(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(11) 공개번호 10-2012-0056099
(43) 공개일자 2012년06월01일

(51) 국제특허분류(Int. Cl.)
C12Q 1/68 (2006.01) *C12N 15/11* (2006.01)
(21) 출원번호 10-2010-0117633
(22) 출원일자 2010년11월24일
심사청구일자 2010년11월24일

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전체 청구항 수 : 총 8 항

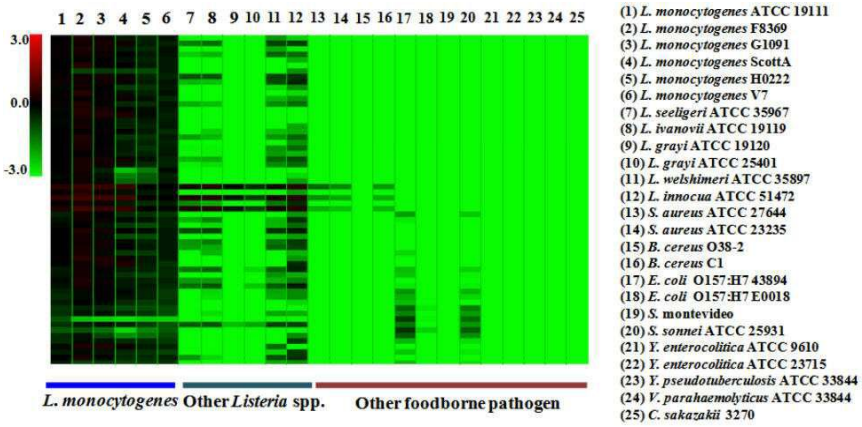
(54) 발명의 명칭 **리스테리아 모노사이토제네스 랜덤 지노믹 ＤＮＡ 단편을 이용한 유전자 칩**

(57) 요 약

본 발명은 리스테리아 모노사이토제네스(*Listeria monocytogenes*)의 랜덤 DNA 단편을 이용한 유전자 칩에 관한 것으로, 더욱 구체적으로 리스테리아 모노사이토제네스의 지노믹 DNA로부터 유래된 랜덤 지노믹 DNA 프로브를 포함하는 리스테리아 모노사이토제네스 검출용 DNA 칩에 관한 것이다.

본 발명에 따르면, 본 발명은 특정 유전 정보 없이 단 하나의 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 균주에서 추출된 지노믹 DNA를 무작위로 절단하여 얻어진 60 개의 DNA 단편을 이용하여 *L. monocytogenes* 검출용 DNA 칩을 제작하였다. 상기 DNA 칩은 리스테리아(*Listeria*) 속(genus)의 다른 종(species) 및 리스테리아(*Listeria*)와 다른 속(genus)의 미생물과 차별되면서 단지 *L. monocytogenes*만 검출할 수 있다.

대 표 도 - 도3



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이 발명을 지원한 국가연구개발사업

과제고유번호	20100301061197001040O
부처명	농림수산식품부
연구사업명	BIO그린21사업
연구과제명	농축산식품으로부터 식중독균 및 식품부패균들의 신속, 동시 검출을 위한 DNA chip 개발
주관기관	고려대학교 산학협력단
연구기간	2008.01.01 ~ 2010.12.31

특허청구의 범위

청구항 1

리스테리아 모노사이토제네스(*Listeria monocytogenes*)의 지노믹 DNA로부터 유래된 랜덤 지노믹 DNA 프로브를 포함하는 리스테리아 모노사이토제네스 검출용 DNA 칩.

청구항 2

제 1항에 있어서, 상기 랜덤 지노믹 DNA 프로브는 상기 리스테리아 모노사이토제네스(*Listeria monocytogenes*)로부터 추출한 지노믹 DNA를 서로 다른 종류의 제한효소 쌍으로 잘라내어 겔 추출법으로 추출한 100 내지 1500 bp의 DNA인 것을 특징으로 하는 DNA 칩.

청구항 3

제 2항에 있어서, 상기 서로 다른 종류의 제한효소 쌍은 *EcoR*Ⅰ/*BamH*Ⅰ, *Hind*Ⅲ/*Xho*Ⅰ 및 *Hind*Ⅲ/*Sac*Ⅱ인 것을 특징으로 하는 DNA 칩.

청구항 4

제 1항에 있어서, 상기 랜덤 지노믹 DNA 프로브는 서열번호 1 내지 60의 염기서열을 갖는 것을 특징으로 하는 DNA 칩.

청구항 5

제 1항에 있어서, 리스테리아(*Listeria*) 속(genus) 중에서 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 종(species)만을 특이적으로 검출하는 것을 특징으로 하는 DNA 칩.

청구항 6

하기의 단계를 포함하는 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 검출용 DNA 칩의 제조방법:

a) 리스테리아 모노사이토제네스(*Listeria monocytogenes*)로부터 지노믹 DNA를 추출하는 단계;

b) 추출한 지노믹 DNA를 서로 다른 종류의 제한효소 쌍으로 잘라내어 겔 추출법으로 100 ~ 1500 bp를 분리하는 단계;

c) 상기 b) 단계에서 사용한 제한효소 쌍으로 처리된 라이브러리용 플라스미드와 상기 절단된 지노믹 DNA를 연결시켜 콜로니를 획득하는 단계;

d) 획득한 콜로니에서 플라스미드를 추출한 후, T3/T7 프라이머로 PCR을 수행한 후 프로브를 정제하는 단계; 및

e) 정제된 프로브를 슬라이드 글라스에 고정하는 단계.

청구항 7

제 6항에 있어서, 하기의 단계를 더 포함하는 것을 특징으로 하는 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 검출용 DNA 칩의 제조방법:

(a) 고정된 랜덤 지노믹 DNA 프로브를 다른 비교 미생물로부터 랜덤 프라이밍(random priming)된 DNA와 하이브리다이제이션(hybridization)시켜 상호중복 하이브리다이제이션을 제외시키는 단계; 및

(b) 리스테리아 모노사이토제네스(*Listeria monocytogenes*)에만 하이브리다이제이션하는 랜덤 지노믹 DNA 프로브만을 선택하여 슬라이드 글라스에 고정화하는 단계.

청구항 8

제 1항의 DNA 칩을 준비하는 단계; 시료 미생물로부터 지노믹 DNA를 추출하고 랜덤 프라이밍(random priming)을 통해 시료 DNA를 제조하는 단계; 상기 시료 DNA를 상기 DNA 칩 상의 지노믹 DNA 프로브와 하이브리다이제이션(hybridization)시켜 리스테리아 모노사이토제네스(*Listeria monocytogenes*)의 존재 유무를 판별하는 단계를 포함하는 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 균의 탐지방법.

명 세 서

기 술 분 야

[0001] 본 발명은 리스테리아 모노사이토제네스(*Listeria monocytogenes*)의 랜덤 DNA 단편을 이용한 유전자 칩에 관한 것으로, 더욱 구체적으로 리스테리아 모노사이토제네스의 지노믹 DNA로부터 유래된 랜덤 지노믹 DNA 프로브를 포함하는 리스테리아 모노사이토제네스 검출용 DNA 칩에 관한 것이다.

배 경 기 술

[0002] 리스테리아(*Listeria*) 속(genus)은 6 개의 종(species); *L. monocytogenes*, *L. seeligeri*, *L. ivanovii*, *L. welshimeri*, *L.innocua* 및 *L. grayi*로 구성되어 있으며, 이 중 리스테리아 모노사이토제네스(*L. monocytogenes*)는 유일하게 인간 리스테리아증(human listeriosis)을 일으키는 균이다. 리스테리아증은 유아, 임산부, 노인, 면역결핍환자와 같은 위험 그룹(risk groups)에서 수막염(meningitis), 뇌염(encephalitis), 패혈증(sepsis)과 같은 심각한 질병을 유발할 수 있으며, 입원과 치사율이 각각 약 91%, 30% 정도로 매우 높다. 리스테리아증은 리스테리아 모노사이토제네스(*L. monocytogenes*)가 오염된 식품의 섭취로 인해 발생되는데 이 균은 냉장온도, 높은 산(acidity)과 염기(salinity), 낮은 수분활성도와 같은 다양한 범위의 환경조건에서 생존 및 성장할 수 있기 때문에 치즈, 육류, 우유, 채소, 해산물(seafood products)과 같은 다양한 식품에 오염될 수 있다.

