Phe Asp Ala Glu Glu Ala Leu
 165 170 175

Ala Leu Gly Leu Ile Asp Asp Met Val Ala Pro Asp Asp Val Tyr Asp
 180 185 190

Ala Ala Ala Ala Trp Ala Arg Arg Phe Leu Asp Gly Pro Pro His Ala
 195 200 205

Leu Ala Ala Ala Lys Ala Gly Ile Ser Asp Val Tyr Glu Leu Ala Pro
 210 215 220

Ala Glu Arg Ile Ala Ala Glu Arg Arg Arg Tyr Val Glu Val Phe Ala
 225 230 235 240

Ala Gly Gln Gly Gly Gly Ser Lys Gly Asp Arg Gly Gly Arg
 245 250

<210> 218

<211> 762

<212> DNA

<213> Mycobacterium tuberculosis

<400> 218

gtgcccagagt tcgtcaacgt cgtgggtcagt gacggctccc aggatgccgg cctggccatg 60

ttgtctctat cgcgaccgcc taccaacgcg atgacccgcc aggtctaccg ggaagtggtc 120

gccgcgggcca acgagctggg gcgacgcgac gacgtggccg cagtgatcct gtatggcggc 180

cacgaaatct tctccgccgg cgacgacatg cccgaactgc ggacattgag cgcgcaggag 240

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```

gccgacaccg ccgcccggat tcggcagcag gccgtcgacg ccgttgccgc gatccccaag    300
ccgaccgtgg ccgccatcac cggatacgcg ttgggtgccg gccttacgct ggccctagcc    360
gccgattggc gagtcagcgg tgacaacgtg aaattcggcg cgaccgagat cctggccggc    420
ctgatcccca gggcgacgg aatggcccgg ctgaccctg cgcccggtcc gagcagagcc    480
aaggagctgg tgttcagcgg gcgcttcttc gacgccgagg aggccttggc gctgggcctg    540
atcgacgaca tgggtggccc cgacgacgtt tacgacgccg cggcggcctg ggcgaggcgc    600
tttcttgacg gcccgccgca cgcgtggcc gcgccaaag ccgggatcag cgacgtctac    660
gagctggcgc cggccgagcg gatcgccgct gagcgtccgc gctatgtcga ggtgttcgcc    720
gctggtcaag gtggtggcag caagggtgac cggggcggcc gt                          762

```

<210> 219

<211> 721

<212> PRT

<213> Mycobacterium tuberculosis

<400> 219

```

Met Gly Ile Ala Leu Thr Asp Asp His Arg Glu Leu Ser Gly Val Ala
1           5           10           15

```

```

Arg Ala Phe Leu Thr Ser Gln Lys Val Arg Trp Ala Ala Arg Ala Ser
          20           25           30

```

```

Leu Asp Ala Ala Gly Asp Ala Arg Pro Pro Phe Trp Gln Asn Leu Ala
          35           40           45

```

```

Glu Leu Gly Trp Leu Gly Leu His Ile Asp Glu Arg His Gly Gly Ser
          50           55           60

```

```

Gly Tyr Gly Leu Ser Glu Leu Val Val Val Ile Glu Glu Leu Gly Arg
65           70           75           80

```

```

Ala Val Ala Pro Gly Leu Phe Val Pro Thr Val Ile Ala Ser Ala Val
          85           90           95

```

```

Val Ala Lys Glu Gly Thr Asp Asp Gln Arg Ala Arg Leu Leu Pro Ala
          100          105          110

```

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Leu Ile Asp Gly Thr Leu Thr Ala Gly Val Gly Leu Asp Ser Gln Val
 115 120 125

Gln Val Thr Asp Gly Val Ala Asp Gly Glu Ala Gly Ile Val Leu Gly
 130 135 140

Ala Gly Leu Ala Glu Leu Leu Leu Val Ala Ala Gly Asp Asp Val Leu
 145 150 155 160

Val Leu Glu Arg Gly Arg Lys Gly Val Ser Val Asp Val Pro Glu Asn
 165 170 175

Phe Asp Pro Thr Arg Arg Ser Gly Arg Val Arg Leu Asp Asn Val Arg
 180 185 190

Val Thr Thr Asp Asp Ile Leu Leu Gly Ala Tyr Glu Ser Ala Leu Ala
 195 200 205

Arg Ala Arg Thr Leu Leu Ala Ala Glu Ala Val Gly Gly Ala Ala Asp
 210 215 220

Cys Val Asp Ser Ala Val Ala Tyr Ala Lys Val Arg Gln Gln Phe Gly
 225 230 235 240

Arg Thr Ile Ala Thr Phe Gln Ala Val Lys His His Cys Ala Asn Met
 245 250 255

Leu Val Ala Ala Glu Ser Ala Ile Ala Ala Val Trp Asp Ala Ala Arg
 260 265 270

Ala Ala Ala Glu Asp Glu Glu Gln Phe Arg Leu Ala Ala Ala Val Ala
 275 280 285

Ala Ala Leu Ala Phe Pro Ala Tyr Ala Arg Asn Ala Glu Leu Asn Ile
 290 295 300

Gln Val His Gly Gly Ile Gly Phe Thr Trp Glu His Asp Ala His Leu
 305 310 315 320

His Leu Arg Arg Ala Leu Val Thr Val Gly Leu Phe Gly Gly Asp Ala
 325 330 335

Pro Val Arg Asp Val Phe Glu Arg Thr Ala Ala Gly Val Thr Arg Ala
 340 345 350

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Ile Ser Leu Asp Leu Pro Ala Gln Ala Glu Glu Leu Arg Ala Arg Ile
 355 360 365

Arg Ser Asp Ala Ala Glu Ile Ala Ala Leu Glu Lys Asp Ala Gln Arg
 370 375 380

Asp Lys Leu Ile Glu Thr Gly Tyr Val Met Pro His Trp Pro Arg Pro
 385 390 395 400

Trp Gly Arg Ala Ala Gly Ala Val Glu Gln Leu Val Ile Glu Glu Glu
 405 410 415

Phe Ser Ala Ala Gly Ile Glu Arg Pro Asp Tyr Ser Ile Thr Gly Trp
 420 425 430

Val Ile Leu Thr Leu Ile Gln His Gly Thr Pro Trp Gln Ile Glu Arg
 435 440 445

Phe Val Glu Lys Ala Leu Arg Gln Gln Glu Ile Trp Cys Gln Leu Phe
 450 455 460

Ser Glu Pro Asp Ala Gly Ser Asp Ala Ala Ser Val Lys Thr Arg Ala
 465 470 475 480

Thr Arg Val Glu Gly Gly Trp Lys Ile Asn Gly Gln Lys Val Trp Thr
 485 490 495

Ser Gly Ala Gln Tyr Cys Ala Arg Gly Leu Ala Thr Val Arg Thr Asp
 500 505 510

Pro Asp Ala Pro Lys His Ala Gly Ile Thr Thr Val Ile Ile Asp Met
 515 520 525

Leu Ala Pro Gly Val Glu Val Arg Pro Leu Arg Gln Ile Thr Gly Asp
 530 535 540

Ser Glu Phe Asn Glu Val Phe Phe Asn Asp Val Phe Val Pro Asp Glu
 545 550 555 560

Asp Val Val Gly Ala Pro Asn Ser Gly Trp Thr Val Ala Arg Ala Thr
 565 570 575

Leu Gly Asn Glu Arg Val Ser Ile Gly Gly Ser Gly Ser Tyr Tyr Glu

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580

585

590

Ala Met Ala Ala Lys Leu Val Gln Leu Val Gln Arg Arg Ser Asp Ala
 595 600 605

Phe Ala Gly Ala Pro Ile Arg Val Gly Ala Phe Leu Ala Glu Asp His
 610 615 620

Ala Leu Arg Leu Leu Asn Leu Arg Arg Ala Ala Arg Ser Val Glu Gly
 625 630 635 640

Ala Gly Pro Gly Pro Glu Gly Asn Ile Thr Lys Leu Lys Val Ala Glu
 645 650 655

His Met Ile Glu Gly Ala Ala Ile Ala Ala Ala Leu Trp Gly Pro Glu
 660 665 670

Ile Ala Leu Leu Asp Gly Pro Gly Arg Val Ile Gly Arg Thr Val Met
 675 680 685

Gly Ala Arg Gly Met Ala Ile Ala Gly Gly Thr Ser Glu Val Thr Arg
 690 695 700

Asn Gln Ile Ala Glu Arg Ile Leu Gly Met Pro Arg Asp Pro Leu Ile
 705 710 715 720

Ser

<210> 220

<211> 2163

<212> DNA

<213> Mycobacterium tuberculosis

<400> 220

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acttcgcaga aggtgcgctg ggcggcgcggt gcatcactgg acgcggcggg ggacgcccgc 120

ccgccgttct ggcagaacct cgccgagctg ggctggctcg gcctgcatat cgacgagcga 180

cacggtggct ctggctatgg cctgtccgag cttgtgggtg tgatcgaaga gctcggctcg 240

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gcgggtggcac cggggctgtt tgtgccgacc gtgatcgctt cagcgggtggc cgccaaagaa 300
gggtactgatg accaacgggc acggctgttg ccggcgctga ttgacggaac cctgacggcg 360
gggtgtgggac tggatagtca ggtgcagggt accgacggtg ttgccgacgg tgaggcgggga 420
atcgtgtttg gcgccgggct tgccgagctg ctgttggttg ccgccgggtga cgacgtgctg 480
gtgttggaac gcggccgcaa gggcgtctcg gttgatgtgc cggaaaactt tgatccgacc 540
cggcggagtg gccgcgtgcg cctggacaac gtgcgcgtca cgaccgacga catcctgctt 600
ggtgcgtatg aatcggcttt ggcccgcgcg cgcacattgc tggccgcca ggcgctcggc 660
ggggcgggcg actgcgtgga cagcgccgtg gcctatgcca aggtgcgaca gcaattcggc 720
cgtaccatcg ccacgtttca agcgggtgaag catcactgcg cgaacatgct ggtggccgcc 780
gagtcggcga tcgccgcggc ctgggatgcc gcgcgtgcgg cagcagagga tgaggagcag 840
tttcggctgg ccgccgcggc cgctgcggcc ctggcgcttc cggcctatgc acgcaatgcc 900
gagctcaaca tccagggtgca cggcgggtatt ggctttacct gggagcatga cgcgcatctg 960
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gatgcacagc gcgacaagct gatcgagacg ggctatgtga tgccgcattg gcccaggccg 1200
tggggtcgtg ccgcggggcg ggtggagcag ttggtgatcg aggaagagtt cagcgcggcg 1260
ggcatcgagc gcccgatta ctcgatcacc ggggtgggtga tcttgacgct gattcagcac 1320
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tgccaactgt tctccgaacc tgacgcgggg tctgacgcgg cctcgggtcaa gaccgcgca 1440
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gacgttgtcg gggcgccgaa ctccgggtgg acggtggcg gcggcaacgct gggcaacgag 1740
cgggtcagca tcggcggcag tggctcgtac tacgaagcaa tggcggcgaa gctggtgcaa 1800
ttggtccagc ggcggtcaga tgcgtttgcg ggcgccccaa ttcgagtcgg cgctttctc 1860
gcagaggatc acgcactgcg gctgctgaac ctgcgccgtg ccgctcgag cgtcgaagga 1920
gccggccctg gtccggaggg caacatcacc aagctcaaag tggcagagca catgatcgag 1980

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ggcgccgccca tcgcggcgc gctatggggg cccgagattg cgttgctgga cggccccggc 2040
 aggggtgattg gccgaacggt gatgggcgcc cgtggcatgg cgatcgccgg cggcacgtcg 2100
 gaggtgaccc gcaatcagat tgccgagcgg atcctgggca tgccgcgtga tcccctgatt 2160
 agc 2163

<210> 221

<211> 141

<212> PRT

<213> Mycobacterium tuberculosis

<400> 221

Met Val Lys Asp Leu Asp Arg Arg Leu Ala Gly Cys Leu Pro Ala Val
 1 5 10 15

Leu Ser Leu Phe Arg Leu Val Tyr Gly Leu Leu Phe Ala Gly Tyr Gly
 20 25 30

Ser Met Ile Leu Phe Gly Trp Pro Val Thr Ser Ala Gln Pro Val Glu
 35 40 45

Phe Gly Ser Trp Pro Gly Trp Tyr Ala Gly Val Ile Glu Leu Val Ala
 50 55 60

Gly Leu Leu Ile Ala Thr Gly Leu Phe Thr Arg Ala Val Ala Phe Val
 65 70 75 80

Ala Ser Gly Glu Met Ala Val Ala Tyr Phe Trp Met His Gln Pro Tyr
 85 90 95

Ala Leu Trp Pro Ile Gly Gly Pro Pro Asp Gly Asn Gly Gly Thr Pro
 100 105 110

Ala Ile Leu Phe Cys Phe Gly Phe Phe Leu Leu Val Phe Thr Gly Gly
 115 120 125

Gly Ile Tyr Ser Ile Asp Ala Arg Arg Thr Val Thr Ala
 130 135 140

<210> 222

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<211> 423

<212> DNA

<213> Mycobacterium tuberculosis

<400> 222

```

atgggtgaaag atctcgaccg tcggctcgcc ggctgtttgc cggctgtgct gagcctcttt      60
cggttggtat acgggctgct gttcgccggc tacggatcga tgatcctttt cggctggccc      120
gtcacctcgg ctcaaccctg cgaatttgga tcctggccccg gctggtatgc cggggtcacg      180
gagttggtgg caggtctgct gatcgcaacc gggctgttta cccgcgctgt ggcgttcggt      240
gcctcggggc aaatggcggt cgcctacttc tggatgcacg aaccgtatgc actgtggccg      300
atcggcggtc caccggacgg caatggcgga actccggcga tactgttctg cttcggcttc      360
ttcctgctgg tgttcaccgg tgggtgggac tactcaattg atgctcgacg cactgtcact      420
gca                                                                    423

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<210> 223

<211> 437

<212> PRT

<213> Mycobacterium tuberculosis

<400> 223

```

Val Val Ser Tyr Val Val Ala Leu Pro Glu Val Met Ser Ala Ala Ala
1           5           10          15

Thr Asp Val Ala Ser Ile Gly Ser Val Val Ala Thr Ala Ser Gln Gly
          20          25          30

Val Ala Gly Ala Thr Thr Thr Val Leu Ala Ala Ala Glu Asp Glu Val
          35          40          45

Ser Ala Ala Ile Ala Ala Leu Phe Ser Gly His Gly Gln Asp Tyr Gln
          50          55          60

Ala Leu Ser Ala Gln Leu Ala Val Phe His Glu Arg Phe Val Gln Ala
65          70          75          80

```

Leu	Thr	Gly	Ala	Ala	Lys	Gly	Tyr	Ala	Ala	Ala	Glu	Leu	Ala	Asn	Ala	
				85					90						95	
Ser	Leu	Leu	Gln	Ser	Glu	Phe	Ala	Ser	Gly	Ile	Gly	Asn	Gly	Phe	Ala	
			100					105					110			
Thr	Ile	His	Gln	Glu	Ile	Gln	Arg	Ala	Pro	Thr	Ala	Leu	Ala	Ala	Gly	
		115					120					125				
Phe	Thr	Gln	Val	Pro	Pro	Phe	Ala	Ala	Ala	Gln	Ala	Gly	Ile	Phe	Thr	
	130					135					140					
Gly	Thr	Pro	Ser	Gly	Ala	Ala	Gly	Phe	Asp	Ile	Ala	Ser	Leu	Trp	Pro	
145				150						155					160	
Val	Lys	Pro	Leu	Leu	Ser	Leu	Ser	Ala	Leu	Glu	Thr	His	Phe	Ala	Ile	
			165						170					175		
Pro	Asn	Asn	Pro	Leu	Leu	Ala	Leu	Ile	Ala	Ser	Asp	Ile	Pro	Pro	Leu	
			180					185					190			
Ser	Trp	Phe	Leu	Gly	Asn	Ser	Pro	Pro	Pro	Leu	Leu	Asn	Ser	Leu	Leu	
		195					200					205				
Gly	Gln	Thr	Val	Gln	Tyr	Thr	Thr	Tyr	Asp	Gly	Met	Ser	Val	Val	Gln	
	210					215					220					
Ile	Thr	Pro	Ala	His	Pro	Thr	Gly	Glu	Tyr	Val	Val	Ala	Ile	His	Gly	
225					230					235					240	
Gly	Ala	Phe	Ile	Leu	Pro	Pro	Ser	Ile	Phe	His	Trp	Leu	Asn	Tyr	Ser	
			245						250					255		
Val	Thr	Ala	Tyr	Gln	Thr	Gly	Ala	Thr	Val	Gln	Val	Pro	Ile	Tyr	Pro	
			260					265					270			
Leu	Val	Gln	Glu	Gly	Gly	Thr	Ala	Gly	Thr	Val	Val	Pro	Ala	Met	Ala	
		275					280					285				
Gly	Leu	Ile	Ser	Thr	Gln	Ile	Ala	Gln	His	Gly	Val	Ser	Asn	Val	Ser	
	290					295					300					
Val	Val	Gly	Asp	Ser	Ala	Gly	Gly	Asn	Leu	Ala	Leu	Ala	Ala	Ala	Gln	
305					310					315					320	

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Tyr Met Val Ser Gln Gly Asn Pro Val Pro Ser Ser Met Val Leu Leu
 325 330 335

Ser Pro Trp Leu Asp Val Gly Thr Trp Gln Ile Ser Gln Ala Trp Ala
 340 345 350

Gly Asn Leu Ala Val Asn Asp Pro Leu Val Ser Pro Leu Tyr Gly Ser
 355 360 365

Leu Asn Gly Leu Pro Pro Thr Tyr Val Tyr Ser Gly Ser Leu Asp Pro
 370 375 380

Leu Ala Gln Gln Ala Val Val Leu Glu His Thr Ala Val Val Gln Gly
 385 390 395 400

Ala Pro Phe Ser Phe Val Leu Ala Pro Trp Gln Ile His Asp Trp Ile
 405 410 415

Leu Leu Thr Pro Trp Gly Leu Leu Ser Trp Pro Gln Ile Asn Gln Gln
 420 425 430

Leu Gly Ile Ala Ala
 435

<210> 224

<211> 1311

<212> DNA

<213> Mycobacterium tuberculosis

<400> 224

gtggtgtcatt atgttggtgc gttgccggag gtgatgtccg ccgcggccac agacgtggct	60
tcgattgggtt cgggtggtcgc gacggcgagc cagggtgtcg cgggtgccac cacgacggta	120
ttagccgctg ccgaggacga ggtgtcagcc gcgatcgcg ctttggtttc cggccatggg	180
caggactatc aagctcttag cgcacagctt gcggtgtttc atgagcgggt tgtgcaggca	240
ttgacaggcg cggccaaggg gtatgccgcc gccgagctgg, ccaacgcttc gctgttgacg	300
agtgaattcg ccagcgggtat cgggaacggg ttgtccacga ttcaccagga aattcagcgg	360
gccccacgg cgctggccgc cggattcacg caggttccgc ctttcgcggc ggcgcaggca	420

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```

gggatcttca cccgcacgcc gtcaggggct gccggattcg acatcgcttc gctgtggccg      480
gtgaaacccc tgctgagttt gtctgcgctc gaaactcact ttgcaatccc aaacaatcca      540
cttttagcgc tcattgccag cgacataccg ccgctgtcgt ggtttcttgg caactcccca      600
ccgccgttgc tgaactcgct gctgggacag acggtccagt acaccaccta tgacgggatg      660
agcgtcgtgc agatcacgcc ggctcatcca accggcgaat acgtgggtgc cattcacggc      720
ggcgcgttta tcctgccgcc gtcaatcttc cactgggtca actactcggg gacggcttac      780
cagaccggcg cgaccgtgca agtgccgatt tacccggttg tgcaggaagg aggcactgcc      840
gggacggtag taccggcgat ggccgggctc atctccacgc aaatcgcgca acacggggtc      900
tccaaagtca gcgtggtcgg ggactccgcg gccggcaacc tcgcactggc ggccgccc aa      960
tacatggtga gccagggcaa ccagtagccg tcgtccatgg tgttgctgtc cccgtggctc     1020
gatgtgggga cctggcagat cagccaggcg tgggcaggca atcttgcggt caacgacccg     1080
ctggtcagtc cgctgtatgg gtcgctgaac ggtcttccgc cgacgtatgt ctattcgggc     1140
tcgcttgatc cgctcgaca acaagcggtt gtcctcgagc acacagccgt agtccaagga     1200
gcgcogttca gcttcgtact ggccccctgg caaatccacg actggatact gctcaccccc     1260
tggggtttgc tgtcctggcc gcagattaac cagcaactcg gtatcgccgc c              1311

```

<210> 225

<211> 527

<212> PRT

<213> Mycobacterium tuberculosis

<400> 225

```

Met Arg Ser Trp Trp Gly Trp Gly Thr Val Glu Asp Ala Leu Ser Asp
1          5          10          15

```

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Gln Glu Thr Gln Ala Leu Gln Ser Arg Val Ala Ala Leu Val Ser Gly
20          25          30

```

```

His Asp Leu Ser Asp His Pro Pro Pro Asp Leu Thr Ala Leu Gly Leu
35          40          45

```

```

Ala Ala Pro Arg Val Ser Pro Pro Ala Ser Leu Ala Ala Leu Cys Ser
50          55          60

```

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Ser Asp Leu Val Asp Arg Ala Gly His Ala Arg Gly Lys Ala Tyr Arg
65 70 75 80

Asp Ile Ala Arg Asn Leu Gln Gly Gln Leu Asp His Leu Pro Asp Leu
85 90 95

Ile Ala Arg Pro Arg Ser Glu Gln Asp Val Ile Asp Val Leu Asp Trp
100 105 110

Cys Ala Arg Glu Gly Ile Ala Val Ile Pro Tyr Gly Gly Gly Ser Ser
115 120 125

Val Val Gly Gly Val Glu Pro Arg Phe Asp Glu Pro Val Val Thr Val
130 135 140

Asp Val Thr Ala Met Ser Ala Val Leu Glu Ile Asp Arg Val Ser Arg
145 150 155 160

Ala Ala Arg Ile Gln Ala Gly Ala Phe Gly Pro Ser Ile Glu His Gln
165 170 175

Leu Arg Pro His Asp Leu Thr Leu Arg His Phe Pro Gln Ser Phe Gly
180 185 190

Phe Ser Thr Leu Gly Gly Trp Leu Ala Thr Arg Ser Gly Gly His Phe
195 200 205

Ala Thr Leu Tyr Thr His Ile Asp Asp Leu Thr Glu Ser Leu Arg Ile
210 215 220

Val Thr Pro Val Gly Ile Ser Glu Ser Arg Arg Leu Pro Gly Ser Gly
225 230 235 240

Ala Gly Pro Ser Pro Asp Arg Leu Phe Leu Gly Ser Glu Gly Thr Leu
245 250 255

Gly Ile Ile Thr Glu Ala Trp Met Arg Leu Gln His Arg Pro Arg Trp
260 265 270

Gln Val Thr Val Ser Val Val Phe Asp Asp Trp Ala Ala Ala Val Ala
275 280 285

Ala Thr Arg Thr Ile Ala Gln Ala Gly Leu Tyr Pro Ala Asn Cys Arg
290 295 300

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Leu Leu Asp Pro Ala Glu Ala Leu Leu Asn Ala Gly Thr Ser Val Gly
 305 310 315 320

Gly Gly Leu Leu Val Leu Ala Phe Glu Ser Ala Asp His Pro Ile Asp
 325 330 335

Pro Trp Leu His Arg Ala Val Ala Ile Thr Ala Glu His Gly Gly Thr
 340 345 350

Val Thr Ala Gln Arg Ser Arg Gly Thr Thr Ser Asp Ala Thr Glu His
 355 360 365

Asn Ala Ala Ala Asn Trp Arg Ser Ala Phe Leu Arg Met Pro Tyr Gln
 370 375 380

Arg Asp Ala Leu Val Arg Arg Gly Val Ile Ala Glu Thr Phe Glu Thr
 385 390 395 400

Ala Cys Thr Trp Asp Gly Phe Asp Thr Leu His Ala Ala Val Thr Asp
 405 410 415

Ala Ala Arg Thr Ala Ile Trp Lys Val Cys Gly Thr Gly Val Val Thr
 420 425 430

Cys Arg Phe Thr His Val Tyr Pro Asp Gly Pro Ala Pro Tyr Tyr Gly
 435 440 445

Ile Tyr Ala Gly Gly Arg Trp Gly Ser Leu Asp Ala Gln Trp Asp Glu
 450 455 460

Ile Lys Ala Ala Val Ser Glu Ala Ile Ser Ala Ser Gly Gly Thr Ile
 465 470 475 480

Thr His His His Ala Val Gly Arg Asp His Arg Ala Trp Tyr Asp Arg
 485 490 495

Gln Arg Pro Asp Pro Phe Ala Ala Ala Leu Arg Ala Ala Lys Ser Ala
 500 505 510

Leu Asp Pro Ala Gly Ile Leu Asn Pro Gly Val Leu Leu Gly Arg
 515 520 525

<210> 226

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<211> 1581

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 226

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ccggacctga ccgcgctcgg tttggcggcc ccacgggtca gcccgcgggc atcgctggcc	180
gcgctctgct caagcgatct cgtcgatcgg gccggacacg cgcgcggcaa agcgtatcgc	240
gacatcgcac gcaacctgca gggccagctc gaccacctgc ccgacctcat cggccgaccc	300
cgcagcgagc aggacgtgat cgacgtgctg gattgggtgtg cgcgcgaggg gattgcggtc	360
atcccatacg gtggtggcag ctcggtgggtt ggcggtgtcg agccgcgctt cgatgagccg	420
gtggtcacgg tcgacgtcac tgccatgagc gcggtgcttg agattgaccg tgtcagccgt	480
gccgcgcgca tccaggcggg tgcgttcggc cctcgatcg agcatcagct tcgcccacac	540
gatttgacac tgcgccattt cccgcagtcc ttcggcttct cgactctcgg tggctggttg	600
gccacccgct ccggcggaca cttcgccacg ctctataccc atatcgacga cttgaccgaa	660
tcgctgcgga ttgtcacccc ggtggggatc agcgagtccc ggcggtgcc cggaagcgg	720
gccggaccat ccccgaccg gttgttcctc gggccgagg ggacgcttgg catcatcacc	780
gaggcgtgga tgcggctgca acaccgtccg cgatggcagg tcacggtgtc cgtggtgttt	840
gacgactggg ccgccgcggg cgcgcgcacc cggacgatcg ctcaggcggg gctgtacccg	900
gccaactgcc ggctgttgga tccggccgag gcgttgctga atgccggcac gtccgttgg	960
ggcgggctgt tgggtgttggc gttcgagtct gccgaccacc cgatagaccc gtggctgcac	1020
cgggcgggtg cgatcacgc cgaacacggc ggcacggtga ccgcgcaacg tagccgcgga	1080
actacaagcg acgcaacgga acacaacgca gccgcgaact ggcgctcggc gtttctgcgc	1140
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cagtgggacg agatcaaggc tgccgtgtcc gaggcgatca gcgccagtgg cggtagcatc	1440
accacaccac atgcggtcgg tcgcgaccac cgcgcttggg atgaccggca gcgtcccgc	1500

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cogttcgcgg cggccctgcg ggcggcgaag tccgcactcg acccggccgg gatcctcaac 1560

ccaggggtgt tgctcggtcg c 1581

<210> 227

<211> 145

<212> PRT

<213> Mycobacterium tuberculosis

<400> 227

Met Thr Ser Phe Ala His Pro Gly Thr Arg Gly Leu Ser Thr Val Phe
1 5 10 15

Gly Leu Met Met Val Gly Ser Ala Ala Val Gly Ser His Gly Leu Ala
20 25 30

Val Val Val Gly Leu Ala Ala Val Ile Ala Val Gly Val Ala Ala Val
35 40 45

Phe Arg Leu Ala Ala Thr Leu Ala Val Val Leu Ser Val Val Met Ile
50 55 60

Val Val Ser Gly Pro Thr His Val Leu Ala Ala Leu Ser Gly Phe Cys
65 70 75 80

Ala Ala Val Tyr Leu Val Cys Arg Tyr Gly Ala Gly Val Val Ala Gly
85 90 95

Ser Trp Pro Thr Thr Val Ala Ala Val Gly Phe Thr Phe Ala Gly Leu
100 105 110

Ala Ala Thr Ser Phe Pro Leu Gln Val Pro Trp Leu Pro Leu Ala Ala
115 120 125

Pro Leu Ala Val Leu Ala Thr Tyr Val Leu Ala Thr Arg Pro Phe Ser
130 135 140

Arg
145

<210> 228

-288-

<211> 435

<212> DNA

<213> Mycobacterium tuberculosis

<400> 228

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atgacctcgt ttgcgcaccc gggactctcgt gggctctcca cgggtgttcgg actgatgatg      60
gtgggggtcgg ccgctgtggg atcgcacggg ctggctgttg tcgtggggct tgccgcgggtg      120
attgcggtag ggggtggcggc ggtgtttcgc ctggcggcaa cgcttgccgt ggtgttgctg      180
gtggtgatga tcgtggtgtc cggcccgcacg catgtgcttg ccgcattgtc ggggttttgc      240
gccgccgtct acctggtgtg ccgatacggg gccggtgttg tcgccgggag ctggccgcacg      300
accgttgccg ccgttggttt cacgttcgct gggttggctg cgacgtcgtt cccgctgcaa      360
gtgccatggc tgccgttggc ggcaccgttg gccgtgttgg ctacctacgt gctggccacc      420
cgtccgttct cgagg                                          435

```

<210> 229

<211> 119

<212> PRT

<213> Mycobacterium tuberculosis

<400> 229

```

Leu Arg Leu Gly Ala Gly Phe Arg Lys Pro Val Pro Thr Leu Leu Leu
1              5              10              15

Glu His Arg Ser Arg Lys Ser Gly Lys Asn Phe Val Ala Pro Leu Leu
                20              25              30

Tyr Ile Thr Asp Arg Asn Asn Val Ile Val Val Ala Ser Ala Leu Gly
                35              40              45

Gln Ala Glu Asn Pro Gln Trp Tyr Arg Asn Leu Pro Pro Asn Pro Asp
                50              55              60