[0003] 이에, 식품에 오염된 리스테리아 모노사이토제네스(*L. monocytogenes*)를 검출하는 다양한 진단방법이 개발되어 있으나, FDA(Food and Administration)와 USDA(U.S. Department of Agriculture)에서 추천하는 전통적인 배양 방법(traditional culture-based assays)은 적어도 3-4일 정도의 시간이 소모되는 단점이 있으며, 뿐만 아니라 인리치먼트(enrichment)동안 식품에 적은 수의 *L. monocytogenes*가 존재할 때 다른 리스테리아(*Listeria*) spp.와 natural backround flora의 성장으로 인해 위 음성결과가 나올 수 있다. 또한 분자적 진단방법(molecular-based assays)을 이용하여 리스테리아(*Listeria*)를 검출하는 다양한 연구방법, 예컨대 PCR(polymerase chain reaction), restriction fragment length polymorphism analysis, amplified fragment length polymorphism analysis, ramdom amplification of polymorphic DNA, 및 pulsed-field gel electrophoresis가 보고되어 졌다. 상기 방법들 중 정확한 검출능력을 가진 것으로 알려진 PCR 검출법은 16s 및 23s rRNA, virulence factor gene과 같은 특이 유전자(characteristic genes)의 특이 프라이머(specific primers) 제작을 위한 시퀀스(sequence) 정보가 요구되며, 결과 확인을 위한 gel electrophoresis 역시 시간 소모적이며 노동집약적 이다. 뿐만 아니라, 식중독균을 동시검출하기 위한 multiple primer sets을 사용한 multiplex PCR의 경우 부정확한 검출 결과(nonspecific products)가 빈번하게 발생 되었다는 연구가 보고되었다. 따라서 다양한 식중독균을 정확하면서 동시 검출할 수 있는 진단방법이 요구된다.

[0004] 한편, DNA 칩(chip)은 슬라이드 글라스, 실리콘 등의 지지체 위에 고밀도로 DNA 분자를 배열하는 방법으로, 적게는 수백 개로부터 많게는 수만개의 DNA를 아주 작은 공간에 부착시킬 수 있다. 이 방법은 검출하고자 하는 미생물을 특정 유전자와 혼성화 방법을 통해 정확한 검출 결과를 얻을 수 있으며, 수만개의 DNA 분자를 고정 시킬 수 있는 장점 때문에 신속하고 동시적인 미생물 검출을 위해 사용된다.

[0005] 식품에 존재하는 리스테리아 모노사이토제네스(*L. monocytogenes*)를 검출하기 위한 DNA 칩은 이미 다양한 연구를 통해 개발되었지만 대부분 칩에 사용된 DNA 프로브(probe)는 PCR 기기(PCR machine)를 이용해서 염기서열을 합성하거나, 올리고뉴클레오티드(oligonucletide)를 합성해서 제작되었다. 하지만 상기 방법들은 칩으로 제작하고자 하는 식중독균의 고유한 유전 표지자의 시퀀스 정보(sequence information)를 알고 있어야 제작이 가능하다. 그러나 랜덤 지노믹 DNA(random genomic DNA)를 프로브로 사용해서 제작하는 칩은 검출하고자 하는 미생물의 시퀀스 정보를 모르더라도 칩 제작이 가능하다는 장점이 있다. 이전 연구에서 여시니아 엔테로콜리티카(*Yersinia enterocolitica*)의 랜덤 지노믹 DNA를 프로브로 이용한 칩이 제작되었으며, 상기 칩은 *Y. enterocolitica*만을 검출하는 검출능력이 확인되었다. 그러나 상기의 방법을 적용해서 리스테리아 모노사이토제네스(*L. monocytogenes*)만을 검출하는 칩이 제작된 사례는 없었다.

[0006] 이에, 본 발명자들은 상기 종래기술들의 문제점들을 극복하기 위하여 예의 연구 노력한 결과, 리스테리아 모노사이토제네스(*L. monocytogenes*)의 랜덤 지노믹 DNA 단편을 이용하여 *L. monocytogenes* 진단용 DNA 칩을 개발하였으며, 제작된 칩이 리스테리아(*Listeria*) 속(genus)의 다른 종(species)의 미생물로부터 *L. monocytogenes*를 선별적으로 진단할 수 있다는 것을 확인하고, 본 발명을 완성하게 되었다.

발명의 내용

해결하려는 과제

[0007] 따라서, 본 발명의 주된 목적은 리스테리아 모노사이토제네스(*L. monocytogenes*)만을 검출할 수 있는 *L. monocytogenes* 검출용 DNA 칩 및 상기 DNA 칩의 제조방법을 제공하는데 있다.

[0008] 본 발명의 다른 목적은 상기 DNA 칩을 이용한 *L. monocytogenes* 균의 탐지방법을 제공하는데 있다.

과제의 해결 수단

[0009] 본 발명의 한 양태에 따르면, 본 발명은 리스테리아 모노사이토제네스(*Listeria monocytogenes*)의 지노믹 DNA로부터 유래된 랜덤 지노믹 DNA 프로브를 포함하는 리스테리아 모노사이토제네스 검출용 DNA 칩을 제공한다.

[0010] 본 발명의 DNA 칩에 있어서, 상기 랜덤 지노믹 DNA 프로브는 상기 식중독 원인균인 리스테리아 모노사이토제네스(*L. monocytogenes*)로부터 추출한 지노믹 DNA를 서로 다른 종류의 제한효소 쌍으로 잘라내어 겔 추출법으로 추출한 100 내지 1500 bp의 DNA인 것을 특징으로 한다. 상기와 같은 크기를 갖는 DNA 단편은 종간의 중복 가능성이 매우 적으므로 리스테리아 모노사이토제네스(*L. monocytogenes*)를 특이적으로 탐지할 수 있다.

[0011] 상기 게놈 DNA 추출을 위해 사용한 서로 다른 종류의 제한효소 쌍은 상기 균으로부터 DNA를 추출할 수 있는 어떠한 제한효소 쌍도 사용될 수 있으나, 바람직하게는 EcoR Ⅰ/BamH Ⅰ, HindⅢ/Xho Ⅰ 및 HindⅢ/Sac Ⅱ인 것을 특징으로 한다.

[0012] 본 발명에 있어서, 상기 랜덤 지노믹 DNA 프로브는 서열번호 1 내지 60의 염기서열을 갖는 것을 특징으로 한다.

[0013] 본 발명의 DNA 칩은 리스테리아(*Listeria*) 속(genus) 중에서 리스테리아 모노사이토제네스(*L. monocytogenes*) 종(species)만을 특이적으로 검출하는 것을 특징으로 한다.

[0014] 본 발명의 실시예에서 살펴본 바와 같이, 상기 리스테리아 모노사이토제네스(*L. monocytogenes*)로부터 60개의 프로브를 얻어내었으며, 상기 프로브가 *L. monocytogenes*만을 검출하는지를 확인하기 위해, 다수의 *L. monocytogenes* strain, 리스테리아(*Listeria*) 속(genus)이지만 다른 종(species), 및 리스테리아(*Listeria*)와 다른 속(genus)의 미생물을 상기 60개의 프로브와 함께 하이브리다이제이션(hybridization) 시킨 결과, *L. monocytogenes*만을 선택적으로 검출하는 것을 확인하였다 (도 3 참조).