Thr His Ile Gln Ile Gly Ser Asp Arg Arg Pro Val Arg Ala Val Val
65              70              75              80

```

Ala Ser Ser Asp Glu Arg Ala Arg Leu Trp Pro Arg Pro Val Asp Ala
85 90 95

Tyr Ala Asp Phe Asp Ser Cys Gln Ser Trp Thr Glu Arg Gly Ile Pro
100 105 110

Val Ile Ile Leu Arg Pro Arg
115

<210> 230

<211> 357

<212> DNA

<213> Mycobacterium tuberculosis

<400>	230						
ttgcgactcg	gcgccggatt	ccgcaaaccg	gtgccgacac	tgctactcga	acaccggagc		60
cgcaagtccg	gcaagaactt	cgtcgcacca	ctgcttttaca	tcaccgaccg	taacaatgtc		120
atcgtcgttg	cctctgccct	tgggcaggca	gaaaaccgcg	agtggtatcg	caacctgccg		180
cccaatcccg	acaccacat	tcagatcgga	tccgatcgcc	gcccggtgag	agccgtcgtg		240
gccagctcgg	acgagcgggc	gcgcctatgg	ccgcgcccg	tagacgccta	cgccgacttc		300
gattcttgcc	aaagctggac	cgagcgtggg	attccggtga	tcattcttgcg	gccacgc		357

<210> 231

<211> 108

<212> PRT

<213> Mycobacterium tuberculosis

<400> 231

Met Ser Gly Gly Ser Ser Arg Arg Tyr Pro Pro Glu Leu Arg Glu Arg
1 5 10 15

Ala Val Arg Met Val Ala Glu Ile Arg Gly Gln His Asp Ser Glu Trp
20 25 30

Ala Ala Ile Ser Glu Val Ala Arg Leu Leu Gly Val Gly Cys Ala Glu
35 40 45

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Thr Val Arg Lys Trp Val Arg Gln Ala Gln Val Asp Ala Gly Ala Arg
 50 55 60

Pro Gly Thr Thr Thr Glu Glu Ser Ala Glu Leu Lys Arg Leu Arg Arg
 65 70 75 80

Asp Asn Ala Glu Leu Arg Arg Ala Asn Ala Ile Leu Lys Thr Ala Ser
 85 90 95

Ala Phe Phe Ala Ala Glu Leu Asp Arg Pro Ala Arg
 100 105

<210> 232

<211> 324

<212> DNA

<213> Mycobacterium tuberculosis

<400> 232

atgtcaggtg gttcatcgag gaggtacccg ccggagctgc gtgagcgggc ggtgcggatg 60
 gtcgcagaga tccgcgggtca gcacgattcg gagtgggcag cgatcagtga ggtcgcccgt 120
 ctacttggtg ttggctgcgc ggagacggtg cgtaagtggg tgcgccaggc gcaggtcgat 180
 gccggcgcac ggcccgggac cacgaccgaa gaatccgctg agctgaagcg cttgcggcgg 240
 gacaacgccg aattgcgaag ggcgaacgcg attttaaaga ccgcgtcggc tttcttcgcg 300
 gccgagctcg accggccagc acgc 324

<210> 233

<211> 133

<212> PRT

<213> Mycobacterium tuberculosis

<400> 233

Met Pro Asp Val Asp Trp Asn Met Leu Arg Gly Asn Ala Thr Gln Ala
 1 5 10 15

Ala Ala Gly Ala Tyr Val Pro Tyr Ser Arg Phe Ala Val Gly Ala Ala

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20	25	30
Ala Leu Val Asp Asp Gly Arg Val Val Thr Gly Cys Asn Val Glu Asn		
35	40	45
Val Ser Tyr Gly Leu Thr Leu Cys Ala Glu Cys Ala Val Val Cys Ala		
50	55	60
Leu His Ser Thr Gly Gly Gly Arg Leu Leu Ala Leu Ala Cys Val Asp		
65	70	75
		80
Gly His Gly Ser Val Leu Met Pro Cys Gly Arg Cys Arg Gln Val Leu		
	85	90
		95
Leu Glu His Gly Gly Ser Glu Leu Leu Ile Asp His Pro Val Arg Pro		
100	105	110
Arg Arg Leu Gly Asp Leu Leu Pro Asp Ala Phe Gly Leu Asp Asp Leu		
115	120	125
Pro Arg Glu Arg Arg		
130		

<210> 234

<211> 399

<212> DNA

<213> Mycobacterium tuberculosis

<400> 234

atgcctgatg tgcattggaa tatgctgcgg ggcaatgcaa cccaggcagc agccggagcc	60
tatgtgccgt attcgcggtt tgcggtgggt gcggccgcac tggtcgacga tggtcgcgtg	120
gtgaccggat gcaacgtgga aaacgtctcg tatggcttga ctttgtgcgc cgaatgtgcg	180
gtggtgtgcg ccctgcattc gaccggcggc ggccggctgc tcgcgctggc ctgcgtcgac	240
ggccatggat ccgtgctgat gccgtgcggg cgatgccgtc aggtgctgct cgaacacggg	300
ggttccgagc tactgatcga ccatccggtg cgaccccgcc ggctcggcga cctgctgccc	360
gacgccttcg gcctcgacga cctcccccg gaaacgcgg	399

<210> 235

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<211> 204

<212> PRT

<213> Mycobacterium tuberculosis

<400> 235

Met	Ser	Val	Gln	Thr	Asp	Pro	Ala	Leu	Arg	Glu	His	Pro	Asn	Arg	Val
1				5					10					15	

Asp	Trp	Asn	Ala	Arg	Tyr	Glu	Arg	Ala	Gly	Ser	Ala	His	Ala	Pro	Phe
			20					25					30		

Ala	Pro	Val	Pro	Trp	Leu	Ala	Asp	Val	Leu	Arg	Ala	Gly	Val	Pro	Asp
		35					40					45			

Gly	Pro	Val	Leu	Glu	Leu	Ala	Ser	Gly	Arg	Ser	Gly	Thr	Ala	Leu	Ala
	50					55					60				

Leu	Ala	Ala	His	Gly	Arg	Gln	Val	Thr	Ala	Ile	Asp	Val	Ser	Asp	Val
65					70					75				80	

Ala	Leu	Leu	Gln	Leu	Asp	Ser	Glu	Ala	Val	Arg	Arg	Gly	Val	Ala	Asp
			85						90					95	

Arg	Leu	Asn	Leu	Val	Gln	Ala	Asp	Leu	Gly	Cys	Trp	Glu	Pro	Gly	Glu
			100					105						110	

Thr	Arg	Phe	Ala	Leu	Val	Leu	Ser	Arg	Leu	Phe	Trp	Asp	Ala	Ala	Ile
		115					120					125			

Phe	His	Arg	Ala	Cys	Glu	Ala	Val	Met	Pro	Gly	Gly	Val	Leu	Ala	Trp
	130					135					140				

Glu	Ser	Leu	Ala	Leu	Ser	Gly	Ala	Glu	Ala	Gly	Thr	Ala	Ser	Ala	Lys
145					150					155					160

Arg	Arg	Val	Lys	Pro	Gly	Glu	Pro	Ala	Cys	Leu	Leu	Pro	Ala	Asp	Phe
				165					170					175	

Thr	Val	Val	His	Glu	Gly	Gln	Gly	Asn	Cys	Asp	Ser	Ala	Pro	Ser	Arg
			180					185					190		

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Ile Met Ile Ala Arg Arg Ser Pro Leu Pro Gly Ala
 195 200

<210> 236

<211> 612

<212> DNA

<213> Mycobacterium tuberculosis

<400> 236

atgagcgtgc agacggatcc ggcgctgcgg gagcacccca accgcgtcga ctggaacgcg 60
 cgatacgaac gcgcgggttc ggcgcacgcg ccgtttgccc cggcgccttg gctcgccgat 120
 gtcctcagag caggcggttc ggacgggtccc gttctggagt tagccagcgg tcgatcgggt 180
 accgcactgg cgttggccgc ccacggccgc caggtcaccg caatcgatgt gtccgatgtc 240
 gcgctgctgc agctggacag cgaggccgtg cgtcgaggcg tggccgatcg gctcaacctc 300
 gtgcaggccg acttgggctg ctgggaaccc ggcgagacgc gtttcgcgct ggtgctcagc 360
 aggctctttt gggatgcggc gatatttcac cgcgcctgtg aggcggtgat gccaggcggc 420
 gtattggcat gggagtcgct ggctctcagt ggcgccgagg cgggcacagc cagcgcgaag 480
 cgacgtgtca agccgggaga gccagcgtgt ctgcttcctg ccgacttcac cgttgtagac 540
 gaggggcagg gtaactgcga ttcggcgccg tcgcggatca tgatcgcgcg gcgctcaccg 600
 ttgccagggg ca 612

<210> 237

<211> 264

<212> PRT

<213> Mycobacterium tuberculosis

<400> 237

Val Leu Ala Ser Cys Pro Ala Arg Ser Gly Ala Ala Val Ala Asp Ala
 1 5 10 15

Ile Lys Ser Ala Val Gly Val Gln Pro Ser Gly Val Glu His Lys Thr
 20 25 30

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Leu Arg Arg Met Asp Leu Val Arg Tyr Leu Ala Gly Gly His Thr Thr
 35 40 45

Tyr Pro Pro Glu Gly Phe Val Ala Gly Ser Asp Val Ile Gly Thr Thr
 50 55 60

Asn Pro Ala Ala Ala Gln Ala Ile Val Ala Ala Ile Gly Thr Trp Pro
 65 70 75 80

Pro Ala Ala Gly Arg Ala Ser Ala Leu Ile Asp Ser Leu Gly Gly Ala
 85 90 95

Val Gly Asp Met Asp Pro Glu Gly Ser Ala Phe Pro Trp Cys Arg Gln
 100 105 110

Ser Ala Val Val Gln Trp Tyr Val Asn Thr Pro Ser Asp Gly Gln Val
 115 120 125

Ala Thr Ala Asn Lys Trp Leu Ser Asp Ala His His Ala Val Gln His
 130 135 140

Phe Ser Val Gly Gly Tyr Val Asn Tyr Leu Glu Ala Asn Ala Ala Ala
 145 150 155 160

Ser Gln Tyr Phe Gly Ala Asn Leu Ser Arg Leu Thr Thr Val Arg Arg
 165 170 175

Lys Tyr Asp Pro Asp Arg Ile Met Tyr Ser Gly Leu Asp Phe Ser Thr
 180 185 190

Arg Gln Val Ala Glu Arg Leu Leu Pro Ala Leu Gly Phe Arg Val Arg
 195 200 205

Phe Gly Val Leu Val Ile Arg Cys Ala Leu Cys Thr Asp Thr Val Lys
 210 215 220

Arg Leu Gly Thr Leu Pro Asn Leu Thr Trp Ser Arg Leu Lys Val Asn
 225 230 235 240

Val Ala Val Thr Gln Glu Gln Ala Gly Val Met Asp Leu Pro Ala Leu
 245 250 255

Pro Val Arg Arg Thr Pro Arg Arg
 260

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<210> 238

<211> 792

<212> DNA

<213> Mycobacterium tuberculosis

<400> 238

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gtgctggcga gctgcccggc gcggtccggc gcggctgtcg cggatgcgat caagtccgcg      60
gttggagtgc aaccagtggt agttgagcac aagacgctgc gccgtatgga cctggtgagg      120
tatctggccg gcggccatac gacctatccg ccggagggct tcgtggctgg atccgatgtc      180
atcgggacga cgaatccggc cgcggcccaa gccatcgtcg ccgccatcgg aacatggcca      240
cccgtgcggg gccgcgcgtc ggctctgata gattcgctgg gcggcgcggg gggcgacatg      300
gacccggagg gctcggcatt tccctggtgc cgccagtccg ctgtggtgca gtggtatgtc      360
aacacccccca gcgacggcca ggtggcgacg gccaacaaat ggctgagcga cgcacaccac      420
gcggtgcaac acttttcggg cggcggctat gtcaactacc tggaggccaa cgccgcggcg      480
tcacaatact tcggcgcgaa cctgtcgcgg ctgaccacag tcgggcgcaa gtaogatccc      540
gaccggatca tgtactcggg tctggatttc tctaccagac aggtcgctga acgactttta      600
cccgtctctg gcttttcgagt gaggttcggg gttttggtaa tcagggtgcgc actgtgcact      660
gacactgtga aacgcttggg aactttgccc aaccttacgt ggtcgcgctt aaaagtgaac      720
gtcgcagtga cccaagaaca ggctgggggtc atggatttgc cggcgctgcc ggttcggcgc      780
acgccgcggc gg                                     792

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<210> 239

<211> 123

<212> PRT

<213> Mycobacterium tuberculosis

<400> 239

```

Val Ser Ala Ala Thr Asp Leu Tyr Ala Val His Gln Ala Leu Ala Gly
1           5           10          15

```

```

Glu Ser Arg Ala Ile Pro Thr Gly Ser Cys Pro Thr Val Gly Val Ala

```

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20	25	30
Gly Leu Thr Leu Gly Gly Gly Leu Gly Ala Asp Ser Arg His Ala Gly		
35	40	45
Leu Thr Cys Asp Ala Leu Lys Ser Ala Thr Val Val Leu Pro Gly Gly		
50	55	60
Asp Ala Val Ser Ala Ser Ala Asp Asp His Ala Glu Leu Phe Trp Ala		
65	70	75
Leu Arg Gly Gly Gly Gly Gly Asn Phe Gly Val Thr Thr Ser Met Thr		
85	90	95
Phe Ala Arg Phe Pro Thr Ala Asp Cys Asp Val Val Arg Val Asp Phe		
100	105	110
Ala Pro Ser Ala Ala Ala Gln Val Leu Val Gly		
115	120	

<210> 240

<211> 369

<212> DNA

<213> Mycobacterium tuberculosis

<400> 240

gtgtcggccg cgaccgatct ctatgcggtc catcaagcgt tggccggtga gagccgggcg	60
attccgaccg gcagctgcc gaccgtgggt gtggcggggtt tgaccctggg cggcgggtta	120
ggcgccgatt ctcgccatgc ggggttgacc tgcgatgcgc tcaagtcggc gacggtggtg	180
ttgcccggcg gtgatgcggt gagcgcgtct gccgacgacc acgcggagct gttctgggcg	240
cttcgtggcg gcggggggcg caacttcggg gtgacgacat cgatgacggt cgcgaggttc	300
cccaccgcgg actgcgatgt cgtccgtgtc gatttcgcgc cgtctgcggc cgcgcaggtg	360
ctggtcggc	369

<210> 241

<211> 213

<212> PRT

-297-

<213> Mycobacterium tuberculosis

<400> 241

Met	Arg	Arg	Arg	Ala	Met	Thr	Lys	Met	Asp	Glu	Ala	Ser	Asn	Pro	Cys
1				5					10					15	

Gly	Gly	Asp	Ile	Glu	Ala	Glu	Met	Cys	Gln	Leu	Met	Arg	Glu	Gln	Pro
		20						25					30		

Pro	Ala	Glu	Gly	Val	Val	Asp	Arg	Val	Ala	Leu	Gln	Arg	His	Arg	Asn
		35					40					45			

Val	Ala	Leu	Ile	Thr	Leu	Ser	His	Pro	Gln	Ala	Gln	Asn	Ala	Leu	Asn
	50					55					60				

Leu	Ala	Ser	Trp	Arg	Arg	Leu	Lys	Arg	Leu	Leu	Asp	Asp	Leu	Ala	Gly
65					70					75					80

Glu	Ser	Gly	Leu	Arg	Ala	Val	Val	Leu	Arg	Gly	Ala	Gly	Asp	Lys	Ala
			85						90					95	

Phe	Ala	Ala	Gly	Ala	Asp	Ile	Lys	Glu	Phe	Pro	Asn	Thr	Arg	Met	Ser
			100					105					110		

Ala	Ala	Asp	Ala	Ala	Glu	Tyr	Asn	Glu	Ser	Leu	Ala	Val	Cys	Leu	Arg
		115					120					125			

Ala	Leu	Thr	Thr	Met	Pro	Ile	Pro	Val	Ile	Ala	Ala	Val	Arg	Gly	Leu
	130					135					140				

Ala	Val	Gly	Gly	Gly	Cys	Glu	Leu	Ala	Thr	Ala	Cys	Asp	Val	Cys	Ile
145					150					155					160

Ala	Thr	Asp	Asp	Ala	Arg	Phe	Gly	Ile	Pro	Leu	Gly	Lys	Leu	Gly	Val
				165					170					175	

Thr	Thr	Gly	Phe	Thr	Glu	Ala	Asp	Thr	Val	Ala	Arg	Leu	Ile	Gly	Pro
			180					185					190		

Ala	Ala	Leu	Lys	Tyr	Leu	Leu	Phe	Ser	Gly	Glu	Leu	Ile	Gly	Ile	Glu
		195					200					205			

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Glu Ala Ala Arg Trp
210

<210> 242

<211> 639

<212> DNA

<213> Mycobacterium tuberculosis

<400> 242

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atgaggcggc gtgcaatgac gaagatggac gaggctagca atccgtgcgg cggggacatc      60
gaagctgaga tgtgccagtt gatgcgcgag caaccacccg ccgaaggcgt cgtcgatcgt      120
gtcgcgctgc aacgccatcg aaacgttgcg ttgatcacgc tgagccatcc gcaggcgcag      180
aacgcactca acctggcgag ctggcgctcg ctgaagcggc tgcctggacga tctcgccggc      240
gaatcggggc tgcgggcggg ggtgctgcgg ggcgccgggtg acaaggcgtt cgccgcgggt      300
gccgacatca aggagtttcc gaacacccgc atgagcgccg cggacgccgc ggagtacaac      360
gagagcctgg ccgtctgcct gagggcgctt accacgatgc cgatcccagt catcgcgggc      420
gtccgggggc tcgccgtcgg tggcggctgt gagctggcga cggcctgcga tgtgtgcatc      480
gcgaccgacg acgcgcgctt cggcatcccg ctgggcaagc tcggcgtcac gacgggcttc      540
accgaggcgg acaccgtcgc gcgcctcatc ggtccggcgg cgctgaagta tctgttgttc      600
agcggagaac tgatcggcac tgaggaagcc gcccgctgg      639

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<210> 243

<211> 467

<212> PRT

<213> Mycobacterium tuberculosis

<400> 243

Val Ala Asp Arg Leu Asn Val Ala Glu Arg Leu Ala Glu Gly Arg Pro
1 5 10 15

Ala Ala Glu His Thr Gln Ser Tyr Val Arg Ala Cys His Leu Val Gly
20 25 30

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Tyr Gln His Pro Asp Leu Thr Ala Tyr Pro Ala Gln Ile His Asp Trp
 35 40 45

Tyr Gly Ser Glu Asp Gly Leu Asp Leu His Ala Leu Asp Ala Asp Cys
 50 55 60

Ala Gln Leu Arg Ala Ala Ala Ser Val Leu Met Glu Ala Leu Arg Met
 65 70 75 80

Glu Arg Ser Gln Val Ala Val Leu Ala Ala Ala Trp Thr Gly Ser Gly
 85 90 95

Ala Asp Ala Ala Val His Phe Val Gln Arg His Cys Glu Thr Gly Asn
 100 105 110

Ser Val Val Thr Glu Val Arg Ala Ala Ala Gln Arg Cys Glu Ser Leu
 115 120 125

Arg Asp Asn Leu Trp Gln Leu Val Asp Ser Lys Val Ala Thr Ala Ile
 130 135 140

Ala Ile Asp Glu Arg Ala Leu Ala Gln Arg Pro Ala Trp Leu Ala Ala
 145 150 155 160

Ala Glu Ala Leu Thr Thr Glu Gly Ala Asp Arg Pro Thr Ala Val Glu
 165 170 175

Val Val Arg Gln Gln Ile Gln Pro Tyr Val Asp Asp Asp Val Arg Asn
 180 185 190

Asp Trp Leu Thr Thr Met Arg Ser Thr Thr Ala Gly Val Ala Ala Ser
 195 200 205

Tyr Asp Ala Val Thr Asp Gln Leu Ala Ser Ala Pro Arg Ala His Phe
 210 215 220

Glu Ile Pro Asp Asp Leu Gly Pro Gly Arg Gln Pro Ser Pro Ala Ser
 225 230 235 240

Val Pro Ala Gln Pro Ser Ala Thr Ala Ala Ile Thr Pro Ala Ala Ala
 245 250 255

Leu Pro Pro Pro Asp Pro Val Pro Ala Val Thr Ser Arg Pro Val Thr
 260 265 270

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Pro Ser Asp Phe Gly Ser Ala Pro Gly Asp Gly Ser Ala Thr Pro Ala
275 280 285

Gly Val Gly Ser Ala Gly Gly Phe Gly Asp Ala Gly Gly Thr Gly Gly
290 295 300

Leu Gly Gly Phe Ala Gly Leu Ala Gly Leu Ala Asn Arg Ile Val Asp
305 310 315 320

Ala Val Asp Ser Leu Leu Gly Ser Val Ala Glu Gln Leu Gly Asp Pro
325 330 335

Leu Ala Ala Asp Asn Pro Pro Gly Ala Val Asp Pro Phe Ala Glu Asp
340 345 350

Ala Ala Asp Asn Ala Asp Asp Gly Asp Asp Ala His Pro Glu Glu Ala
355 360 365

Asp Glu Ala Ala Glu Pro Lys Glu Ala Thr Glu Pro Asp Glu Ala Asp
370 375 380

Glu Val Asp Asp Ala Asp Glu Ser Val Pro Ala Glu Arg Ala Gln Asp
385 390 395 400

Val Ala Glu Glu Ala Thr Leu Pro Pro Val Ala Glu Pro Pro Pro Pro
405 410 415

Ala Ala Pro Pro Val Ala Glu Pro Pro Pro Pro Val Ala Ala Pro Ala
420 425 430

Pro Pro Gly Ala Pro Glu Pro Ala Asn Gly Pro Ser Pro Glu Ala Leu
435 440 445

Ser Glu Gly Ala Thr Pro Cys Glu Ile Ala Ala Asp Glu Leu Pro Gln
450 455 460

Ala Gly Pro
465

<210> 244

<211> 1401

<212> DNA

-301-

<213> Mycobacterium tuberculosis

<400> 244