[0015] 본 발명의 다른 양태에 따르면, 본 발명은 하기의 단계를 포함하는 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 검출용 DNA 칩의 제조방법을 제공한다:

[0016] a) 리스테리아 모노사이토제네스(*Listeria monocytogenes*)로부터 지노믹 DNA를 추출하는 단계;

[0017] b) 추출한 지노믹 DNA를 서로 다른 종류의 제한효소 쌍으로 잘라내어 겔 추출법으로 100 ~ 1500 bp를 분리하는 단계;

[0018] c) 상기 b) 단계에서 사용한 제한효소 쌍으로 처리된 라이브러리용 플라스미드와 상기 절단된 지노믹 DNA를 연결시켜 콜로니를 획득하는 단계;

[0019] d) 획득한 콜로니에서 플라스미드를 추출한 후, T3/T7 프라이머로 PCR을 수행한 후 프로브를 정제하는 단계; 및

[0020] e) 정제된 프로브를 슬라이드 글라스에 고정하는 단계.

[0021] 본 발명을 보다 자세히 설명하면 다음과 같다.

[0022] 상기 제조방법에 있어서, a) 단계의 지노믹 DNA의 추출은, *L. monocytogenes*을 계대 배양시킨 후, 상기 계대 배양을 통해 얻어진 미생물로부터 지노믹 DNA를 DNA 검출 키트를 이용하여 추출한다.

[0023] 상기 제조방법에 있어서, b) 단계의 각각의 제한효소 쌍으로 잘려진 지노믹 DNA는 아가로스 겔로 전기영동한 후, 겔 추출법으로 100 ~ 1500 bp의 사이즈, 즉 100 ~ 500 bp, 500 ~ 1000 bp 및 1000 ~ 1500 bp를 갖는 부분을 분리한다. 이때 사용하는 제한효소는 서로 다른 종류의 제한효소 쌍을 이용하는 것을 기본으로 한다.

[0024] 이후 랜덤 지노믹 DNA 라이브러리를 제작하기 위해, 동일한 제한효소 쌍으로 처리된 라이브러리용 플라스미드를 준비하여 상기 c) 단계를 수행한다. 상기 제한효소 쌍으로 잘려진 플라스미드와 상기 회수한 게놈 DNA 단편을 연결(ligation)시킨다. 이후 연결된 플라스미드 DNA들은 열 충격방법으로 형질전환시켜 콜로니를 획득한다. 이때, 대략 하나의 제한효소 쌍으로부터 잘라 구성된 랜덤 라이브러리에서는 수백 개의 콜로니가 얻어지며, 이들 중 각각의 플레이트에서 콜로니를 랜덤하게 선별하여 플라스미드를 추출한다.

[0025] 상기 제조방법에 있어서, 상기 d) 단계로부터 얻어진 PCR 산물은 본래의 순수 배양된 *L. monocytogenes*만의 지노믹 DNA 단편들을 포함한다.

[0026] 상기 e) 단계에서 정제된 프로브를 슬라이드 글라스에 집적시킬 때, 프로브의 수의 개수는 제한되지 않으나 55 ~ 65 개로 한정하여 DNA가 잘 붙는 케미칼로 코팅 처리된 유리 슬라이드 글라스 위에 집적시키는 것이 좋다. 상기 DNA가 잘 붙는 케미칼로는 일반적으로 사용되는 실란(silane), 아민(amine), 알데히드(aldehyde) 또는 폴리-엘-라이신(Poly-L-lysine) 등이 있으며, 본 발명에서는 아민(amine)을 사용하였다.

[0027] 본 발명의 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 검출용 DNA 칩 제조방법에 있어서, 하기의 단계를 더 포함하는 것을 특징으로 한다:

[0028] a) 고정된 랜덤 지노믹 DNA 프로브를 다른 비교 미생물로부터 랜덤 프라이밍(random priming)된 DNA와 하이브리다이제이션(hybridization)시켜 상호중복 하이브리다이제이션을 제외시키는 단계; 및

[0029] b) *L. monocytogenes*에만 하이브리다이제이션하는 랜덤 지노믹 DNA 프로브만을 선택하여 슬라이드 글라스에 고정화하는 단계.

[0030] 상기 a) 단계의 상호중복 프로브의 제외는 *L. monocytogenes*와 유전 정보가 비슷한 다른 리스테리아(*Listeria*) spp.로부터 랜덤 프라이밍된 DNA 프로브와 상기 고정된 랜덤 DNA 프로브를 하이브리다이제이션 시킴으로써 상호중복 하이브리다이제이션 랜덤 DNA 프로브를 제거함으로써 수행되며, 이후 *L. monocytogenes*에만 하이브리다이제이션하는 랜덤 지노믹 DNA 프로브를 선별하여 슬라이드 글라스에 고정화시킨다.

[0031] 본 발명의 다른 양태에 따르면, 본 발명은 리스테리아 모노사이토제네스(*Listeria monocytogenes*)로부터 유래된 지노믹 DNA 프로브를 이용하여 DNA 칩을 준비하는 단계; 시료 미생물로부터 지노믹 DNA를 추출하고 랜덤 프라이밍(random priming)을 통해 시료 DNA를 제조하는 단계; 상기 시료 DNA를 상기 DNA 칩 상의 지노믹 DNA 프로브와 하이브리다이제이션(hybridization)시켜 리스테리아 모노사이토제네스(*Listeria monocytogenes*)의 존재 유무를 판별하는 단계를 포함하는 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 균의 탐지방법을 제공한다.

발명의 효과

[0032] 이상 설명한 바와 같이, 본 발명은 특정 유전 정보 없이 단 하나의 리스테리아 모노사이토제네스(*Listeria monocytogenes*) 균주에서 추출된 지노믹 DNA를 무작위로 절단하여 얻어진 60 개의 DNA 단편을 이용하여 *L. monocytogenes* 검출용 DNA 칩을 제작하였다. 상기 DNA 칩은 리스테리아(*Listeria*) 속(genus)의 다른 종(species) 및 리스테리아(*Listeria*)와 다른 속(genus)의 미생물과 차별되면서 단지 *L. monocytogenes*만 검출할 수 있다.

도면의 간단한 설명

[0033] 도 1은 제한효소 쌍으로 사이즈별로 절단한 후 칩 제작을 위해 선정된 60 개의 DNA 단편을 나타내는 전기영동 이미지이다.

도 2는 제작된 칩의 *L. monocytogenes* ATCC 19111과 다양한 미생물의 지노믹 DNA와 하이브리다이제이션 후, 스캐너를 통해 탐지결과를 확인한 결과이다 (붉은색 단편; Cy5 dye와 라벨링된 *L. monocytogenes* ATCC 19111의 지노믹 DNA와 하이브리다이제이션 후 635 nm 파장에서 스캔된 이미지, 녹색 단편; Cy3 dye와 라벨링된 다양한 미생물의 지노믹 DNA와 하이브리다이제이션 후 532 nm 파장에서 스캔된 이미지).

도 3은 제작된 칩의 *L. monocytogenes* ATCC 19111과 다양한 미생물의 지노믹 DNA와 하이브리다이제이션 후, log2로 전환한 intensity(532/635 nm) 결과를 Mev v4.6으로 분석한 결과이다.

도 4는 hierarchical clustering 분석에 의해 *L. monocytogenes*와 리스테리아(*Listeria*) 속(genus)의 다른 미생물 종(species)이 차별되는 결과를 tree view로 나타낸 이미지이다.

발명을 실시하기 위한 구체적인 내용

[0034] 이하, 실시예를 통하여 본 발명을 더욱 상세히 설명하기로 한다. 이들 실시예는 단지 본 발명을 예시하기 위한 것이므로, 본 발명의 범위가 이들 실시예에 의해 제한되는 것으로 해석되지는 않는다.

[0035] **실시예 1. 랜덤 지노믹(random gemomic) DNA의 분리**

[0036] 리스테리아 모노사이토제네스(*Listeria monocytogenes*; strain number ATCC 19111)를 Brain Heart Infusion Broth(BHI; BBL/Difco, Sparks, MD, USA)에 접종하여 24 시간 간격으로 3일 동안 균과 배지를 1 : 1000의 비율로 계대한 후, 37 ℃에서 배양하였다. 배양 3일 째, *L. monocytogenes* 배양액 4.5 ml을 13,000×g로 1 분간 원심분리한 후 남은 펠렛(pellet)을 DNeasy Blood & Tissue Kit(Qiagen instrument AG, Homberchtikon, Switzerland)를 이용하여 지노믹 DNA를 추출하였다.

[0037] 이후 추출된 *L. monocytogenes*의 지노믹 DNA를 3 개의 튜브(tube)에 각각 넣고, 제한효소 쌍 즉, *EcoR*Ⅰ/*BamH*Ⅰ, *Hind*Ⅲ/*Xho*Ⅰ 및 *Hind*Ⅲ/*Sac*Ⅱ를 상기 튜브에 각각 첨가하여 지노믹 DNA를 절단하였다. 상기 제한효소 쌍으로 절단된 DNA는 아가로스 겔(agarose gel)을 이용해서 전기영동 한 후, gel electrophoresis를 사용해서 각각의 제한효소 쌍으로 절단된 3 개의 DNA마다 아가로스 겔을 100 ~ 500 bp, 500 ~ 1000 bp 및 1000 ~ 1500 bp 사이즈로 절단하였다. 절단된 겔(gel)을 튜브에 넣고, QIAquick 겔 추출키트(QIAquick gel extraction kit; Qiagen)를 사용하여 DNA만을 추출한 후, 페놀-클로로포름 추출(phenol-chloroform extraction) 기술을 이용하여 추출한 DNA를 정제하였다.

[0038] **실시예 2. 랜덤 지노믹(random genomic) DNA 라이브러리 및 DNA 칩 제조**

[0039] 칩 제작에 사용되는 리스테리아 모노사이토제네스(*Listeria monocytogenes*)의 DNA 라이브러리(library)를 제작하기 위하여 pPCR-Script amp vector(Invitrogen, Carlbad, CA, USA)를 실시예 1에서와 동일한 제한효소 쌍, 즉*EcoR*Ⅰ/*BamH*Ⅰ, *Hind*Ⅲ/*Xho*Ⅰ 및 *Hind*Ⅲ/*Sac*Ⅱ를 이용하여 절단하였다. 이는 각각의 제한효소 쌍으로 절단된 지노믹 DNA를 상기 벡터에 삽입시키기 위해 동일 제한효소 쌍으로 벡터를 절단한 것이다. 각 제한효소 쌍으로 절단된 벡터는 동일한 제한효소 쌍으로 절단된 *L. monocytogenes*의 100 ~ 1500 bp의 DNA 단편과 서로 연결(ligation)시키고, 각 DNA와 연결된 플라스미드(Plasmid) 벡터들은 열 충격(heat shock)을 이용해서 *Escherichia coli* DH5α(*E. coli* DH5α; Real Biotech Corp., Banqiao, Taipei, Taiwan)로 형질전환 시킨 후, LB(Luria-Bertani) 아가(agar)에 100 μL/ml의 암피실린(ampicillin)을 첨가한 배지에 도말하여 16 시간 동안

37 ℃에서 배양하여 수백개의 콜로니(colony)를 얻어내었다.

[0040] 이후, 칩 제작에 사용하기 위한 다양한 크기의 DNA 단편을 선정하기 위하여 각각의 콜로니를 랜덤하게 선택하고, 3 ml의 LB broth에서 16 시간 동안 37 ℃에서 배양한 뒤 3 ml을 채취하여 *L. monocytogenes*의 DNA 단편이 포함된 플라스미드를 QIA prep Spin Miniprep Kit(Qiagne)를 이용해서 분리하였다. 분리된 플라스미드는 플라스미드 제작을 위해 사용했던 제한효소 쌍으로 절단한 뒤, 아가로스 겔을 이용해서 DNA 크기를 확인하였다. 상기 과정을 반복하여 서로 다른 크기의 DNA를 확보하였으며, 플라스미드의 T3와 T7의 프로모터(promotor)를 인식하는 프라이머(표 1)를 이용하여 PCR을 수행함으로써 DNA 단편을 증폭시켰다. PCR의 조건은 94 ℃에서 5 분간 predenature 이후 58 ℃에서 1 분간 annealing, 72 ℃에서 1 분간 elongation을 1 사이클(cycle) 수행한 후, 94 ℃에서 30 초간 denature, 58 ℃에서 30 초간 annealing, 72 ℃에서 30 초간 elongation을 40 사이클 수행한 후 72 ℃에서 10 분간 post elongation을 수행하였다. 이후 아가로스 겔 전기영동을 이용하여 60 개의 서로 다른 크기의 *L. monocytogenes*의 DNA 단편을 선정하고, PCR 정제 키트(PCR purification kit)를 이용해서 DNA를 정제하였다. PCR 이후 선정된 프로브에 대한 전기영동이미지를 도 1에 나타내었다.

[0041] [표 1. 프로모터 인식하는 프라이머]

[0042]

인식 프로모터	프라이머 서열
T3	5'-AAT TAA CCC TCA CTA AAG GGA AC-3'
T7	5'-GTA ATA CGA CTC ACT ATA GGG CG-3'

[0043] 이후, 상기 60 개의 *L. monocytogenes* DNA 단편은 시퀀스 분석을 위해 바이오닉스사(www.bionicsro.co.kr)에 의뢰하였으며, 또한 칩 제작을 위해서 지노첵사(www.genocheck.com)에 의뢰하였다. 바이오닉스사로부터의 시퀀스 분석은 Applied Biosystems사의 3730XL DNA analyzer를 이용하여 시퀀스를 분석하였으며, T7 프라이머를 이용하여 정방향(5'→3')으로 분석한 결과는 서열번호 1 내지 60에 나타내었다. 그리고 지노첵사로부터의 칩 제작은 Cartesian Technologies사의 PixSys 3200을 이용하여 아민(amine) 코팅된 슬라이드 글라스에 2번 반복하여 선정된 DNA 단편을 집적하였다. 칩의 결과를 분석하기 위해 양성 대조군(positive control)으로 사용된 박테리오파지(bacteriophage)ΦFC1의 MJ1 유전자는 프라이머 MJ1 probe F(GGA ACT GGC ATT GTT CCC TT) 및 MJ1 probe R(TTC AGC TCC GCA TTT ACC AC)을 이용하여 PCR machine을 이용하여 증폭되었으며, 60 개의 DNA 단편중 6행, 3열에 집적되었다.

[0044] **실시예 3. DNA 칩의 탐지능력 확인**

[0045] **3-1. 랜덤 프라이밍**

[0046] 상기 실시예 2에서 제작한 칩이 리스테리아 모노사이토제네스(*Listeria monocytogenes*)만을 검출하는 진단능력을 확인하기 위해, 칩 제작에 사용하지 않은 다른 *L. monocytogenes* (F8369, G1091, ScottA, H0222 및 V7)와 *L. monocytogenes*를 제외한 다른 리스테리아(*Listeria*) 속(genus; *L. ivanovii* ATCC 19119, *L. seeligeri* ATCC 35967, *L. welshimeri* ATCC 35897, *L. grayi* ATCC 19120, *L. grayi* ATCC 25401, *L. innocua* ATCC 51472) 및 주요 식중독 원인균(*Y. enterocolitica* ATCC 9610, *Y. enterocolitica* ATCC 23715, *Y. pseudotuberculosis* ATCC 6902, *C. sakazakii* 3270, *B. cereus* C1, *B. cereus* 038-2, *S. aureus* ATCC 23235, *S. aureus* ATCC 26744, *E. coli* O157:H7 43894, *E. coli* O157:H7 E0018, *S. montevideo*, *V. parahaemolyticus* ATCC 33844 및 *S. sonnei* ATCC 25931)을 선정하였다.