```
gtggctgacc ggttgaacgt cgctgagcgt ctgcccgagg gcaggccccg agccgagcac      60
acgcaaagct acgtgcgggc ttgccacctg gtgggctacc aacatcccg cctgaccgcc      120
taccctgccc agatccacga ctggtacggc agcgaagacg gacttgacct gcacgcgctc      180
gacgctgact gcgcgcagct gcgggctgcc gccagtgtgc tcatggaggc gctgcggatg      240
gagcgtagcc aggtcgccgt cttggcagcg gcatggacgg gatcgggggg cgacgcggcg      300
gtgcactttg tgcagcgtca ctgtgagact ggaaattcgg tggtcaccga agtccgtgcc      360
gcggcccaac gctgcgaatc gctgcgcgac aacctctggc agctggtgga ctccaaagtc      420
gcgacggcca ttgcgatcga cgagcgtgcc ctggcgcagc ggccggcatg gttggctgcg      480
gccgaagcgc tcacgacgga gggggcagat cggccgacgg ccgtcgaagt ggttcgccaa      540
cagatacagc cctacgtgga cgacgatgtt cgcaacgact ggctgaccac gatgcgatcg      600
acaacggccg gtgtggcggc gtcgtatgat gcggtcaccg atcagctggc cagcgcgccg      660
cgcgcgcact tcgagattcc ggacgatctc gggcccggtc gccaaccttc tccggcatcg      720
gtgccggctc aaccgagcgc gacggcagcg attacgcccg cggccgctct tcccccgccg      780
gatccggtgc cggccgtgac ctgcgggcca gtgacgccgt cggatttttg atcggcgcca      840
ggtgatggtt ccgcgacgcc ggcggtgtt ggacgcgccg gtggtttcgg cgatgccggc      900
ggcaccggcg gtctgggcgg gtttgccggg cttgccgggc ttgccaaccg gatcgtcgat      960
gcggttgata gcctgctggg ttcggtggcc gaacagctgg gggatccgtt ggcagctgac     1020
aatccgccgg gtgccgtcga tccgttcgct gaagacgcgg ccgacaacgc tgatgacggc     1080
gacgatgccc acccggaaga ggccgacgag gcagcggagc cgaaggaagc aacagagccc     1140
gacgaagcag acgaggtcga cgacgccgac gaatcgggtc ccgctgaacg tgcccaggat     1200
gtcgccgagg aggccacgct gccgccggtc gccgaaccgc cgccgcctgc cgcgcctccg     1260
gtcgccgaac caccgcctcc ggtcgctgcg ccggcgccgc cgggtgcgcc ggaaccggcg     1320
aatgggcctt cgccggaagc gctgtccgag ggagccaccc cctgtgagat cgccgccgac     1380
gagcttccgc aggcggggcc g                                     1401
```

<210> 245

<211> 404

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<212> PRT

<213> Mycobacterium tuberculosis

<400> 245

Val Ser Pro His Arg Ala Val Ile Glu Ala Gly Pro Gly Ala Ile Arg
1 5 10 15

Arg Leu Cys Cys Gly Ala Asp Val Val Ala Asp Thr Ala Val Ser Ala
20 25 30

Ala Ala Leu Ala Ala Ile Asp Asp Gln Val Ala Leu Leu Asp Glu Arg
35 40 45

Pro Val Ala Val Asp Ser Leu Trp Phe Asp Ala Leu Arg Ser Val Ala
50 55 60

Val Asp His Arg Asp Gly Pro Val Val Val His Pro Ser Trp Trp Ser
65 70 75 80

Ala Ala Arg Val Glu Val Val Thr Ala Ala Ala Arg Thr Leu Thr Arg
85 90 95

Asp Val Val Val His Pro Arg Ser Trp Leu Leu Arg Gln Ala Ser Ser
100 105 110

Gly Val Ser Ala Ala Thr Val Val Val Glu Ile Ala Glu Arg Leu Val
115 120 125

Leu Val Ala Gly Ala Glu Val Ala Ala Val Ala Arg Arg Thr Asp Ala
130 135 140

Glu Ser Val Ala Gly Gln Val Gly Ser Val Ile Ala Arg Met Thr Arg
145 150 155 160

Gly Ile Thr Ala Val Val Leu Ile Asp Val Pro Ser Thr Val Ala Gly
165 170 175

Ala Ala Ala Leu Ala Ala Ala Ile Ala Gly Ala Val Arg Gly Thr Gly
180 185 190

Ser Ser Val Val Glu Ile Asp Gly Val Arg Leu Ala Arg Leu Ala Arg
195 200 205

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Ala Ala Leu Pro Pro Ser Asp Glu Pro Ala Asp Pro Ala Ala Arg Pro
 210 215 220

Ala Thr Arg Ser Arg Val Pro Thr Leu Ala Arg Val Ala Ala Ala Gly
 225 230 235 240

Val Ala Leu Ala Leu Leu Ala Pro Ala Ala Val Val Arg His Gly Ala
 245 250 255

Thr Thr Leu Gln Arg Pro Pro Thr Thr Leu Leu Val Glu Gly Arg Val
 260 265 270

Ala Leu Thr Ile Pro Ala Asp Trp Ser Thr Gln Arg Val Val Ser Gly
 275 280 285

Pro Gly Ser Ala Arg Val Gln Val Thr Ser Pro Ala Asp Pro Glu Val
 290 295 300

Ala Leu His Val Thr Gln Ser Pro Val Pro Gly Glu Thr Leu Pro Gly
 305 310 315 320

Thr Ala Gln Arg Leu Lys Arg Ala Ile Asp Ala Ser Pro Ala Gly Val
 325 330 335

Phe Val Asp Phe Asn Pro Ser Asp Ile Arg Ala Gly Arg Pro Ala Val
 340 345 350

Thr Tyr Arg Glu Val Arg Ala Gly His Gln Val Arg Trp Thr Ile Leu
 355 360 365

Leu Asp Gly Ala Val Arg Ile Ser Val Gly Cys Gln Ser Gly Pro Gly
 370 375 380

His Glu Asp Leu Leu Arg Glu Val Cys Ala Gln Ala Val Arg Ser Val
 385 390 395 400

His Ala Val Gly

<210> 246

<211> 1212

<212> DNA

-304-

<213> Mycobacterium tuberculosis

<400> 246

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gtgagccac atcgcgcggt gatcgaggcg ggtccgggtg ccatccgccc attgtgttgt      60
ggcgagacg tagtcgcgga caccgcagtg tctgccgccc cgctggcggc gatcgacgac      120
caggtagcgc tgctggacga acggccagtc gccgtggatt cgctgtggtt cgacgccctg      180
cgatcggtag ccgtcgacca ccgtgacggc ccggtcgtcg tgcacccgtc gtggtggtcg      240
gcggtctggg tcgaggtggt caccgcagcc gcacgcacgc tgaccgcga tgcgtcgtg      300
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catcaggtgc ggtggacgat tctgctcgac ggagcgggtc ggatcagcgt cggctgccag     1140
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cacgccgttg gt                                         1212
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<210> 247

<211> 1236

<212> PRT

<213> Mycobacterium tuberculosis

-305-

<400> 247

Met Asn Ser Gly Pro Ala Cys Ala Thr Ala Asp Ile Leu Val Ala Pro
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Leu Pro Val Val Met Ser Val Ala Thr Val Gly Val Met Val Thr Val
 35 40 45

Phe Leu Pro Gly Ser Pro Ala Thr Arg His Pro Thr Phe Leu Ala Phe
 50 55 60

Pro Met Met Met Leu Val Ser Leu Val Val Thr Ala Val Thr Gly Arg
 65 70 75 80

Gly Arg Arg His Val Ser Gly Ile His Asn Asp Arg Val Asp Tyr Leu
 85 90 95

Gly Tyr Leu Ser Val Leu Arg Thr Ser Val Thr Gln Thr Ala Ala Ala
 100 105 110

Gln His Val Ser Leu Asn Trp Thr His Pro Asp Pro Ala Thr Leu Trp
 115 120 125

Thr Leu Ile Gly Gly Pro Arg Met Trp Glu Arg Arg Pro Gly Ala Ala
 130 135 140

Asp Phe Cys Arg Ile Arg Val Gly Val Gly Ser Ala Pro Leu Ala Thr
 145 150 155 160

Arg Leu Val Val Gly Gln Leu Pro Pro Ala Gln Arg Ala Asp Pro Val
 165 170 175

Thr Arg Ala Ala Leu Arg Cys Phe Leu Ala Ala His Ala Thr Ile Ala
 180 185 190

Asp Ala Pro Ile Ala Ile Pro Leu Arg Val Gly Gly Pro Ile Ala Ile
 195 200 205

Asp Gly Asp Pro Thr Lys Val Arg Gly Leu Leu Arg Ala Met Ile Cys
 210 215 220

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Gln Leu Ala Val Trp His Ser Pro Glu Glu Leu Leu Ile Ala Gly Val
 225 230 235 240

Val Ser Asp Arg Asn Arg Ala His Trp Asp Trp Leu Lys Trp Leu Pro
 245 250 255

His Asn Gln His Pro Asn Ala Cys Asp Ala Leu Gly Pro Ala Pro Met
 260 265 270

Val Tyr Ser Thr Leu Ala Glu Met Gln Asn Ala Leu Ala Ala Thr Val
 275 280 285

Leu Ala His Val Val Ala Ile Val Asp Thr Ala Glu Arg Gly Asn Gly
 290 295 300

Ala Ile Thr Gly Val Ile Thr Ile Glu Val Gly Ala Arg Arg Asp Gly
 305 310 315 320

Ala Pro Pro Val Val Arg Cys Ala Gly Glu Val Thr Ala Leu Ala Cys
 325 330 335

Pro Asp Gln Leu Glu Pro Gln Asp Ala Leu Val Cys Ala Arg Arg Leu
 340 345 350

Ala Ala His Arg Val Gly His Ser Gly Arg Thr Phe Ile Arg Gly Ser
 355 360 365

Gly Trp Ala Glu Leu Val Gly Ile Gly Asp Val Ala Ala Phe Asp Pro
 370 375 380

Ser Thr Leu Trp Arg Asn Val Asn Gln His Asp Arg Leu Arg Val Pro
 385 390 395 400

Ile Gly Val Thr Pro Asp Gly Thr Ala Val Gln Leu Asp Ile Lys Glu
 405 410 415

Ala Ala Glu Gln Gly Met Gly Pro His Gly Leu Cys Val Gly Ala Thr
 420 425 430

Gly Ser Gly Lys Ser Glu Leu Leu Arg Thr Ile Ala Leu Gly Met Met
 435 440 445

Ala Arg Asn Ser Pro Glu Val Leu Asn Leu Leu Leu Val Asp Phe Lys
 450 455 460

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Gly Gly Ala Thr Phe Leu Asp Leu Ala Gly Ala Pro His Val Ala Ala
 465 470 475 480

Val Ile Thr Asn Leu Ala Glu Glu Ala Pro Leu Val Ala Arg Met Gln
 485 490 495

Asp Ala Leu Ala Gly Glu Met Ser Arg Arg Gln Gln Leu Leu Arg Met
 500 505 510

Ala Gly His Leu Val Ser Val Thr Ala Tyr Gln Arg Ala Arg Gln Thr
 515 520 525

Gly Ala Gln Leu Pro Cys Leu Pro Ile Leu Phe Ile Val Val Asp Glu
 530 535 540

Phe Ser Glu Leu Leu Ser Gln His Pro Glu Phe Val Asp Val Phe Leu
 545 550 555 560

Ala Ile Gly Arg Val Gly Arg Ser Leu Gly Met His Leu Leu Leu Ala
 565 570 575

Ser Gln Arg Leu Asp Glu Gly Arg Leu Arg Gly Leu Glu Thr His Leu
 580 585 590

Ser Tyr Arg Met Cys Leu Lys Thr Trp Ser Ala Ser Glu Ser Arg Asn
 595 600 605

Val Leu Gly Thr Gln Asp Ala Tyr Gln Leu Pro Asn Thr Pro Gly Ala
 610 615 620

Gly Leu Leu Gln Thr Gly Thr Gly Glu Leu Ile Arg Phe Gln Thr Ala
 625 630 635 640

Phe Val Ser Gly Pro Leu Arg Arg Ala Ser Pro Ser Ala Val His Pro
 645 650 655

Val Ala Pro Pro Ser Val Arg Pro Phe Thr Thr His Ala Ala Ala Pro
 660 665 670

Val Thr Ala Gly Pro Val Gly Gly Thr Ala Glu Val Pro Thr Pro Thr
 675 680 685

Val Leu His Ala Val Leu Asp Arg Leu Val Gly His Gly Pro Ala Ala

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690		695		700
His Gln Val Trp Leu Pro Pro Leu Asp Glu Pro Pro Met Leu Gly Ala				
705		710		715 720
Leu Leu Arg Asp Ala Glu Pro Ala Gln Ala Glu Leu Ala Val Pro Ile				
	725		730	735
Gly Ile Val Asp Arg Pro Phe Glu Gln Ser Arg Val Pro Leu Thr Ile				
	740		745	750
Asp Leu Ser Gly Ala Ala Gly Asn Val Ala Val Val Gly Ala Pro Gln				
	755		760	765
Thr Gly Lys Ser Thr Ala Leu Arg Thr Leu Ile Met Ala Leu Ala Ala				
	770		775	780
Thr His Asp Ala Gly Arg Val Gln Phe Tyr Cys Leu Asp Phe Gly Gly				
785		790		795 800
Gly Ala Leu Ala Gln Val Asp Glu Leu Pro His Val Gly Ala Val Ala				
	805		810	815
Gly Arg Ala Gln Pro Gln Leu Ala Ser Arg Met Leu Ala Glu Leu Glu				
	820		825	830
Ser Ala Val Arg Phe Arg Glu Ala Phe Phe Arg Asp His Gly Ile Asp				
	835		840	845
Ser Val Ala Arg Tyr Arg Gln Leu Arg Ala Lys Ser Ala Ala Glu Ser				
	850		855	860
Phe Ala Asp Ile Phe Leu Val Ile Asp Gly Trp Ala Ser Leu Arg Gln				
865		870		875 880
Glu Phe Ala Ala Leu Glu Glu Ser Ile Val Ala Leu Ala Ala Gln Gly				
	885		890	895
Leu Ser Phe Gly Val His Val Ala Leu Ser Ala Ala Arg Trp Ala Glu				
	900		905	910
Ile Arg Pro Ser Leu Arg Asp Gln Ile Gly Ser Arg Ile Glu Leu Arg				
	915		920	925

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Leu Ala Asp Pro Ala Asp Ser Glu Leu Asp Arg Arg Gln Ala Gln Arg
 930 935 940

Val Pro Val Asp Arg Pro Gly Arg Gly Leu Ser Arg Asp Gly Met His
 945 950 955 960

Met Val Ile Ala Leu Pro Asp Leu Asp Gly Val Ala Leu Arg Arg Arg
 965 970 975

Ser Gly Asp Pro Val Ala Pro Pro Ile Pro Leu Leu Pro Ala Arg Val
 980 985 990

Asp Tyr Asp Ser Val Val Ala Arg Ala Gly Asp Glu Leu Gly Ala His
 995 1000 1005

Ile Leu Leu Gly Leu Glu Glu Arg Arg Gly Gln Pro Val Ala Val
 1010 1015 1020

Asp Phe Gly Arg His Pro His Leu Leu Val Leu Gly Asp Asn Glu
 1025 1030 1035

Cys Gly Lys Thr Ala Ala Leu Arg Thr Leu Cys Arg Glu Ile Val
 1040 1045 1050

Arg Thr His Thr Ala Ala Arg Ala Gln Leu Leu Ile Val Asp Phe
 1055 1060 1065

Arg His Thr Leu Leu Asp Val Ile Glu Ser Glu His Met Ser Gly
 1070 1075 1080

Tyr Val Ser Ser Pro Ala Ala Leu Gly Ala Lys Leu Ser Ser Leu
 1085 1090 1095

Val Asp Leu Leu Gln Ala Arg Met Pro Ala Pro Asp Val Ser Gln
 1100 1105 1110

Ala Gln Leu Arg Ala Arg Ser Trp Trp Ser Gly Pro Asp Ile Tyr
 1115 1120 1125

Val Val Val Asp Asp Tyr Asp Leu Val Ala Val Ser Ser Gly Asn
 1130 1135 1140

Pro Leu Met Val Leu Leu Glu Tyr Leu Pro His Ala Arg Asp Leu
 1145 1150 1155

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Gly Leu His Leu Val Val Ala Arg Arg Ser Gly Gly Ala Ala Arg
 1160 1165 1170

Ala Leu Phe Glu Pro Val Leu Ala Ser Leu Arg Asp Leu Gly Cys
 1175 1180 1185

Arg Ala Leu Leu Met Ser Gly Arg Pro Asp Glu Gly Ala Leu Phe
 1190 1195 1200

Gly Ser Ser Arg Pro Met Pro Leu Pro Pro Gly Arg Gly Ile Leu
 1205 1210 1215

Val Thr Gly Ala Gly Asp Glu Gln Leu Val Gln Val Ala Trp Ser
 1220 1225 1230

Pro Pro Pro
 1235

<210> 248

<211> 3708

<212> DNA

<213> Mycobacterium tuberculosis

<400> 248

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gcgatgatct gccagctggc cgtatggcac tcaccggagg agttgctgat cgccggcgtg	720
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<210> 249

<211> 470

<212> PRT

<213> Mycobacterium tuberculosis

<400> 249

Val Pro Ser Pro Ala Thr Thr Trp Leu His Val Ser Gly Tyr Arg Phe

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Leu Leu Arg Arg Ile Glu Cys Ala Leu Leu Phe Gly Asp Val Cys Ala	20	25	30
Ala Thr Gly Ala Leu Arg Ala Arg Thr Thr Ser Leu Ala Leu Gly Cys	35	40	45
Val Leu Ala Ile Val Ala Ala Met Gly Cys Ala Phe Val Ala Leu Leu	50	55	60
Arg Pro Gln Ser Ala Leu Gly Gln Ala Pro Ile Val Met Gly Arg Glu	65	70	75
Ser Gly Ala Leu Tyr Val Arg Val Asp Asp Val Trp His Pro Val Leu	85	90	95
Asn Leu Ala Ser Ala Arg Leu Ile Ala Ala Thr Asn Ala Asn Pro Gln	100	105	110
Pro Val Ser Glu Ser Glu Leu Gly His Thr Lys Arg Gly Pro Leu Leu	115	120	125
Gly Ile Pro Gly Ala Pro Gln Leu Leu Asp Gln Pro Leu Ala Gly Ala	130	135	140
Glu Ser Ala Trp Ala Ile Cys Asp Ser Asp Asn Gly Gly Ser Thr Thr	145	150	155
Val Val Val Gly Pro Ala Glu Asp Ser Ser Ala Gln Val Leu Thr Ala	165	170	175
Glu Gln Met Ile Leu Val Ala Thr Glu Ser Gly Ser Pro Thr Tyr Leu	180	185	190
Leu Tyr Gly Gly Arg Arg Ala Val Val Asp Leu Ala Asp Pro Ala Val	195	200	205
Val Trp Ala Leu Arg Leu Gln Gly Arg Val Pro His Val Val Ala Gln	210	215	220
Ser Leu Leu Asn Ala Val Pro Glu Ala Pro Arg Ile Thr Ala Pro Arg	225	230	235
			240

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Ile Arg Gly Gly Gly Arg Ala Ser Val Gly Leu Pro Gly Phe Leu Val
 245 250 255

Gly Gly Val Val Arg Ile Thr Arg Ala Ser Gly Asp Glu Tyr Tyr Val
 260 265 270

Val Leu Glu Asp Gly Val Gln Arg Ile Gly Gln Val Ala Ala Asp Leu
 275 280 285

Leu Arg Phe Gly Asp Ser Gln Gly Ser Val Asn Val Pro Thr Val Ala
 290 295 300

Pro Asp Val Ile Arg Val Ala Pro Ile Val Asn Thr Leu Pro Val Ser
 305 310 315 320

Ala Phe Pro Asp Arg Pro Pro Thr Pro Val Asp Gly Ser Pro Gly Arg
 325 330 335

Ala Val Thr Thr Leu Cys Val Thr Trp Thr Pro Ala Gln Pro Gly Ala
 340 345 350

Ala Arg Val Ala Phe Leu Ala Gly Ser Gly Pro Pro Val Pro Leu Gly
 355 360 365

Gly Val Pro Val Thr Leu Ala Gln Ala Asp Gly Arg Gly Pro Ala Leu
 370 375 380

Asp Ala Val Tyr Leu Pro Pro Gly Arg Ser Ala Tyr Val Ala Ala Arg
 385 390 395 400

Ser Leu Ser Gly Gly Gly Thr Gly Thr Arg Tyr Leu Val Thr Asp Thr
 405 410 415

Gly Val Arg Phe Ala Ile His Asp Asp Asp Val Ala His Asp Leu Gly
 420 425 430

Leu Pro Thr Ala Ala Ile Pro Ala Pro Trp Pro Val Leu Ala Thr Leu
 435 440 445

Pro Ser Gly Pro Glu Leu Ser Arg Ala Asn Ala Ser Val Ala Arg Asp
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Thr Val Ala Pro Gly Pro
 465 470

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<210> 250

<211> 1410

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 250

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acaacatcgc tggccctcgg gtgcgtgctg gcgatcgtcg ccgcgatggg atgcgcattc      180
gttgcgctgc tgcggccaca gtcggcgctc ggtcaggcgc cgatcgtgat gggtcgggaa      240
tcgggggcac tctacgtgcg agtggacgat gtctggcatc cgggtgtgaa cctggcttcg      300
gcgcgggtga tcgcggcgac gaacgccaac ccgcaaccgg tgtccgagtc cgaattgggc      360
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1410

<210> 251

<211> 317

<212> PRT

<213> Mycobacterium tuberculosis

<400> 251

Val	Ser	Thr	Arg	Gln	Ala	Ala	Glu	Ala	Asp	Leu	Ala	Gly	Lys	Ala	Ala
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			20					25					30		

Trp	Leu	His	Pro	Asp	Gly	Asp	Leu	Thr	Asp	Thr	Glu	Arg	Ala	Arg	Lys
		35					40					45			

Arg	Gly	Ile	Thr	Leu	Ser	Asn	Gln	Gln	Tyr	Asp	Gly	Met	Ser	Arg	Leu
	50					55					60				

Ser	Gly	Tyr	Leu	Thr	Pro	Gln	Ala	Arg	Ala	Thr	Phe	Glu	Ala	Val	Leu
65					70					75					80

Ala	Lys	Leu	Ala	Ala	Pro	Gly	Ala	Thr	Asn	Pro	Asp	Asp	His	Thr	Pro
				85					90					95	

Val	Ile	Asp	Thr	Thr	Pro	Asp	Ala	Ala	Ala	Ile	Asp	Arg	Asp	Thr	Arg
			100					105					110		

Ser	Gln	Ala	Gln	Arg	Asn	His	Asp	Gly	Leu	Leu	Ala	Gly	Leu	Arg	Ala
		115					120					125			

Leu	Ile	Ala	Ser	Gly	Lys	Leu	Gly	Gln	His	Asn	Gly	Leu	Pro	Val	Ser
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Ile	Val	Val	Thr	Thr	Thr	Leu	Thr	Asp	Leu	Gln	Thr	Gly	Ala	Gly	Lys
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Gly	Phe	Thr	Gly	Gly	Gly	Thr	Leu	Leu	Pro	Met	Ala	Asp	Val	Ile	Arg
			165						170					175	

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Met Thr Ser His Ala His His Tyr Ser Pro Ala Ser Gly Arg Tyr Pro
 180 185 190

Gln Ala Ile Phe Asp His Gly Thr Pro Leu Ala Leu Tyr His Thr Lys
 195 200 205

Arg Leu Ala Ser Pro Ala Gln Arg Ile Met Leu Phe Ala Asn Asp Arg
 210 215 220

Gly Cys Thr Lys Pro Gly Cys Asp Ala Pro Ala Tyr His Ser Gln Ala
 225 230 235 240

His His Val Thr Ala Trp Thr Ser Thr Gly Arg Thr Asp Ile Thr Glu
 245 250 255

Leu Thr Leu Ala Cys Gly Pro Asp Asn Arg Leu Ala Glu Lys Gly Trp
 260 265 270

Thr Thr His Asn Asn Thr His Gly His Thr Glu Trp Leu Pro Pro Pro
 275 280 285

His Leu Asp His Gly Gln Pro Arg Thr Asn Thr Phe His His Pro Glu
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Arg Phe Leu His Asn Gln Asp Asp Asp Asp Lys Pro Asp
 305 310 315

<210> 252

<211> 951

<212> DNA

<213> Mycobacterium tuberculosis

<400> 252

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accgacaccg aacgcgcccc caaacgcggc atcaccctga gcaaccagca atacgacggc 180

atgtcacggc taagtggcta cctgaccccc caagcgcggg ccacctttga agccgtgcta 240

gccaaactgg cgcgccccgg cgcgaccaac cccgacgacc acaccccggt catcgacacc 300

acccccgatg cggccgccat cgaccgcgac acccgagcc aagcccaacg caaccacgac 360

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```

gggctgctgg cggggctgcg cgcgctgata gcctccggga aactggggcca acacaacggt      420
cttcccgctct cgatcgctggt caccaccacc ctgaccgacc tgcaaaccgg cgccggcaag      480
ggcttcaccg gcggcggcac cctgctaccc atggccgatg tgatccgcat gaccagccac      540
gcccaccact actccccgc aagcgggagg taccaccagg cgatcttcga ccacggcaca      600
cccctggcgc tgtatcacac caaacgccta gcctccccgg ccagcggat catgctgttc      660
gccaacgacc gcggctgcac caaaccggc tgtgacgcac cggcctacca cagccaagcc      720
caccacgtca ccgcctggac cagcaccgga cgcaccgaca tcaccgagct gaccctggcc      780
tgcgggccccg acaaccgact cgccgaaaaa ggctggacca ccacaacaa caccacggc      840
cacaccgaat ggctaccacc accccacctc gaccacggcc aaccgcgcac caacaccttc      900
caccaccccg aacgattcct ccacaacaa gacgacgacg acaaaccga t              951