[0047] 상기 각 균의 지노믹 DNA를 추출하여 200 ng/μl 농도로 nanodrop spectrophotometer(Thermo Fisher Scientific, Waltham, MA, USA)를 이용하여 측정하였다. 이후 각 DNA에 형광표지물(Cy5, Cy3)을 라벨링(labeling)하기 위해, 본 발명의 칩 제작을 위해 사용된 균주 *L. monocytogenes* ATCC 19111와 비교군으로 사용되는 다른 리스테리아(*Listeria*) 속(genus) 및 주요 식중독 원인균의 지노믹 DNA(200 ng/μl)를 각각 Cy5-dCTP 및 Cy3-dCTP와 함께 랜덤프라이밍 방법으로 라벨링하였다. 랜덤 프라이밍은 로슈사(Roche)의 High prime DNA labeling kit를 사용하였으며, 랜덤 프라이밍 반응 용액에는 랜덤 헥사머, dNTPs, Klenow 단편들 및 버퍼가 포함되어 있으며, 총 20 μl 반응액에 25 nM의 Cy5-dCTP 및 Cy3-dCTP를 각각 1 μl씩 포함하였다. 그리고

양성대조군은 본 발명의 *L. monocytogenes* DNA와 비교군 지노믹 DNA를 각각 Cy5-dCTP 및 Cy3-dCTP와 함께 라벨링하기 전, 각각의 튜브에 10 ng/㎕씩 첨가하였다. 즉, 2 개의 튜브를 준비하고, 1번 튜브에 200 ng/㎕의 *L. monocytogenes* ATCC 19111, 랜덤 프라이밍 키트의 조성물, 1 ㎕의 Cy5 및 10 ng/㎕ 양성대조군을 첨가하고(총 부피 20 ㎕), 2번 튜브에는 비교군인 6 개의 다른 리스테리아(*Listeria*) 속(genus) 및 13 개의 주요 식중독 원인균의 지노믹 DNA 200 ng/㎕를 각각 첨가하고, 1 ㎕ Cy3 및 10 ng/㎕ 양성대조군을 첨가하였다(총 부피 20 ㎕). 이후 Cy5 및 Cy3 dye를 각각의 지노믹 DNA에 라벨링시키기 위해, 37 ℃에서 2 시간, 65 ℃에서 10 분간 인큐베이션(incubation) 시켰다. 이후, Cy5가 라벨링된 *L. monocytogenes* DNA와 Cy3가 라벨링된 비교군 DNA 혼합물을 섞은 후, MinElute PCR 정제 키트(Qiagen)를 사용하여 10 ㎕로 정제하였다.

[0048] **3-2. 하이브리다이제이션(hybridization)**

[0049] 각각 Cy5 및 Cy3 dye로 라벨링된 *L. monocytogenes* DNA와 비교군 DNA를 혼합한 혼합 DNA를 칩에 주입하기 전에 제작한 DNA 칩으로 Pre-하이브리다이제이션을 수행하였다. Pre-하이브리다이제이션을 위해, 상기 제조한 DNA 칩을 1.75×SSC(saline-sodium citrate), 0.1% SDS(sodium dodecyl sulfate) 및 10 mg/ml의 BSA(bovine serum albumin)로 제조된 20 ml의 용액에 30 분간 담근 후, 증류수로 1 분간, 100 % 이소프로판 용액으로 30 초간 세척하였다. 세척된 DNA 칩은 50 ml 튜브에 넣어 상온에서 원심분리(2231×g, 5분)하여 건조하였다. 이후 98 ℃에서 2 분간 가열하여 변성(denaturation)시킨 DNA 혼합물을, 상기 Pre-하이브리다이제이션 후 건조시킨 DNA 칩에 주입하고 커버글라스를 덮었다. 그리고 챔버에 넣어 65 ℃ 항온조(water bath)에서 15 ~ 16 시간 동안 하이브리다이제이션을 수행하였다. 하이브리다이제이션이 완료된 DNA 칩은 버퍼(buffer) 1 용액(2×SSC)에 담구어 커버글라스를 제거한 후, 65 ℃로 미리 가열시킨 버퍼 2 용액(2×SSC, 0.2% SDS)으로 10 분간 세척하고, 버퍼 3용액(0.05×SSC)으로 5 분간 2번 세척하였다. 세척이 완료되면, 50 ml 튜브에 넣어 원심분리(2231×g, 5 분)하여 DNA 칩을 건조시켰다.

[0050] **3-3. 마이크로어레이 스캐닝 및 결과 분석(Microarray scanning and data analysis)**

[0051] 상기 건조된 칩은 GenePix 4000B 레이져 스캐너(Axon, Union, CA, USA)를 이용하여 스캔하였다. 상기 스캐너는 635 nm 파장에서 형광표지물 Cy5를 붉은색, 532 nm 파장에서 Cy3을 녹색으로 표지한다. 칩에 부착된 양성대조군을 532/635 nm 파장에서 대략 1에 가까운 수치가 나오도록 스캐너의 PMT(photomultiplier tubes)의 수치를 조절하여 스캔하였다. 도 2는 제작된 칩 DNA 프로브(*L. monocytogenes* ATCC 19111)와 다양한 균주의 지노믹 DNA를 하이브리다이제이션한 후 스캐너를 통해 분석된 이미지 결과이다.

[0052] 각 DNA 단편에서 발생되는 형광시그널(fluorescent signal)의 값은 Gene Pix Pro 6.0 software(Axon)를 이용하여 측정하였으며, 측정 이후 양성표지자의 중앙(median) 값 1을 기준으로 칩에 부착된 전체 DNA 단편을 정규화(normalization) 하였다. 분석 결과 중 532/635 nm 파장의 중앙 값을 선택하여 나온 수치를 log2 값으로 환산하였다. 이 환산된 수치를 다시 Mev v4.6 software(http://www.tm4.org/mev/)로 분석하였으며, 그 결과를 도 3에 나타내었다. 그리고, 도 3의 제작된 칩의 전체 DNA 단편(60 개)과 양성 결과가 나타난 DNA 단편을 백분율로 환산하여 표로 작성하였다 (표 2). 그리고 *L. monocytogenes*와 같은 속(genus)이지만 다른 종(species)인 다른 리스테리아(*Listeria*) spp.와 차별되는지를 확인하기 위해, 상기 log2 값이 MeV의 hierarchical clustering을 이용해서 분석하였으며 tree view를 이용해서 이미지를 나타내었다 (도 4).

[0053] [표 2. 하이브리다이제이션 결과]

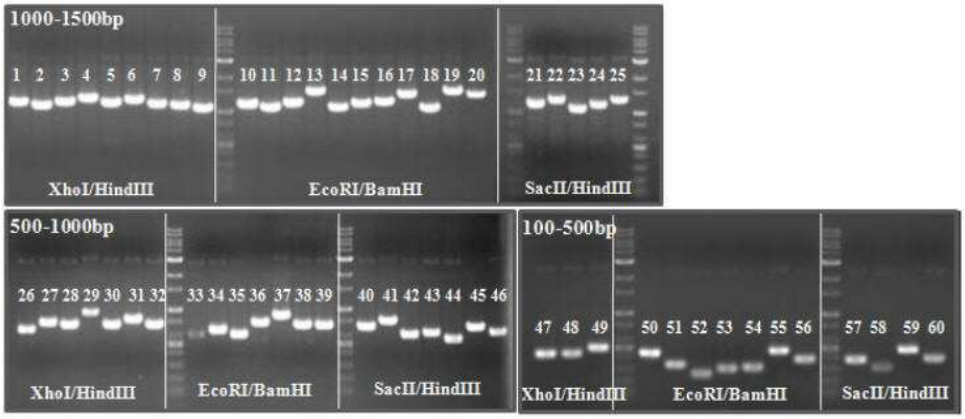
strains	Numbers (%) of positive hybridization on DNA chip
L. monocytogenes ATCC 19111	60(100%)
L. monocytogenes F8369	60(100%)
L. monocytogenes G1091	60(100%)
L. monocytogenes ScottA	60(100%)
L. monocytogenes H0222	60(100%)
L. monocytogenes V7	60(100%)
L. seeligeri ATCC 35967	23(38%)
L. ivanovii ATCC 19119	29(48%)
L. grayi ATCC 19120	4(7%)
L. grayi ATCC 25401	6(10%)
L. welshimeri ATCC 35897	37(62%)
L. innocua ATCC 51472	51(85%)
S. aureus ATCC 27644	3(5%)
S. aureus ATCC 23235	3(5%)
B. cereus 038-2	0(0%)
B. cereus C1	3(5%)
E. coli O157:H7 43894	18(30%)
E. coli O157:H7 E0018	3(5%)
S. montevideo	0(0%)
S. sonnei ATCC 25931	15(25%)
Y. enterocolitica ATCC 9610	0(0%)
Y. enterocolitica ATCC 23715	0(0%)
Y. pseudotuberculosis ATCC 6902	0(0%)
V. parahaemolyticus ATCC 33844	0(0%)
C. sakazakii 3270	0(0%)