```

<210> 253

<211> 373

<212> PRT

<213> Mycobacterium tuberculosis .

<400> 253

```

Met Asp Phe Thr Thr Thr Glu Ala Ala Gln Asp Leu Gly Gly Leu Val
1          5          10          15

```

```

Asp Thr Ile Val Asp Ala Val Cys Thr Pro Glu His Gln Arg Glu Leu
          20          25          30

```

```

Asp Lys Leu Glu Gln Arg Phe Asp Arg Glu Leu Trp Arg Lys Leu Ile
          35          40          45

```

```

Asp Ala Gly Ile Leu Ser Ser Ala Ala Pro Glu Ser Leu Gly Gly Asp
          50          55          60

```

```

Gly Phe Gly Val Leu Glu Gln Val Ala Val Leu Val Ala Leu Gly His
65          70          75          80

```

```

Gln Leu Ala Ala Val Pro Tyr Leu Glu Ser Val Val Leu Ala Ala Gly
          85          90          95

```

```

Ala Leu Ala Arg Phe Gly Ser Pro Glu Leu Gln Gln Gly Trp Gly Val

```

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100					105					110					
Ser	Ala	Val	Ser	Gly	Asp	Arg	Ile	Leu	Thr	Val	Ala	Leu	Asp	Gly	Glu
		115					120					125			
Met	Gly	Glu	Gly	Pro	Val	Gln	Ala	Ala	Gly	Thr	Gly	His	Gly	Tyr	Arg
		130					135					140			
Leu	Thr	Gly	Thr	Arg	Thr	Gln	Val	Gly	Tyr	Gly	Pro	Val	Ala	Asp	Ala
		145					150					155			160
Phe	Leu	Val	Pro	Ala	Glu	Thr	Asp	Ser	Gly	Ala	Ala	Val	Phe	Leu	Val
				165					170					175	
Ala	Ala	Gly	Asp	Pro	Gly	Val	Ala	Val	Thr	Ala	Leu	Ala	Thr	Thr	Gly
			180						185					190	
Leu	Gly	Ser	Val	Gly	His	Leu	Glu	Leu	Asn	Gly	Ala	Lys	Val	Asp	Ala
		195					200					205			
Ala	Arg	Arg	Val	Gly	Gly	Thr	Asp	Val	Ala	Val	Trp	Leu	Gly	Thr	Leu
		210					215					220			
Ser	Thr	Leu	Ser	Arg	Thr	Ala	Phe	Gln	Leu	Gly	Val	Leu	Glu	Arg	Gly
		225					230					235			240
Leu	Gln	Met	Thr	Ala	Glu	Tyr	Ala	Arg	Thr	Arg	Glu	Gln	Phe	Asp	Arg
				245					250					255	
Pro	Ile	Gly	Ser	Phe	Gln	Ala	Val	Gly	Gln	Arg	Leu	Ala	Asp	Gly	Tyr
				260					265					270	
Ile	Asp	Val	Lys	Gly	Leu	Arg	Leu	Thr	Leu	Thr	Gln	Ala	Ala	Trp	Arg
		275					280					285			
Val	Ala	Glu	Asp	Ser	Leu	Ala	Ser	Arg	Glu	Cys	Pro	Gln	Pro	Ala	Asp
		290					295					300			
Ile	Asp	Val	Ala	Thr	Ala	Gly	Phe	Trp	Ala	Ala	Glu	Ala	Gly	His	Arg
		305					310					315			320
Val	Ala	His	Thr	Ile	Val	His	Val	His	Gly	Gly	Val	Gly	Val	Asp	Thr
				325					330					335	

Asp His Pro Val His Arg Tyr Phe Leu Ala Ala Lys Gln Thr Glu Phe
340 345 350

Ala Leu Gly Gly Ala Thr Gly Gln Leu Arg Arg Ile Gly Arg Glu Leu
355 360 365

Ala Glu Thr Pro Ala
370

<210> 254

<211> 1119

<212> DNA

<213> Mycobacterium tuberculosis

<400> 254

atggatttca	cgacaaccga	agccgccccag	gatcttggtg	gtctggtcga	caccatcgtg	60
gacgcggtgt	gcacgcccga	gcatcaacgt	gagctggaca	agctcgagca	gcggttcgac	120
cgcgagctgt	ggcgcaagct	gatagacgcc	ggcatcctgt	ccagtgcggc	gccggagtcg	180
ctgggcggcg	atggcttcgg	cgtgctcgag	caggttgccg	tgctggtggc	gttggggcat	240
caactggccg	cggtgccgta	cctggagtcg	gtggtgctcg	ccgccggcgc	cctggcccgg	300
ttcggctcgc	cggaactgca	gcagggctgg	ggggtgtcgg	cggctctccg	cgatcggatc	360
ctcaccgtcg	ccctcgacgg	tgagatgggc	gagggtcctg	tgcaggccgc	cggcaccgga	420
catggctacc	gcctcaccgg	cacacgcacc	caggtcgggt	acggcccggg	ggccgacgca	480
tttctggtac	ccgccgaaac	cgattccggg	gcagccggtt	tcctggttgc	cgccggcgac	540
ccaggggttg	cggtgaccgc	actggccacc	accggactgg	gcagcgtcgg	acacctcgag	600
ctaaacgggg	ccaaagtgga	cgccgccccg	agggtcggcg	gaaccgatgt	cgcggtttgg	660
ctcggcacgc	tttccaccct	gagccgcacc	gcttttcagc	tcggtgtgct	cgagcgcgga	720
ctgcaaatga	cggccgaata	tgcgcgacc	cgtgaacaat	tcgaccgcc	gatcggcagc	780
ttccaggcgg	tggggcaacg	gttggctgac	ggctacatcg	acgtcaaggg	attgcgactg	840
acgcttacc	aggcggcctg	gcgggtggcc	gaagattccc	tggcaagccg	ggagtgcccc	900
cagccagccg	acatcgacgt	cgccaccgcg	gggttctggg	ccgccgaagc	cgggcacatg	960
gtggcgcata	ccatcgtgca	tgtgcatggc	ggcgtcggcg	tcgacaccga	tcatcccgta	1020
caccgggtatt	tcctggccgc	caagcagacc	gaatttcgct	tgggcggcgc	caccgggtcag	1080

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ctccgccgaa tcggccgtga actggcggaa acccctgcc

1119

<210> 255

<211> 386

<212> PRT

<213> Mycobacterium tuberculosis

<400> 255

Val	Leu	Ser	Gly	Gln	Ala	Ala	Ile	Val	Gly	Ile	Gly	Ala	Thr	Asp	Phe
1			5					10						15	

Ser	Lys	Asn	Ser	Gly	Arg	Ser	Glu	Leu	Arg	Leu	Ala	Ala	Glu	Ala	Val
		20					25						30		

Leu	Asp	Ala	Leu	Ala	Asp	Ala	Gly	Leu	Ser	Pro	Thr	Asp	Val	Asp	Gly
	35						40					45			

Leu	Thr	Thr	Phe	Thr	Met	Asp	Thr	Asn	Thr	Glu	Ile	Ala	Val	Ala	Arg
	50					55					60				

Ala	Ala	Gly	Ile	Gly	Glu	Leu	Thr	Phe	Phe	Ser	Lys	Ile	His	Tyr	Gly
65					70				75						80

Gly	Gly	Ala	Ala	Cys	Ala	Thr	Val	Gln	His	Ala	Ala	Met	Ala	Val	Ala
				85					90					95	

Thr	Gly	Val	Ala	Asp	Val	Val	Val	Ala	Tyr	Arg	Ala	Phe	Asn	Glu	Arg
		100						105					110		

Ser	Gly	Met	Arg	Phe	Gly	Gln	Val	Gln	Thr	Arg	Leu	Thr	Glu	Asn	Ala
		115					120					125			

Asp	Ser	Thr	Gly	Val	Asp	Asn	Ser	Phe	Ser	Tyr	Pro	His	Gly	Leu	Ser
	130					135					140				

Thr	Pro	Ala	Ala	Gln	Val	Ala	Met	Ile	Ala	Arg	Arg	Tyr	Met	His	Leu
145					150					155					160

Ser	Gly	Ala	Thr	Ser	Arg	Asp	Phe	Gly	Ala	Val	Ser	Val	Ala	Asp	Arg
				165					170					175	

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Lys His Ala Ala Asn Asn Pro Lys Ala Tyr Phe Tyr Gly Lys Pro Ile
 180 185 190