[0054]

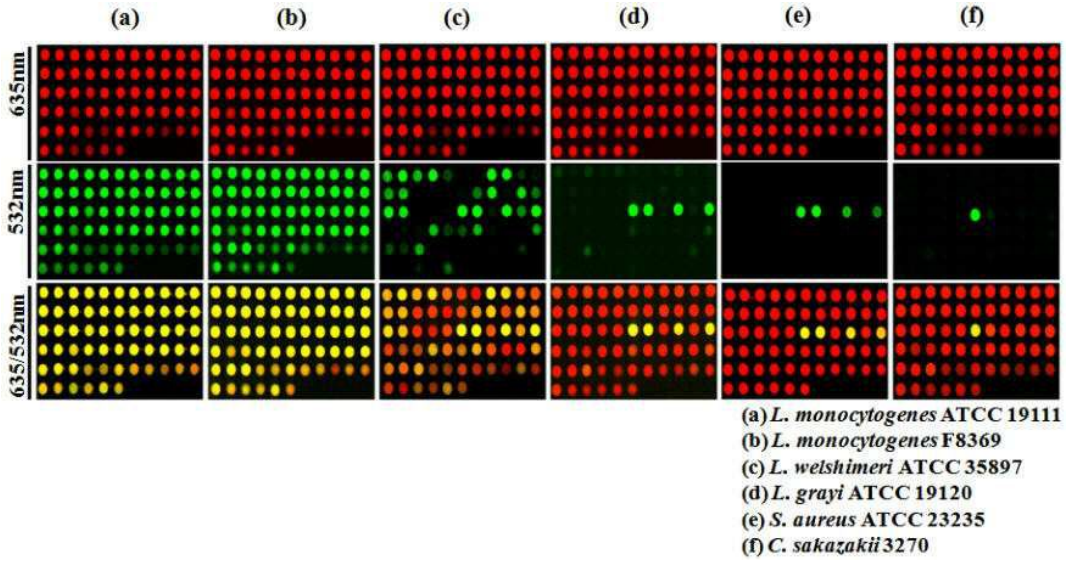
[0055] 먼저, 도 3의 이미지(Mev v4.6 software는 log 2 값이 -3.0~3.0일 때 혼성화 반응된 프로브로 분석하며, 검은색으로 표시된다)를 통해 분석된 표 2의 혼성화 결과를 보면, 칩의 *L. monocytogenes* 프로브와 *L. monocytogenes*의 6 개의 strain의 지노믹 DNA를 각각 테스트한 결과, 100% 혼성화된 결과를 나타내고 있으며, 다른 리스테리아(*Listeria*)와 같은 속(genus)이지만 다른 종(species)인 미생물의 지노믹 DNA를 각각 테스트한 결과는 7 ~ 85%의 혼성화 결과를 보였다. 그리고 리스테리아(*Listeria*) 속(genus)과 다른 속(genus)에 속하는 미생물은 0 ~ 30%의 혼성화 결과를 보였다. 상기의 결과는 제조된 칩이 리스테리아(*Listeria*) 속(genus)의 다른 종(species) 및 리스테리아(*Listeria*) 속(genus)과 다른 속(genus)에 속하는 미생물에 비해 다수의 *L. monocytogenes*의 strain으로부터 추출된 지노믹 DNA와 높은 혼성화 비율을 보임을 나타낸다. 그리고 도 4에 나타낸 바와 같이, *L. monocytogenes*와 다른 리스테리아(*Listeria*) spp.가 차별되는지를 확인하기 위해 상기 log2 값을 이용해서 MeV의 hierarchical clustering을 이용해서 분석한 결과, *L. monocytogenes*와 다른 리스테리아(*Listeria*) spp.가 분명하게 구별되는 것이 확인되었다.

도면

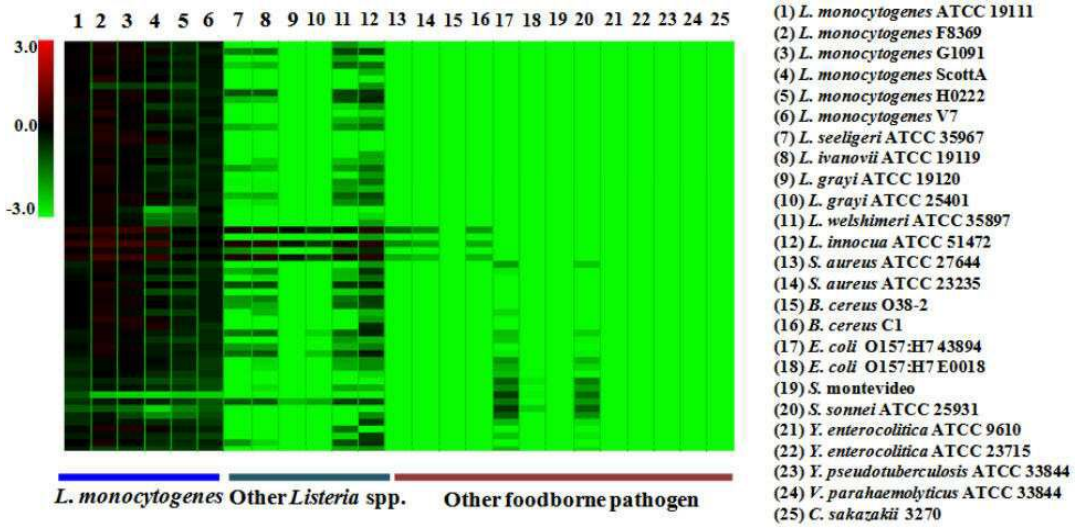
도면1



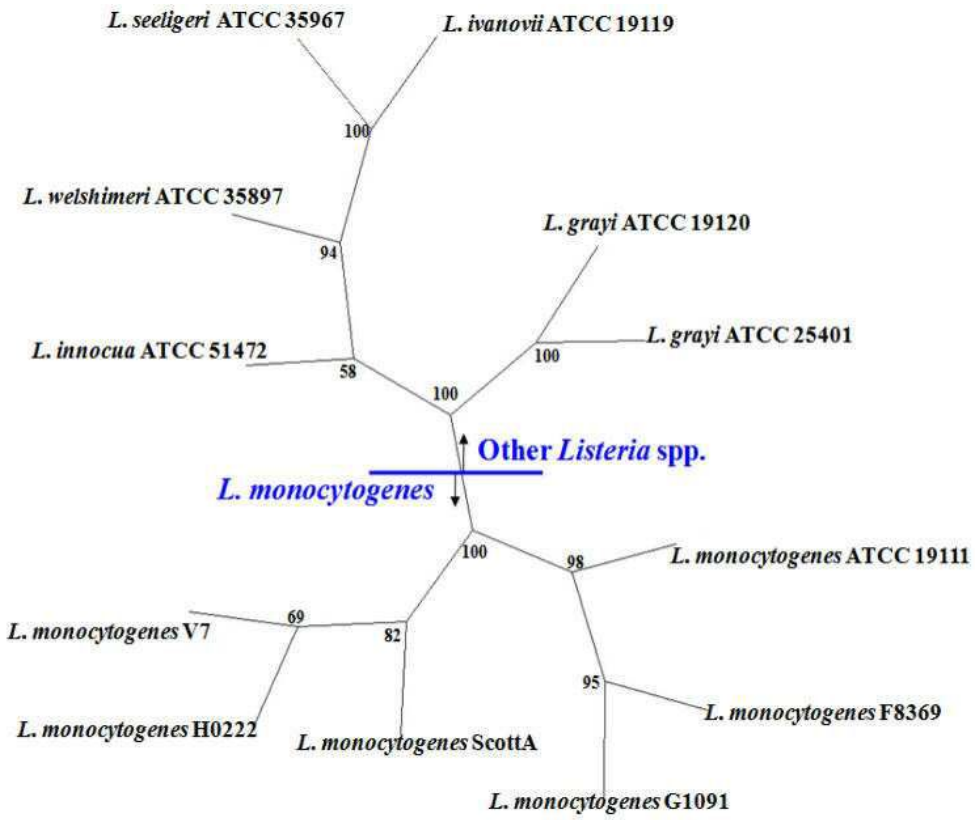
도면2



도면3



도면4



서 열 목 록

<110> Korea University Industrial & Academic Collaboration Foundation

<120> DNA chip using random genomic DNA fragments of Listeria monocytogenes

<160> 60

<170> KopatentIn 1.71

<210> 1

<211> 1171

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

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ggaagtaatc gagtaacgtg tatggtgtaa ctcccgctgg acgaagggat aaatgtctag 540

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caaagtgaga tgccgggaaa atggaaacat gttctctttc tcctataatt tcaccagtaa 780

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agacgccgcc accgcggtga gctcagcttg t 1171

<210> 2

<211> 1076

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

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ccatacattg ttattgcacc agggattgca cttccccatg cttctgtgga tgacggcgca 120

tatcgagtcg gaatgagctt actgcgctta aatcagccag tatcattttc aagtaaagcg 180

aaggatcagg ttaaattaat tattgtgctc gcttccattg actcctacac acatattaat 240

gcacttagcc aactcactaa tttaatcatg aaacatcact tgctagagca gattgaacaa 300

gcgacatcag ccgcggaaat tgccgcaatg ttaaccataa aataagcgat aaagccagtg 360

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aacaacgata tattgaaaaa atgattcatt cagagattac caagcattgg agattagtgg 960

agggatacga tgaaatttta gcagtgtgtg acttggcaga cagctgatat cgaattcctg 1020

cagcccgggg gatccgccgg ctagagcgcc gccaccgcgg tgagctcagc ttgttg 1076

<210> 3

<211> 1141

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 3

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ttctttgaga agttggttca atcctcggac acccttttcgt taaggtggtg attaaaaacac 120

gttcgttttt ctcgacgcga tcgttaatct catccattaa gtcatcaatt tgtccttgaa 180

tcggacggat ttctacgatt gggtctagca agccagttgg tcgaatgatt tgttcaatga 240

catctggatt tttttctaat tcgtaagggc ctggtgtagc ggatataaac ataatttgat 300

tgatatgctt ctcaaattct tctaaacgaa gcggcctatt atctagagcg ctaggcaatc 360

taaagccatg atcaactagc atttgttttc tggcttggtc cccgttaaac ataccacgaa 420

tttgcggcat cgtaacgtgt gactcatcaa ttaccatttg gaaatcatct gggaagtaat 480

cgagtaacgt gtatggtgta actcccgctg gacgaaggga taaatgtcta gaatagttct 540

caataccaga gcaatagccc atttcttcca tcatttccaa atcataattc gttcgctgtt 600

caaggcgctg agcttctagc aatttattat ctgcacgtaa aactttaaga cggtcttcga 660

gttcagcttt tatattaaca attgcttttt tcataatatc aggtctggtg acaaagtgag 720

atgccgggaa aatggaaaca tgttctcttt ctcctataat ttcaccagta agtgcatcta 780

cttctctaat tcgttcaatt tcatcaccga aaaattcaat ccgcatacag tgttcatctc 840

ttgaagctgg gaaaatttcg acaacatcac cgcgaacacg gaagcgtcca cgttgaaatc 900

tatatcattt cgatcatatt gaatatctac taatttgcgc agtagctgat cacggctatt 960

ccatgccaac acgaagcgaa cgagcatctc tcatattcat cggcgactag gcatagatac 1020

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c 1141

<210> 4

<211> 1237

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

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tcttctgaca ttaaaagttg gaaccttcgg ttgtggaggc attgcaaacg ggaggcatat 120

gccaagttta ttaaaagctg agagagcaga aatggttgct ttttgcgata tcgttttaga 180

aaaagccgaa gcagcagcaa aagaatttgg tggcgaaaat gcaagcgtat acacaaacta 240

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tcatgcggag atttctatcg cagcaatgga agccggaaaa cacgttatgt gtgaaaaacc 360

aatggcgaaa acaacagcag aagcgaaaag tatgattgaa gctgcagagc gtacaggcaa 420

aaaactaaca attgggtacc aaaatagatt tcgcaaagac tcggattact tgcaccaagt 480

ttgcgagaat ggcgaattag gtgatatcta ttatgcaaaa gcaaaagcga ttcgtcgtcg 540

tgctgtccca acatggggtg tgtttttaga tgaagaagcg cagggcggcg gacctcttat 600

tgatattgga acacatgcgc ttgatttaac gctttggatg atggacaatt ataaaccgaa 660

atatgtagta ggaaacagtt atcataaact tgctaaaaaa gaaaatgcag caaatgcatg 720

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ggaaaacggc gcgacgatag tattagaagc aagttgggcg cttaacacac ttgatgtcgg 840

tgaagcaagg acgtctctat cgggaacaga aggcggcgcg gatatggaag acggtttacg 900

aattaacggc gaagcgcaca gcccaaatgt atgaaaagaa aattcaatta gaagcatgtg 960

gcgttgattt ttacgacgga cagtgatgat ccagcattat cgagcagaca tggttagagc 1020

aattgaaaaa atacagatct gtgtaaacca gacagcactg tgtacacaaa tcttagagct 1080

atttatgatc atcgaaacag acagcagtta ttttattagg aggagtgctt atgaagcgaa 1140

attggttaca gttgtggatt tacgagcttg taattccaat ctgatcgggg aatccggcca 1200

gactaaggcg cgcgccatcg cgttgaatcg aatagct 1237

<210> 5

<211> 1147

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 5

ctgggcggtc cgctcgagtc cagttttagc attgatcctt acgtaaaacc aattattcgt 60

gtgattgaaa cgattccgag tcaagaattg cttttccgta tgcagcgtga acgttcccac 120

attgctattc tgcttgacga atatggtggt acttctggac ttgttacggt tgaagatatt 180

gtagaggaaa tcgtaggtga tatccgcgat gaatttgatg ccgatgaaat tccagaaatt 240

cgcaaaatca aagatggaca ctatattgta gatgcgaaac ttctgattga tgaagtaaat 300

aacattttag gtactgaaat tgaggaagaa gaagtcgaca caatcggcgg ttggttctta 360

acacaaaatt atgaagtaga agttggggac gaaattgatt atgacggatt cattttccgc 420

gtaaaacaag gcgaacctca tcatattgaa tatatcgaaa tcatcaaaaa aacaaatgat 480

taatcaaaaa gtagctatcc ctctcatagg gtagctactt ttttatatac gatgtgctaa 540

cataaattgc ttaaacttct cagctgcagg cgttagtgtt tggtttttcg cgaccgcaag 600

ataaaagaac cgctcccagt ttgggcttct aattggtaag actttgacat ccacataatt 660

taaaatcggc atgttcggaa ctacagcaat cccaaagttt tgtgcgacca tcccggcaat 720

gacttgatcc acttcaattt cataagcgat ttgataatcg gcaccaattt ttctgaataa 780

atcatcgata attggacgca aaccactttt tttcgagaaa gcgatatgcg gataatctac 840

agtttcgatt aaatcaatcc agtctttatc agcgagcgga tgacttttgg ggacaatgag 900

gactaattct tgtttggcaa ttggcgtaaa gtgaatattt ctttcatttt caagtttgga 960

acaataccaa tatcaaattt cttttctttc agccttgaat gatatcaatc gaaacacccg 1020

tatggaaaat aaaatcattt gttttctggt tcagtttgga ggaattcttg gacagcttga 1080

tatcgattcc tgcagcccgg gggatccgcc cggctagagc gccgccaccg cgtgacgcac 1140

ttgtttc 1147

<210> 6

<211> 1227

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 6

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catgcacctg ctactttaaa agatttttgt ttttggtctg gattaactgt gaccgatgcc 120