Thr Ile Glu Asp His Gln Asn Ser Arg Trp Ile Ala Glu Pro Leu Arg
 195 200 205

Leu Leu Asp Cys Cys Gln Glu Thr Asp Gly Ala Val Ala Ile Val Val
 210 215 220

Thr Ser Ala Ala Arg Ala Arg Asp Leu Lys Gln Arg Pro Val Val Ile
 225 230 235 240

Glu Ala Ala Ala Gln Gly Cys Ser Pro Asp Gln Tyr Thr Met Val Ser
 245 250 255

Tyr Tyr Arg Pro Glu Leu Asp Gly Leu Pro Glu Met Gly Leu Val Gly
 260 265 270

Arg Gln Leu Trp Ala Gln Ser Gly Leu Thr Pro Ala Asp Val Gln Thr
 275 280 285

Ala Val Leu Tyr Asp His Phe Thr Pro Phe Thr Leu Ile Gln Leu Glu
 290 295 300

Glu Leu Gly Phe Cys Gly Lys Gly Glu Ala Lys Asp Phe Ile Ala Asp
 305 310 315 320

Gly Ala Ile Glu Val Gly Gly Arg Leu Pro Ile Asn Thr His Gly Gly
 325 330 335

Gln Leu Gly Glu Ala Tyr Ile His Gly Met Asn Gly Ile Ala Glu Gly
 340 345 350

Val Arg Gln Leu Arg Gly Thr Ser Val Asn Pro Val Ala Gly Val Glu
 355 360 365

His Val Leu Val Thr Ala Gly Thr Gly Val Pro Thr Ser Gly Leu Ile
 370 375 380

Leu Gly
 385

<210> 256

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<211> 1158

<212> DNA

<213> *Mycobacterium tuberculosis*

<400> 256

gtgttatcgg gtcaggcggc catcgtcggt atcggcgcca ccgacttttc gaagaactcc	60
ggtcgaagtg agctgcggtt ggcggccgag gcggtgttgg atgctgtggc cgatgctggc	120
ctgagcccga ccgatgtcga cgggctgacc acgttcacga tggacaccaa caccgaaatc	180
gccgtggcgc gtgctggcgg catcggcgag ctgacgttct tctccaagat ccactacggc	240
ggctggcgccg catgtgcgac cgtgcagcac gccgctatgg cagtggccac cgggggtggc	300
gacgtcgtgg tggcgtatcg ggcattcaac gaacgatccg gcatgctggt cggtcaggtg	360
caaactcgtt tgaccgagaa tgccgactcc accggcgtgg acaattcgtt ttcgtatccg	420
cacgggtctt ccacgcccgc cgcgcaagtg gcgatgatcg ctgcccggta catgcacctg	480
tctggtgcga ccagccggga cttcgggtgt gtctcgggtg ccgaccgcaa gcatgccgcc	540
aaacaaccca aggcgtactt ctacggcaag ccgataacca ttgaggacca ccagaattcg	600
aggtggatcg ccgagccgct ggcgctgctg gactgctgcc aggagaccga cggcgcggtc	660
gcgatcgtgg tgacgtcagc tgcgcgcgca cgggacctca agcagcgcgc ggtggtcatt	720
gaggcggctg cgcagggctg cagtccagac cagtacacga tggtcagcta ctaccggccg	780
gaactcgacg gcctgcccga gatgggcctg gtgggcccgc agctatgggc gcagtcgggg	840
ctgacgcccg ccgatgtcca gaccgcagtc ctctacgacc acttcacgcc gtttaccctg	900
attcagttgg aggagttggg attctgcggc aagggcgaag cgaaagactt catcgccgac	960
ggcgcgatcg aggtgggccc ggcgctgccc atcaacaccc acggcgggtca actcggcgaa	1020
gcctacatcc atggcatgaa cggcatcgcg gagggggtgc ggcagctgcg cggcacctcg	1080
gtgaaccggt tggcgggctg cgagcatgtg ctctcaccg cgggcaccgg ggtgcctacg	1140
tccgggtga tcctgggt	1158

<210> 257

<211> 391

<212> PRT

<213> *Mycobacterium tuberculosis*

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<400> 257

Met Gly Tyr Pro Val Ile Val Glu Ala Thr Arg Ser Pro Ile Gly Lys
 1 5 10 15

Arg Asn Gly Trp Leu Ser Gly Leu His Ala Thr Glu Leu Leu Gly Ala
 20 25 30

Val Gln Lys Ala Val Val Asp Lys Ala Gly Ile Gln Ser Gly Leu His
 35 40 45

Ala Gly Asp Val Glu Gln Val Ile Gly Gly Cys Val Thr Gln Phe Gly
 50 55 60

Glu Gln Ser Asn Asn Ile Ser Arg Val Ala Trp Leu Thr Ala Gly Leu
 65 70 75 80

Pro Glu His Val Gly Ala Thr Thr Val Asp Cys Gln Cys Gly Ser Gly
 85 90 95

Gln Gln Ala Asn His Leu Ile Ala Gly Leu Ile Ala Ala Gly Ala Ile
 100 105 110

Asp Val Gly Ile Ala Cys Gly Ile Glu Ala Met Ser Arg Val Gly Leu
 115 120 125

Gly Ala Asn Ala Gly Pro Asp Arg Ser Leu Ile Arg Ala Gln Ser Trp
 130 135 140

Asp Ile Asp Leu Pro Asn Gln Phe Glu Ala Ala Glu Arg Ile Ala Lys
 145 150 155 160

Arg Arg Gly Ile Thr Arg Glu Asp Val Asp Val Phe Gly Leu Glu Ser
 165 170 175

Gln Arg Arg Ala Gln Arg Ala Trp Ala Glu Gly Arg Phe Asp Arg Glu
 180 185 190

Ile Ser Pro Ile Gln Ala Pro Val Leu Asp Glu Gln Asn Gln Pro Thr
 195 200 205

Gly Glu Arg Arg Leu Val Phe Arg Asp Gln Gly Leu Arg Glu Thr Thr
 210 215 220

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Met Ala Gly Leu Gly Glu Leu Lys Pro Val Leu Glu Gly Gly Ile His
 225 230 235 240

Thr Ala Gly Thr Ser Ser Gln Ile Ser Asp Gly Ala Ala Ala Val Leu
 245 250 255

Trp Met Asp Glu Ala Val Ala Arg Ala His Gly Leu Thr Pro Arg Ala
 260 265 270

Arg Ile Val Ala Gln Ala Leu Val Gly Ala Glu Pro Tyr Tyr His Leu
 275 280 285

Asp Gly Pro Val Gln Ser Thr Ala Lys Val Leu Glu Lys Ala Gly Met
 290 295 300

Lys Ile Gly Asp Ile Asp Ile Val Glu Ile Asn Glu Ala Phe Ala Ser
 305 310 315 320

Val Val Leu Ser Trp Ala Arg Val His Glu Pro Asp Met Asp Arg Val
 325 330 335

Asn Val Asn Gly Gly Ala Ile Ala Leu Gly His Pro Val Gly Cys Thr
 340 345 350

Gly Ser Arg Leu Ile Thr Thr Ala Leu His Glu Leu Glu Arg Thr Asp
 355 360 365

Gln Ser Leu Ala Leu Ile Thr Met Cys Ala Gly Gly Ala Leu Ser Thr
 370 375 380

Gly Thr Ile Ile Glu Arg Ile
 385 390

<210> 258

<211> 1173

<212> DNA

<213> Mycobacterium tuberculosis

<400> 258

atggggttacc cgggtcatcgt tgaagccacc cgcagcccca tcggcaaacy caacgggatgg 60

ctgtcggggc tgcattgccac cgagttgttg ggcgcggtgc aaaaggcggt ggtcgacaag 120

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```

gccggcatcc agtccggcct tcacgccggt gacgtcgaac aggtcatcgg cggttgcggtg 180
accagttcg gggagcaatc caacaacatc agccgggtgg cctggctgac ggccggtttg 240
cccgaacacg tcggcgccac caccgtcgac tgccagtgcg gcagcggcca gcaggccaac 300
catctgattg cggggttgat cgcgccggt gccatcgatg tcggcatcgc ctgcggcac 360
gaggcgatga gccgggtcgg gctgggccc aacgccgggc cggaccgctc gctgatccgc 420
gcgcagtcac gggatatcga cctgccgaac cagttcgagg ccgccgagcg gatcgccaag 480
cggcgcgga tcacccgca ggacgtggat gtcttcgggc tcgagtcgca gcgacgcgcg 540
cagcgggcct gggcggaggg ccgctttgac cgcgagatct cgccgatcca ggcgccggtg 600
ctcgacgagc agaatcagcc caccggcgag cggcgccctg tctttcgca ccagggcctg 660
cgcgagacca cgatggcggg gctaggcgag ctgaaaccgg tgctcgaggg cggcatccac 720
accgcgggca cgtcgtcgca gatctccgac ggcgcgagc cgtgttgtg gatggacgaa 780
gccgtggcac gtgcgcacgg cctgacccc cgggcccgga tcgtcgcca ggcactcgtc 840
ggcgccgagc cctactacca cctggacggc ccggtgcagt ccaccgcgaa ggtgctggag 900
aaggccggca tgaagatcgg cgacatcgac atcgtcgaga tcaacgaggc gttcgcgtcc 960
gtggtgctgt cctgggcgcg ggtgcacgag cccgacatgg accgggtcaa cgtcaacggc 1020
ggggcgatcg cgctggggca tccggtgggc tgcaccggca gccggctgat caccaccgcc 1080
ctgcacgagc tcgagcgcac cgaccagagc ctgcgctga tcaccatgtg cgccggcggg 1140
gccctgtcca ccggcaccat catcgagcgg att 1173

```

<210> 259

<211> 247

<212> PRT

<213> Mycobacterium tuberculosis

<400> 259

```

Met Pro Ile Thr Ser Thr Thr Pro Glu Pro Gly Ile Val Ala Val Thr
1           5           10           15

```

```

Val Asp Tyr Pro Pro Val Asn Ala Ile Pro Ser Lys Ala Trp Phe Asp
20           25           30

```

```

Leu Ala Asp Ala Val Thr Ala Ala Gly Ala Asn Ser Asp Thr Arg Ala

```

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35	40	45
Val Ile Leu Arg Ala Glu Gly Arg Gly Phe Asn Ala Gly Val Asp Ile		
50	55	60
Lys Glu Met Gln Arg Thr Glu Gly Phe Thr Ala Leu Ile Asp Ala Asn		
65	70	75 80
Arg Gly Cys Phe Ala Ala Phe Arg Ala Val Tyr Glu Cys Ala Val Pro		
	85	90 95
Val Ile Ala Ala Val Asn Gly Phe Cys Val Gly Gly Gly Ile Gly Leu		
	100	105 110
Val Gly Asn Ser Asp Val Ile Val Ala Ser Glu Asp Ala Thr Phe Gly		
	115	120 125
Leu Pro Glu Val Glu Arg Gly Ala Leu Gly Ala Ala Thr His Leu Ser		
	130	135 140
Arg Leu Val Pro Gln His Leu Met Arg Arg Leu Phe Phe Thr Ala Ala		
145	150	155 160
Thr Val Asp Ala Ala Thr Leu Gln His Phe Gly Ser Val His Glu Val		
	165	170 175
Val Ser Arg Asp Gln Leu Asp Glu Ala Ala Leu Arg Val Ala Arg Asp		
	180	185 190
Ile Ala Ala Lys Asp Thr Arg Val Ile Arg Ala Ala Lys Glu Ala Leu		
	195	200 205
Asn Phe Ile Asp Val Gln Arg Val Asn Ala Ser Tyr Arg Met Glu Gln		
	210	215 220
Gly Phe Thr Phe Glu Leu Asn Leu Ala Gly Val Ala Asp Glu His Arg		
225	230	235 240
Asp Ala Phe Val Lys Lys Ser		
	245	

<210> 260

<211> 741

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<212> DNA

<213> Mycobacterium tuberculosis

<400> 260

```

atgccgatca cctccaccac gcccgaaaccg ggcatcgctcg cggtcaccgt cgactaccgc      60
ccgggtcaacg ccatcccgctc gaaagcgtgg ttcgacctgg ccgacgcggt gacggccgcg      120
ggcgccaact ccgacacccg cgcggtgatc ctgcggggccg aggggcgcgg cttcaacgcc      180
gggggtggaca tcaaagagat gcaacgaacc gaaggtttca cggcgctgat cgacgccaac      240
cgcggctgct tcgccgcatt ccgcgccgtc tacgagtgcg cggtgccggt gatcgccgcc      300
gtgaacggat tctgcgtggg cggcggcata ggcctggctcg gcaactccga cgatcatcgtg      360
gcctccgagg acgccacctt cggcctgccc gaggtggaac ggggcgcgct gggcgcggcc      420
acgcacctct cgcggctggg gccccagcac ctgatgcgac ggctgttctt tacggcggcc      480
accgtggacg cggccacctt gcagcacttc ggctcgggtgc acgaggtggt gtcccgcgat      540
cagctggacg aggcgccttt gcgggtggcc cgcgacatcg ccgccaaaga caccggggtc      600
atccgcgccg ccaaggaggc gctgaacttc atcgacgtgc aacgggtcaa tgcgagttac      660
cggatggagc aagggttttac cttcgagctc aacctcgccg gagtcgccga cgagcaccgc      720
gacgcctttg tgaagaagtc a                                     741

```

<210> 261

<211> 250

<212> PRT

<213> Mycobacterium tuberculosis

<400> 261

```

Val Ser Thr Arg Ala Glu Val Cys Ala Val Ala Cys Ala Glu Leu Phe
1              5              10             15

Arg Asp Ala Gly Glu Ile Met Ile Ser Pro Met Thr Asn Met Ala Ser
                20              25             30

Val Gly Ala Arg Leu Ala Arg Leu Thr Phe Ala Pro Asp Ile Leu Leu
35              40              45

```

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Thr Asp Gly Glu Ala Gln Leu Leu Ala Asp Thr Pro Ala Leu Gly Lys
 50 55 60

Thr Gly Ala Pro Asn Arg Ile Glu Gly Trp Met Pro Phe Gly Arg Val
 65 70 75 80

Phe Glu Thr Leu Ala Trp Gly Arg Arg His Val Val Met Gly Ala Asn
 85 90 95

Gln Val Asp Arg Tyr Gly Asn Gln Asn Ile Ser Ala Phe Gly Pro Leu
 100 105 110

Gln Arg Pro Thr Arg Gln Met Phe Gly Val Arg Gly Ser Pro Gly Asn
 115 120 125

Thr Ile Asn His Ala Thr Ser Tyr Trp Val Gly Asn His Cys Lys Arg
 130 135 140

Val Phe Val Glu Ala Val Asp Val Val Ser Gly Ile Gly Tyr Asp Lys
 145 150 155 160

Val Asp Pro Asp Asn Pro Ala Phe Arg Phe Val Asn Val Tyr Arg Val
 165 170 175

Val Ser Asn Leu Gly Val Phe Asp Phe Gly Gly Pro Asp His Ser Met
 180 185 190

Arg Ala Val Ser Leu His Pro Gly Val Thr Pro Gly Asp Val Arg Asp
 195 200 205

Ala Thr Ser Phe Glu Val His Asp Leu Asp Ala Ala Glu Gln Thr Arg
 210 215 220

Leu Pro Thr Asp Asp Glu Leu His Leu Ile Arg Ala Val Ile Asp Pro
 225 230 235 240

Lys Ser Leu Arg Asp Arg Glu Ile Arg Ser
 245 250

<210> 262

<211> 750

<212> DNA

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<213> Mycobacterium tuberculosis

<400> 262

```

gtgagcaccc gagccgaagt gtgtgccgtc gcctgcgccg agttgttccg cgatgcaggc      60
gaaatcatga tcagcccat gaccaacatg gcctcggtag gggcgcggtt ggcgcggctc      120
accttcgcgc cggacattct gctgaccgac ggcgaggctc agctgctcgc ggacacaccg      180
gcattgggca agacggggcg cccaaacagg attgaggggt ggatgccgtt cggccggggt      240
ttcgaaaccc tggcctgggg gcgccggcac gtggtgatgg gcgccaatca ggtcgaccgc      300
tatggcaatc agaacatctc ggcgttcggg ccgctgcagc ggccgaccgc gcagatgttc      360
ggcgtccgcg gctcgccggg caacaccatc aaccacgcca ccagttactg ggtgggcaac      420
cactgcaagc gggctcttct cgaggccgtc gatgtggtct ccggcatcgc ctacgacaag      480
gtggatccgg acaatccggc cttccggttc gtcaacgtct accgggtggt gtccaaccta      540
ggcgtgttcg acttcggcgg ccccgaccac tccatgcggg cggtatccct acaccccggg      600
gtgacgcccg gcgacgtccg cgacgccacc tcgttcgagg tgcatgacct cgacgcggcc      660
gagcagacca ggctgccac cgacgacgaa ctgcacctga tccgcgcggt aatcgatccg      720
aagtcgttgc gggacaggga gatacgatca                                     750

```

<210> 263

<211> 388

<212> PRT

<213> Mycobacterium tuberculosis

<400> 263

```

Val Thr Asp Arg Val Ala Leu Arg Ala Gly Val Pro Pro Phe Tyr Val
1              5              10              15

Met Asp Val Trp Leu Ala Ala Ala Glu Arg Gln Arg Thr His Gly Asp
                20              25              30

Leu Val Asn Leu Ser Ala Gly Gln Pro Ser Ala Gly Ala Pro Glu Pro
                35              40              45

Val Arg Ala Ala Ala Ala Ala Ala Leu His Leu Asn Gln Leu Gly Tyr
50              55              60

```

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Ser Val Ala Leu Gly Ile Pro Glu Leu Arg Asp Ala Ile Ala Ala Asp
65 70 75 80

Tyr Gln Arg Arg His Gly Ile Thr Val Glu Pro Asp Ala Val Val Ile
85 90 95

Thr Thr Gly Ser Ser Gly Gly Phe Leu Leu Ala Phe Leu Ala Cys Phe
100 105 110

Asp Ala Gly Asp Arg Val Ala Met Ala Ser Pro Gly Tyr Pro Cys Tyr
115 120 125

Arg Asn Ile Leu Ser Ala Leu Gly Cys Glu Val Val Glu Ile Pro Cys
130 135 140

Gly Pro Gln Thr Arg Phe Gln Pro Thr Ala Gln Met Leu Ala Glu Ile
145 150 155 160

Asp Pro Pro Leu Arg Gly Val Val Val Ala Ser Pro Ala Asn Pro Thr
165 170 175

Gly Thr Val Ile Pro Pro Glu Glu Leu Ala Ala Ile Ala Ser Trp Cys
180 185 190

Asp Ala Ser Asp Val Arg Leu Ile Ser Asp Glu Val Tyr His Gly Leu
195 200 205

Val Tyr Gln Gly Ala Pro Gln Thr Ser Cys Ala Trp Gln Thr Ser Arg
210 215 220

Asn Ala Val Val Val Asn Ser Phe Ser Lys Tyr Tyr Ala Met Thr Gly
225 230 235 240

Trp Arg Leu Gly Trp Leu Leu Val Pro Thr Val Leu Arg Arg Ala Val
245 250 255

Asp Cys Leu Thr Gly Asn Phe Thr Ile Cys Pro Pro Val Leu Ser Gln
260 265 270

Ile Ala Ala Val Ser Ala Phe Thr Pro Glu Ala Thr Ala Glu Ala Asp
275 280 285

Gly Asn Leu Ala Ser Tyr Ala Ile Asn Arg Ser Leu Leu Leu Asp Gly

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290 295 300
 Leu Arg Arg Ile Gly Ile Asp Arg Leu Ala Pro Thr Asp Gly Ala Phe
 305 310 315 320
 Tyr Val Tyr Ala Asp Val Ser Asp Phe Thr Ser Asp Ser Leu Ala Phe
 325 330 335
 Cys Ser Lys Leu Leu Ala Asp Thr Gly Val Ala Ile Ala Pro Gly Ile
 340 345 350
 Asp Phe Asp Thr Ala Arg Gly Gly Ser Phe Val Arg Ile Ser Phe Ala
 355 360 365
 Gly Pro Ser Gly Asp Ile Glu Glu Ala Leu Arg Arg Ile Gly Ser Trp
 370 375 380
 Leu Pro Ser Gln
 385

<210> 264

<211> 1164

<212> DNA

<213> Mycobacterium tuberculosis

<400> 264

gtgacggatc gtgtcgccct gcgtgccggc gttccccctg tctacgtgat ggacgtctgg 60
 ttggcgggccg cggagcgcca gcgcacccat ggggatctgg tgaatctttc ggccggccaa 120
 cccagtgcgg gcgctccgga accggtgcgt gcggccgcgg ccgccgccct gcatctcaac 180
 cagttgggat actcgggtggc gctgggtatt ccggagctgc gcgacgctat cgcgcgggat 240
 taccaacgcc ggcatggcat caccgtcgaa ccgatgcgg tggatgatcac caccggctcc 300
 tcgggcgggt ttctgctcgc gtttctggcg tgettgcag ccggtgatcg ggtcgcgatg 360
 gccagtcccg gctaccctg ctaccggaat atcctgtcag cgctgggatg tgaggtcgtg 420
 gagatcccg gcgaccgca gaccgattc caaccgaccg cgcagatgct ggccgagatc 480
 gaccaccgc tgcgcggtgt cgtcgtcgcc agcccggcca acccgaccgg aaccgtcatc 540
 ccgcccgaag aactggcggc catcgcgtcg tgggtgacg catcggatgt ccggttgatc 600

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```

agtgatgagg tctaccacgg cctggtgtac cagggggcac cgcaaaccag ctgcgcctgg      660
cagacgtcgc gaaacgcggt ggtagtcaac agcttttcca agtattacgc gatgacgggc      720
tggcggtctgg gctggctgct ggtgccgacg gtgctgcgcc gcgcggtgga ctgcctgacc      780
ggcaacttca ccattctgcc gccggtcttg tcgcagatcg ccgcggtgtc cgcgttcacc      840
ccggaggcga ccgccgaggc cgacggcaac ctggccagct acgcgatcaa ccgctcgctg      900
ttgctggacg gtctgcgtcg catcggcatc gaccggctgg caccaccga cggcgcattc      960
tacgtctacg ccgacgtctc ggacttcacc agcgattcgc tggccttctg ctcaaagttg     1020
ctggccgaca ccggtgttgc gatcgacccc ggaatcgatt tcgacaccgc acgggggggt     1080
tcgtttgttc ggatatcggt tgccggggcca agcggcgaca tcgaagaagc cttacggcgc     1140
atcggtctct ggctgccgag ccaa                                     1164

```

<210> 265

<211> 291

<212> PRT

<213> Mycobacterium tuberculosis

<400> 265

```

Met Thr Ala Thr Glu Glu Leu Thr Phe Glu Ser Thr Ser Arg Phe Ala
1              5              10              15

```

```

Glu Val Asp Val Asp Gly Pro Leu Lys Leu His Tyr His Glu Ala Gly
                20              25              30

```

```

Val Gly Asn Asp Gln Thr Val Val Leu Leu His Gly Gly Gly Pro Gly
        35              40              45

```

```

Ala Ala Ser Trp Thr Asn Phe Ser Arg Asn Ile Ala Val Leu Ala Arg
        50              55              60

```

```

His Phe His Val Leu Ala Val Asp Gln Pro Gly Tyr Gly His Ser Asp
65              70              75              80

```

```

Lys Arg Ala Glu His Gly Gln Phe Asn Arg Tyr Ala Ala Met Ala Leu
            85              90              95

```

```

Lys Gly Leu Phe Asp Gln Leu Gly Leu Gly Arg Val Pro Leu Val Gly

```

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100	105	110
Asn Ser Leu Gly Gly Gly Thr Ala Val Arg Phe Ala Leu Asp Tyr Pro		
115	120	125
Ala Arg Ala Gly Arg Leu Val Leu Met Gly Pro Gly Gly Leu Ser Ile		
130	135	140
Asn Leu Phe Ala Pro Asp Pro Thr Glu Gly Val Lys Arg Leu Ser Lys		
145	150	155
Phe Ser Val Ala Pro Thr Arg Glu Asn Leu Glu Ala Phe Leu Arg Val		
165	170	175
Met Val Tyr Asp Lys Asn Leu Ile Thr Pro Glu Leu Val Asp Gln Arg		
180	185	190
Phe Ala Leu Ala Ser Thr Pro Glu Ser Leu Thr Ala Thr Arg Ala Met		
195	200	205
Gly Lys Ser Phe Ala Gly Ala Asp Phe Glu Ala Gly Met Met Trp Arg		
210	215	220
Glu Val Tyr Arg Leu Arg Gln Pro Val Leu Leu Ile Trp Gly Arg Glu		
225	230	235
Asp Arg Val Asn Pro Leu Asp Gly Ala Leu Val Ala Leu Lys Thr Ile		
245	250	255
Pro Arg Ala Gln Leu His Val Phe Gly Gln Cys Gly His Trp Val Gln		
260	265	270
Val Glu Lys Phe Asp Glu Phe Asn Lys Leu Thr Ile Glu Phe Leu Gly		
275	280	285
Gly Gly Arg		
290		

<210> 266

<211> 873

<212> DNA

<213> Mycobacterium tuberculosis

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<400> 266
 atgacagcta ccgaggaatt gacgttcgaa tccacctcgc gctttgcgga agtggacgtc 60
 gacggggccgc tgaaactgca ctaccacgag gccggcggtg gcaacgacca gacggtggtg 120
 ctactgcacg gcggtggggc cggcgcggcg agctggacga acttctcgcg taatatcgcg 180
 gtgctggcgc ggcactttca tgtgctggcc gtcgaccagc ccggttacgg ccattccgac 240
 aagcggggccg agcacggcca gttcaatcgc tatgccgcga tggcgctgaa ggggctcttc 300
 gatcagctgg ggctggggcg ggtaccgctg gtgggcaact cgttgggcgg gggaaaccgcg 360
 gtccggtttg cgctggacta cccggcccgg gcaggacggt tagtgctgat gggcccgggg 420
 ggcctgagta tcaacctgtt tgcgcccgc cgcaccgagg gagtcaaacg gctgtcgaag 480
 ttctccgttg cggccaccgc ggagaacctc gaggcgttcc tgcgggtcat ggtctacgac 540
 aagaacctga tcacccccga gttggtggat cagcggtttg cgctggccag caccocggag 600
 tcgttgacgg caacacgggc gatgggaaag tcgttcgccg gagccgactt cgaggccggc 660
 atgatgtggc gcgaggtgta tcggctgcgc cagccggtgt tgctgatctg gggtcgtgag 720
 gaccgggtca acccgctgga cggcgcgctg gttgcgttga aaacgattcc gcgtgcgcag 780
 ctgcacgtat tcgggcagtg tgggcattgg gtgcagggtg agaagttcga cgagttcaac 840
 aagctgacga ttgaatttct gggaggtggc aga 873

<210> 267

<211> 188

<212> PRT

<213> Mycobacterium tuberculosis

<400> 267

Met Thr Arg Val Val Leu Ser Val Gly Ser Asn Leu Gly Asp Arg Leu
 1 5 10 15

Ala Arg Leu Arg Ser Val Ala Asp Gly Leu Gly Asp Ala Leu Ile Ala
 20 25 30

Ala Ser Pro Ile Tyr Glu Ala Asp Pro Trp Gly Gly Val Glu Gln Gly
 35 40 45

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Gln Phe Leu Asn Ala Val Leu Ile Ala Asp Asp Pro Thr Cys Glu Pro
 50 55 60

Arg Glu Trp Leu Arg Arg Ala Gln Glu Phe Glu Arg Ala Ala Gly Arg
 65 70 75 80

Val Arg Gly Gln Arg Trp Gly Pro Arg Asn Leu Asp Val Asp Leu Ile
 85 90 95

Ala Cys Tyr Gln Thr Ser Ala Thr Glu Ala Leu Val Glu Val Thr Ala
 100 105 110

Arg Glu Asn His Leu Thr Leu Pro His Pro Leu Ala His Leu Arg Ala
 115 120 125

Phe Val Leu Ile Pro Trp Ile Ala Val Asp Pro Thr Ala Gln Leu Thr
 130 135 140

Val Ala Gly Cys Pro Arg Pro Val Thr Arg Leu Leu Ala Glu Leu Glu
 145 150 155 160

Pro Ala Asp Arg Asp Ser Val Arg Leu Phe Arg Pro Ser Phe Asp Leu
 165 170 175

Asn Ser Arg His Pro Val Ser Arg Ala Pro Glu Ser
 180 185

<210> 268

<211> 564

<212> DNA

<213> Mycobacterium tuberculosis

<400> 268

atgacgcggg tagtgcctc gggtggctcc aacctgggtg accgcctggc acgattgcgg	60
tcggtcgccg acggtctcgg cgatgcgttg attgcggctt cccgatata tgaggccgac	120
ccctgggggtg ggggtggagca ggggcagttc ctcaatgcgg tgctgatcgc cgacgatcct	180
acctgcgaac cgcgggagtg gctgcggcgg ggcgaggagt tcgagcgcgc tgcgggcagg	240
gtgcgtggcc agcgtgggg tccacgaaat ctgcacgtcg acctgatcgc ctgctaccag	300
acctcgcca ccgaggctct ggtcgaagtg accgcgcggg agaaccacct cagctgcgg	360

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cacccactgg cgcatctgcg ggcctttgtg ttgatcccggt ggattgccgt cgacccaacg 420
 gcgcagctga cggttgccgg gtgcccgcgg cccgtcacgc gactgctggc cgagctggag 480
 cccgccgacc gcgacagtgt gcggttgttt aggccgtcgt tcgatctgaa tagcagacac 540
 cccgtcagtc gggcaccgga aagc 564

<210> 269

<211> 166

<212> PRT

<213> Mycobacterium tuberculosis

<400> 269

Leu Pro Gly Arg Val Phe Ala Ser Pro Ala Asp Phe Asn Thr Gln Leu
 1 5 10 15

Gln Ala Trp Leu Val Arg Ala Asn His Arg Gln His Arg Val Leu Gly
 20 25 30

Cys Arg Pro Ala Asp Arg Ile Glu Ala Asp Thr Ala Ala Met Leu Thr
 35 40 45

Leu Pro Pro Val Gly Pro Ser Ile Gly Trp Arg Thr Ser Thr Arg Leu
 50 55 60

Pro Arg Asp His Tyr Val Arg Leu Asp Gly Asn Asp Tyr Ser Val His
 65 70 75 80

Pro Val Ala Ile Gly Arg Arg Ile Glu Ile Thr Ala Asp Leu Ser Arg
 85 90 95

Val Arg Val Trp Cys Gly Gly Thr Leu Val Ala Asp His Asp Arg Ile
 100 105 110

Trp Ala Lys His Gln Thr Ile Ser Asp Pro Glu His Val Val Ala Ala
 115 120 125

Lys Leu Leu Arg Arg Lys Arg Phe Asp Ile Val Gly Pro Pro His His
 130 135 140

Val Glu Val Glu Gln Arg Leu Leu Thr Thr Tyr Asp Thr Val Leu Gly

145 150 155 160

Arg Lys Thr Trp Ser Ala Ala Ala Ala Val Val Leu Asp His Ala Ala

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35	40	45															
Ala	Asp	Arg	Cys	Gly	Arg	Leu	Ala	Leu	Pro	Arg	Arg	Thr	His	Val	Ser		
50						55					60						
Val	Leu	Thr	Gly	Thr	Glu	Ala	Ala	Thr	Ala	Thr	Trp	Ala	Ala	Ala	Ile		
65					70					75					80		
Thr	Val	Gly	Ala	Gln	His	Val	Leu	Arg	Met	Pro	Glu	Gln	Glu	Gly	Glu		
				85					90					95			
Leu	Val	Arg	Glu	Leu	Ala	Glu	Ala	Ala	Glu	Ser	Ala	Arg	Asp	Asp	Gly		
			100					105					110				
Ile	Cys	Gly	Ala	Val	Val	Ala	Val	Ile	Gly	Gly	Arg	Gly	Gly	Ala	Gly		
		115					120					125					
Ala	Ser	Leu	Phe	Ala	Val	Ala	Leu	Ala	Gln	Ala	Ala	Ala	Asp	Ala	Leu		
		130					135					140					
Leu	Val	Asp	Leu	Asp	Pro	Trp	Ala	Gly	Gly	Ile	Asp	Leu	Leu	Val	Gly		
145					150					155					160		
Gly	Glu	Thr	Ala	Pro	Gly	Leu	Arg	Trp	Pro	Asp	Leu	Ala	Leu	Gln	Gly		
				165					170					175			
Gly	Arg	Leu	Asn	Trp	Ser	Ala	Val	Arg	Ala	Ala	Leu	Pro	Arg	Pro	Arg		
		180						185					190				
Gly	Ile	Ser	Val	Leu	Ser	Gly	Thr	Arg	Arg	Gly	Tyr	Glu	Leu	Asp	Ala		
		195					200					205					
Gly	Pro	Val	Asp	Ala	Val	Ile	Asp	Ala	Gly	Arg	Arg	Gly	Gly	Val	Thr		
		210				215					220						
Val	Val	Cys	Asp	Leu	Pro	Arg	Arg	Leu	Thr	Asp	Ala	Thr	Gln	Ala	Ala		
225					230					235					240		
Leu	Asp	Ala	Ala	Asp	Leu	Val	Val	Leu	Val	Ser	Pro	Cys	Asp	Val	Arg		
				245					250					255			
Ala	Cys	Ala	Ala	Ala	Ala	Thr	Met	Ala	Pro	Val	Leu	Thr	Ala	Ile	Asn		
				260				265					270				

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Pro Asn Leu Gly Leu Val Val Arg Gly Pro Ser Pro Gly Gly Leu Arg
 275 280 285

Ala Ala Glu Val Ala Asp Val Ala Gly Val Pro Leu Leu Ala Ser Met
 290 295 300

Arg Ala Gln Pro Arg Leu Ala Glu Gln Leu Glu His Gly Gly Leu Arg
 305 310 315 320

Leu Arg Arg Arg Ser Val Leu Ala Ser Ala Ala Arg Arg Val Leu Gly
 325 330 335

Val Leu Pro Arg Ala Gly Ser Gly Arg His Gly Arg Ala Ala
 340 345 350

<210> 272

<211> 1050

<212> DNA

<213> Mycobacterium tuberculosis

<400> 272

atgctgaccg atccgggggtt gcgcgacgag ctggaccgag tcgccgcagc cgtcgggggtt	60
cgcgttggtc atctcggcgg ccgccatccg gtgagcagaa agacgtggtc ggcggcggcg	120
gctgtggtgc tcgaccacgc ggcggcggac cgggtgtgggc ggctcgcgct accccggcgc	180
accacgtca gcgtgttgac cggaaccgaa gccgcgacgg cgacctgggc ggctgccata	240
accgtcgggg cccagcacgt gctgaggatg cccgagcagg agggatgaact ggtccgcgag	300
ctcgccgaag ctgctgaatc ggcacgcgat gacgggatct gcggggcggt ggtcgcggtc	360
atcgggggtc gcggtggcgc tggggcatcg ttgtttgcgg ttgccctggc gcaggccgcc	420
gctgatgcgc tgttggtcga tctcgatccg tgggccggcg gcatcgatct tctggtgggc	480
ggcgaaaccg ccccggtct gcgttgccc gacctggcgc tacagggtgg acggctgaat	540
tggtcggcgg tgcgtgcggc attgccgcga ccgcggggga tcagcgtgct ctcgggaaat	600
cggcgcggct acgagttaga cgcggggccg gtggacgccg tgatcgacgc cggccgacgt	660
gggggagtc ccggtggtctg cgatcttcca cgtcgtctga ccgatgccac ccaagcagcg	720
ctggatgccg ccgatctcgt cgtcctggtc agcccatgcg atgtgcgggc atgtgcggcc	780
gccgcgacga tggcgctgt gctgaccgcg atcaacccca acctgggtct ggtggtgcgg	840

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```

gggccctccc cggggggatt gcgggcggca gaggtcgcgg acgtcgccgg ggtgccgcta      900
ctggcatcca tgagggccca gccgcggcta gccgaacagc tggaacacgg gggctcttcga      960
ctgcgacggc gatcggtgct ggcacggct gcccgacggg tacttggtgt gctgccacgt     1020
gctgggtcag ggcgacacgg tagggcggca                                     1050

```

<210> 273

<211> 70

<212> PRT

<213> Mycobacterium tuberculosis

<400> 273

```

Met Ser Asp Cys Asn Val Leu Gly Gly Ala Leu Glu Gln Gly Gly Thr
1           5           10           15

```

```

Asp Pro Leu Thr Gly Phe Tyr Arg Asp Gly Cys Cys Ala Thr Gly Pro
          20           25           30

```

```

Glu Asp Leu Gly Trp His Thr Ile Cys Ala Val Met Thr Thr Glu Phe
          35           40           45

```

```

Leu Ala His Gln Arg Ser Val Gly Asn Asp Leu Ser Ile Ala Arg Pro
          50           55           60

```

```

Pro Arg Trp Leu Arg Pro
65           70

```

<210> 274

<211> 210

<212> DNA

<213> Mycobacterium tuberculosis

<400> 274

```

atgtccgatt gcaatgtgct gggcggcgcc ctggaacagg gtggcaccga tccgcttacc      60
ggcttctatc gtgacggctg ctgtgcgacc ggacccgagg acctcggttg gcacaccatc     120
tgcgccgtca tgaccaccga attcctggca caccagcgct cggtcggcaa cgacctgtcg     180

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attgcgcgcc cgccacggtg gctgcgccct

210

<210> 275

<211> 846

<212> PRT

<213> Mycobacterium tuberculosis

<400> 275

Met Ala Pro Leu Ala Val Asp Pro Ala Ala Leu Asp Ser Ala Gly Gly
1 5 10 15

Ala Val Val Ala Ala Gly Ala Gly Leu Gly Ala Val Ile Ser Ser Leu
20 25 30

Thr Ala Ala Leu Ala Gly Cys Ala Gly Met Ala Gly Asp Asp Pro Ala
35 40 45

Gly Ala Val Phe Gly Arg Ser Tyr Asp Gly Ser Ala Ala Ala Leu Val
50 55 60

Gln Ala Met Ser Val Ala Arg Asn Gly Leu Cys Asn Leu Gly Asp Gly
65 70 75 80

Val Arg Met Ser Ala His Asn Tyr Ser Leu Ala Glu Ala Met Ser Asp
85 90 95

Val Ala Gly Arg Ala Ala Pro Leu Pro Ala Pro Pro Pro Ser Gly Cys
100 105 110

Val Gly Val Gly Ala Pro Pro Ser Ala Val Gly Gly Gly Gly Gly Ala
115 120 125

Pro Lys Gly Trp Gly Trp Val Ala Pro Tyr Ile Gly Met Ile Trp Pro
130 135 140

Asn Gly Asp Ser Thr Lys Leu Arg Ala Ala Ala Val Ala Trp Arg Ser
145 150 155 160

Ala Gly Thr Gln Phe Ala Leu Thr Glu Ile Gln Ser Thr Ala Gly Pro
165 170 175

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Met Gly Val Ile Arg Ala Gln Gln Leu Pro Glu Ala Gly Leu Ile Glu
 180 185 190

Ser Ala Phe Ala Asp Ala Tyr Ala Ser Thr Thr Ala Val Val Gly Gln
 195 200 205

Cys His Gln Leu Ala Ala Gln Leu Asp Ala Tyr Ala Ala Arg Ile Asp
 210 215 220

Ala Val His Ala Ala Val Leu Asp Leu Leu Ala Arg Ile Cys Asp Pro
 225 230 235 240

Leu Thr Gly Ile Lys Glu Val Trp Glu Phe Leu Thr Asp Gln Asp Glu
 245 250 255

Asp Glu Ile Gln Arg Ile Ala His Asp Ile Ala Val Val Val Asp Gln
 260 265 270

Phe Ser Gly Glu Val Asp Ala Leu Ala Ala Glu Ile Thr Ala Val Val
 275 280 285

Ser His Ala Glu Ala Val Ile Thr Ala Met Ala Asp His Ala Gly Lys
 290 295 300

Gln Trp Asp Arg Phe Leu His Ser Asn Pro Val Gly Val Val Ile Asp
 305 310 315 320

Gly Thr Gly Gln Gln Leu Lys Gly Phe Gly Glu Glu Ala Phe Gly Met
 325 330 335

Ala Lys Asp Ser Trp Asp Leu Gly Pro Leu Arg Ala Ser Ile Asp Pro
 340 345 350

Phe Gly Trp Tyr Arg Ser Trp Glu Glu Met Leu Thr Gly Met Ala Pro
 355 360 365

Leu Ala Gly Leu Gly Gly Glu Asn Ala Pro Gly Val Val Glu Ser Trp
 370 375 380

Lys Gln Phe Gly Lys Ser Leu Ile His Trp Asp Glu Trp Thr Thr Asn
 385 390 395 400

Pro Asn Glu Ala Leu Gly Lys Thr Val Phe Asp Ala Ala Thr Leu Ala
 405 410 415

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Leu Pro Gly Gly Pro Leu Ser Lys Leu Gly Ser Lys Gly Arg Asp Ile
 420 425 430

Leu Ala Gly Val Arg Gly Leu Lys Glu Arg Leu Glu Pro Thr Thr Pro
 435 440 445

His Leu Glu Pro Pro Ala Thr Pro Pro Arg Pro Gly Pro Gln Pro Pro
 450 455 460

Arg Ile Glu Pro Pro Glu Ser Gly His Pro Ala Pro Ala Pro Ala Ala
 465 470 475 480

Lys Pro Ala Pro Val Pro Ala Asn Gly Pro Leu Pro His Ser Pro Thr
 485 490 495

Glu Ser Lys Pro Pro Pro Val Asp Arg Pro Ala Glu Pro Val Ala Pro
 500 505 510

Ser Ser Ala Ser Ala Gly Gln Pro Arg Val Ser Ala Ala Thr Thr Pro
 515 520 525

Gly Thr His Val Pro His Gly Leu Pro Gln Pro Gly Glu His Val Pro
 530 535 540

Ala Gln Ala Pro Pro Ala Thr Thr Leu Leu Gly Gly Pro Pro Val Glu
 545 550 555 560

Ser Ala Pro Ala Thr Ala His Gln Pro Gln Trp Ala Thr Thr Pro Ala
 565 570 575

Ala Pro Ala Ala Ala Pro His Ser Thr Pro Gly Gly Val His Ser Thr
 580 585 590

Glu Ser Gly Pro His Gly Arg Ser Leu Ser Ala His Gly Ser Glu Pro
 595 600 605

Thr His Asp Gly Ala Ser His Gly Ser Gly His Gly Ser Gly Ser Glu
 610 615 620

Pro Pro Gly Leu His Ala Pro His Arg Glu Gln Gln Leu Ala Met His
 625 630 635 640

Ser Asn Glu Pro Ala Gly Glu Gly Trp His Arg Leu Ser Asp Glu Ala

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	645		650		655
Val Asp Pro Gln Tyr Gly Glu Pro Leu Ser Arg His Trp Asp Phe Thr	660		665		670
Asp Asn Pro Ala Asp Arg Ser Arg Ile Asn Pro Val Val Ala Gln Leu	675		680		685
Met Glu Asp Pro Asn Ala Pro Phe Gly Arg Asp Pro Gln Gly Gln Pro	690		695		700
Tyr Thr Gln Glu Arg Tyr Gln Glu Arg Phe Asn Ser Val Gly Pro Trp	705		710		715
Gly Gln Gln Tyr Ser Asn Phe Pro Pro Asn Asn Gly Ala Val Pro Gly	725		730		735
Thr Arg Ile Ala Tyr Thr Asn Leu Glu Lys Phe Leu Ser Asp Tyr Gly	740		745		750
Pro Gln Leu Asp Arg Ile Gly Gly Asp Gln Gly Lys Tyr Leu Ala Ile	755		760		765
Met Glu His Gly Arg Pro Ala Ser Trp Glu Gln Arg Ala Leu His Val	770		775		780
Thr Ser Leu Arg Asp Pro Tyr His Ala Tyr Thr Ile Asp Trp Leu Pro	785		790		795
Glu Gly Trp Phe Ile Glu Val Ser Glu Val Ala Pro Gly Cys Gly Gln	805		810		815
Pro Gly Gly Ser Ile Gln Val Arg Ile Phe Asp His Gln Asn Glu Met	820		825		830
Arg Lys Val Glu Glu Leu Ile Arg Arg Gly Val Leu Arg Gln	835		840		845

<210> 276

<211> 2538

<212> DNA

<213> Mycobacterium tuberculosis

<400> 276
atggcgccgt tggcggtcga tcccgcgcc cttgatagcg cggcgggcg ggtggtggct 60
gcgggtgcgg gtttggtgc ggtgatctcg tcgctgaccg cggcgctggc cgggtgtgcg 120
gggatggccg gtgatgatcc ggctggggcg gtgttcgggc gtcctatga cggttcggcg 180
gccgcgctgg tgcaggcgat gtcggtggcg cgcaacggat tgtgcaacct cggcgatggg 240
gtgcgcatga gcgcgcacaa ctactcgttg gccgaggcga tgcgcatgt cgctgggcgg 300
gcggcgccgt tgcggcgcc gccgccgagc ggctgtgtcg gcgtgggtgc gccgccgtcg 360
gcggtcggtg gcggcggtgg cggccgaag ggctgggggt gggtgcccc gtatatcggg 420
atgatctggc cgaacgggga ttcgacaaag ctacgtgcgg cggctgtggc gtggcgcgagc 480
gcgggcacgc agttcgcgct gactgagatt cagtcgacgg cggggccgat gggcgttatt 540
cgcgcccagc agctcccga ggcggggctg atcgagtcgg cgtttgctga cgcgtacgcc 600
agcaccaccg ctgtcgtggg ccaatgccac cagctggcg cccagctaga cgcctatgcc 660
gcccgcacg acgcggtgca tgcggcggtc ctggatttgt tggcccgcat ctgcgatccg 720
ctgaccggga tcaaagaggt gtgggagttt ctgaccgacc aggacgaaga cgagatccag 780
cgcatcgccc atgacatcgc ggtggtggtc gaccagttca gcggggaagt ggacgcgttg 840
gctgcggaga tcaccgcggt ggtgtcgac gccgaggcg tgatcaccgc gatggcagac 900
cacgcaggca aacaatggga tcggttcttg cacagcaacc cggtggtgt ggtcatcgat 960
ggcaccgggc agcagctcaa aggcttcggc gaggaggcct tcgggatggc caaggactcc 1020
tgggacctag ggccactgcg cgcctcgata gaccggttcg ggtggtatcg ctccctgggag 1080
gagatgctga ctgggatggc gccgctggcg ggcctgggcg gcgagaacgc tcccggcgtt 1140
gtggagtcgt ggaagcagtt cggcaaaagc ctcatccatt gggatgagtg gacgaccaac 1200
cctaagagg cgctaggcaa gaccgtattc gacgccgga cgctagcttt gccgggcggg 1260
ccgctgtcga aacttggcag caagggccg gacattctcg cggcgctgcg aggcctcaag 1320
gagcggcttg agccgacgac accgcacctt gagccccag caacgcgcgc gcggccagga 1380
ccgcaaccac cacggatcga accaccagaa tcggggccacc cggcaccgc gcccgcgcg 1440
aaaccggcg ccgtgccgc caacggtcca ctgccgcaca gcccaccga atccaaaccg 1500
ccggccgtcg acagaccggc tgaaccggtg gcgccgtcgt cggcgctggc aggcagccc 1560
cgggtatccg cagccaccac gcccggcaca catgtgccgc atggcctgcc gcaaccgggt 1620
gaacatgtcc cggcgcaagc accaccggcg acgacgttgc ttggcggaac tcctgtcgag 1680

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tcagcgcccg ctaccgcgca ccaacccag tgggcgacca caccagcagc acccgcgggcg 1740
 gcgcccgcatt ccacgcccgg aggcgttcac tcaaccgaat cggggcctca cggccgatca 1800
 ctgagcgcac acggatccga gccgaccac gacgggtgcgt ctcacgggtc aggccacggc 1860
 agcggtagcg agccacctgg gctgcatgcg ccgcatcgcg agcagcagct tgcaatgcat 1920
 tcgaacgaac cagctggaga gggttggcat cggttatccg acgaagcggc tgacccgcag 1980
 tatggcgagc cattatcgcg ccaactgggac tttacagaca atccggccga tcgcagtcgg 2040
 ataaacccgg ttgtggccca gctcatggag gaccccaacg ccccatcggc ccgcgatcct 2100
 caggacagc cctataccca agaacggat caagagcgat ttaatagtgt aggcccatgg 2160
 ggcagcagc actctaattt tccgcctaac aatgggtgcg ttccaggac aaggatcgcc 2220
 tacactaatc tcgaaaaatt tcttagtgac tacggccccc agctagatcg tataggcggc 2280
 gatcagggca agtacctggc gatcatggaa catgggcgcc cggcatcatg ggaacaacgt 2340
 gccctgcacg tgacgtcggt acgcgacccc taccacgcgt ataccattga ttggttgcc 2400
 gagggatggc tcatcgaagt atctgaggtc gcgcccgggt gcggccagcc gggcggtacc 2460
 atccaagtgc ggatattcga tcatcagaac gagatgcgca aagtggaaga gttaataagg 2520
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<210> 277

<211> 115

<212> PRT

<213> *Mycobacterium tuberculosis*

<400> 277

Met Phe Leu Ala Gly Val Leu Cys Met Cys Ala Ala Ala Ala Ser Ala
 1 5 10 15

Leu Phe Gly Ser Trp Ser Leu Cys His Thr Pro Thr Ala Asp Pro Thr
 20 25 30

Ala Leu Ala Leu Arg Ala Met Ala Pro Thr Gln Leu Ala Ala Ala Val
 35 40 45

Met Leu Ala Ala Gly Gly Val Val Ala Val Ala Ala Pro Gly His Thr
 50 55 60

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Ala Leu Met Val Val Ile Val Cys Ile Ala Gly Ala Val Gly Thr Leu
65 70 75 80

Ala Ala Gly Ser Trp Gln Ser Ala Gln Tyr Ala Leu Arg Arg Glu Thr
85 90 95

Ala Ser Pro Thr Ala Asn Cys Val Gly Ser Cys Ala Val Cys Thr Gln
100 105 110

Ala Cys His
115

<210> 278

<211> 345

<212> DNA

<213> Mycobacterium tuberculosis

<400> 278

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cccacgcagt tggcagccgc agtaatgctg gccgccgggg gagtggtggc ggtggccgcg 180
cccgggcaca ccgccttgat ggtggtgatc gtctgcattg cgggcgcggt cggcacgctg 240
gccgcgggggt cgtggcagag cgcccagtac gcgctgcgcc gtgaaaccgc tagccccacc 300
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<210> 279

<211> 236

<212> PRT

<213> Mycobacterium tuberculosis

<400> 279

Met Gly Gly Met Asp Thr Gly Val Thr Ser Pro Arg Val Leu Val Val
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Asp Asp Asp Ser Asp Val Leu Ala Ser Leu Glu Arg Gly Leu Arg Leu
20 25 30

-349-

Ser Gly Phe Glu Val Ala Thr Ala Val Asp Gly Ala Glu Ala Leu Arg
 35 40 45

Ser Ala Thr Glu Asn Arg Pro Asp Ala Ile Val Leu Asp Ile Asn Met
 50 55 60

Pro Val Leu Asp Gly Val Ser Val Val Thr Ala Leu Arg Ala Met Asp
 65 70 75 80

Asn Asp Val Pro Val Cys Val Leu Ser Ala Arg Ser Ser Val Asp Asp
 85 90 95

Arg Val Ala Gly Leu Glu Ala Gly Ala Asp Asp Tyr Leu Val Lys Pro
 100 105 110

Phe Val Leu Ala Glu Leu Val Ala Arg Val Lys Ala Leu Leu Arg Arg
 115 120 125

Arg Gly Ser Thr Ala Thr Ser Ser Ser Glu Thr Ile Thr Val Gly Pro
 130 135 140

Leu Glu Val Asp Ile Pro Gly Arg Arg Ala Arg Val Asn Gly Val Asp
 145 150 155 160

Val Asp Leu Thr Lys Arg Glu Phe Asp Leu Leu Ala Val Leu Ala Glu
 165 170 175

His Lys Thr Ala Val Leu Ser Arg Ala Gln Leu Leu Glu Leu Val Trp
 180 185 190

Gly Tyr Asp Phe Ala Ala Asp Thr Asn Val Val Asp Val Phe Ile Gly
 195 200 205

Tyr Leu Arg Arg Lys Leu Glu Ala Gly Gly Gly Pro Arg Leu Leu His
 210 215 220

Thr Val Arg Gly Val Gly Phe Val Leu Arg Met Gln
 225 230 235

<210> 280

<211> 708

<212> DNA

-350-

<213> Mycobacterium tuberculosis

<400> 280

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gtggacggcg ccgaggcctt gcgcagcgcc accgagaacc ggccggacgc gatcgtgctc      180
gacatcaaca tgccagtgtc cgatggagtc agcgtcgtga cggcactacg cgcgatggac      240
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gtgctctccc gagcgcaact cctggaattg gtgtggggct acgacttcgc cgccgacacc      600
aacgtggtgg acgtcttcat cgggtacctg cggcgcaaac tggaggccgg cgggtggccct      660
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<210> 281

<211> 112

<212> PRT

<213> Mycobacterium tuberculosis

<400> 281

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Met Ala Ala Leu Val Arg Glu Val Val Gly Asp Val Leu Arg Gly Ala
1          5          10         15

Arg Met Ser Gln Gly Arg Thr Leu Arg Glu Val Ser Asp Ser Ala Arg
          20          25         30

Val Ser Leu Gly Tyr Leu Ser Glu Ile Glu Arg Gly Arg Lys Glu Pro
          35          40         45

Ser Ser Glu Leu Leu Ser Ala Ile Cys Thr Ala Leu Gln Leu Pro Leu
          50          55         60

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Ser Val Val Leu Ile Asp Ala Gly Glu Arg Met Ala Arg Gln Glu Arg
 65 70 75 80

Leu Ala Arg Ala Thr Pro Ala Gly Arg Ala Thr Gly Ala Thr Ile Asp
 85 90 95

Ala Ser Thr Lys Val Val Ile Ala Pro Val Val Ser Leu Ala Val Ala
 100 105 110

<210> 282

<211> 336

<212> DNA

<213> Mycobacterium tuberculosis

<400> 282

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ggtcgggacgc tgcgcgaggt gtccgattcg gcgcgggtga gcctcgggta tctgtcggag	120
atcgagcgcg gtcgcaagga gccttcacgc gagctgctca gtgcgatttg tacggctctg	180
cagctcccggt tgcggtggt gctcatcgat gcgggcgagc ggatggcgcg tcaagagcgc	240
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