aaaatagggt tagcggatat gcctaaaata ggcgattatt acataacaac attggttaaa 180

aatggcacaa tgctagctac aattccactt gctggttttg atgaatggat tatcggctac 240

cgagatcgct cagccgtttt accggaaata tggcacgatg aaattatgac gaaaaacggg 300

attttcagac cggctattat tacaaatggc gaagtagtcg gaaaatggga aaaaccaaag 360

aaacgtgctg aattagaagg agacttctgg gaccgttaca tccagtttcg aaatatgcta 420

tagtcaagta gatgtataaa ttttaatttg aggtgataaa gcaatgaatg cttttgataa 480

attttataaa aaaacagtag aagaacgaca tgcaattttg gcggaatatg ctgatttaaa 540

tgaagaagaa caagcatttt tagcttctac aggggctctt tcttttgata aagcgaatca 600

tatgattgaa aacacgattg gtatttattc gctgccgctc ggattaggaa tgaatatgct 660

tttaaatgat aaacgttatg ttgtacccat ggcgatggag gagccttctg ttgtggcggc 720

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acgaaaaatg attggtcaga ttgagttgat ttctgtttct gatatccaag cagcaaaaga 840

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acaaaagcgt ggcggtggtg cggttaaaat tcaagtcaga acagcacaac agcgaatgac 960

gaaacgttat ttatcgttca tttactcgta gacacccaga agcatgggcg cgatatggtc 1020

atacgatggt cgaaacctag cacagattag aatgttgacg acggacagca tatgcgcatt 1080

ttatctaatt agtagatgag cgaccgcact gctgtttgtc gatatcagaa ggctgattcg 1140

aatctgcagc cggggatccg cccagcttag cgccctcgtg gatcgtgcat ctctgtacgc 1200

aataagagag tagagcaacc gcaggcg 1227

<210> 7

<211> 1245

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 7

gctcgtcgtc cctcgagcgt tatcccagtt gatttactgt gcaatcggat gaacttgtag 60

taggactgaa accgtcattt aaggcgagta atataaaaac aaaaacatcc ggtcaactga 120

aaaaaggcga tatagagatt gttatttcca ataatccggt tcgcatggaa gtgcatttta 180

aaaataaatt agtcttagag tcccataaaa tttacccagc attgcagtgg tatacagata 240

aaactggcac aatcaacaaa gttaaactac atttagatgc gccgaaagaa gaagagtatt 300

acggtttcgg cgaacgatac aatgcgctag gtcaacgcgg gaatgtgctt gattgttttg 360

tctataatca atatcgtgat caaggaacga gaacatatat cccaatgccg ttttaccata 420

caaaccgaga ttatagtgtg ttcgttgata ctgcgcgcta tacaagtttc gatttgggga 480

gccaactagc tgataaacat accattacag tcgaaataaa tggctgcgat acagatatct 540

gtcttttaat gggagatatt cgtagtgcgg ttgctagcta tatgaaaaaa actgggaaac 600

cggcgatggt accagtttgg gcgcttggac cgtggatgtc tagtaacaac tgggaccgtg 660

aatctgtcgt tcgaacggaa gtggaaacga cgcaagaatt gcaaatccca tcaaccgttg 720

tcgtgctaga acaatggagc gatgaagcga cctattatat gttcaatgac gccgaatatg 780

acgaaaaagc accatccgaa gcatattcct acgatgaaat tagattccct tcatggggca 840

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aagaagccta tatgattgaa aaaggctacg tagtgaaaat ccagatggct caccgtaccg 1020

cagtccagaa actggttcac agaaagcttg atatcgaatt ctgcagcccg gggatccgcc 1080

gggctagagc gcgcacgcgt gggagctcag ctgtctgctg gggttataag ttaagtatat 1140

ataacacaac gcacactacg agctccttgt agatactttc tttcagagta atgcagccac 1200

acctatgttc acaacaaaac ttagagccga gtagcagtta gcagc 1245

<210> 8

<211> 1093

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 8

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ggccatacat tgttattgca ccagggattg cacttcccca tgcttctgtg gatgacggcg 120

catatcgagt cggaatgagc ttactgcgct taaatcagcc agtatcattt tcaagtaaag 180

cgaaggatca ggttaaatta attattgtgc tcgcttccat tgactcctac acacatatta 240

atgcacttag ccaactcact aatttaatca tgaaacatca cttgctagag cagattgaac 300

aagcgacatc agccgcggaa attgccgcaa tgttaaccat aaaataagcg ataaagccag 360

tggggcacaa agatgccgcg ctggcttttt gtatgctcga taacaacaaa atgtaacagt 420

ctattctttg cactttcgaa aagaaaggaa ttgggctttt ttaaacagag gagctacagc 480

tataataaga gtgtaagtta ttgatagcgc tatcaattag ttagaaggga tgaagagata 540

tgtctttttt ggataaagag cttgtgaatc tgcatgggtc agctaaaaat gctgacgaag 600

caatcgtgca agcaggagaa ttattagtga atgcaggtta tgtgagcgag cagtatgtag 660

aaaaaatggt ggaatcttat catgaaaatg gtgcgtactt tgtcattgca cctcaaatag 720

caattcctca tgcaagacca acggatggtg tggaaaactc tgcagtatca ctagtcgttc 780

taaaagatgg cgtgaatttc ggacacgccg caatgatccc gtacgattag tttttgggct 840

cgcagctact tcaagtgagg cacatttgaa agtcattcaa aaaatcgtct ccttgcttag 900

taacaacgat catattgaaa aaatgattca ttcagaagat taccaagcaa ttggagaatt 960

agtggaggga taacaatgaa aattttagca gtgtgtggac ttgggcaagg aacaagcttg 1020

atatcgaatt cctgcagccc gggggatccg cccgggctag agcggccgcc accgcggtgg 1080

agctccagcg tgc 1093

<210> 9

<211> 1028

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 9

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tattttcaca agaggcacta cttcagcgat taatttagtt gtagatagtt acgcggaagc 120

aaatattgaa gctggcgatg agatagttat ttcttattta gagcatcatt ctaatttgat 180

tccatggcaa caactagcta aacgcaaagg cgcggtttta aaatatatcg aactagaaga 240

agatggcacg atttcagtgg aacaagcgaa aaaaacgatt ggcgagaaaa cgaaaatcgt 300

tgcgctagca catgtttcta atgttctagg gacaatcacg ccaattaaag aaatcgcagc 360

aattgctcat caatttggag cagtcattct cgttgacggt gcgcaagctg tgcctcatat 420

ggaagtcgat gtagtagatt tagatgctga cttttatgct ttttcagggc acaaaatgat 480

ggctcctact ggcattggcg ccttgtatgg caaacgtgaa ttgcttgatg cgatggaacc 540

taccgaattt ggcggagaaa tgattgattt tgttgaatta tacgattcga cttggaaaga 600

actgccgtgg aaatttgaag ccggaacacc gattattggc ggagcaattg cgctaggtgc 660

ggcgattgat tacttggcag aagtcggact cgaaaacatt cacgcacatg aacaagcatt 720

agccagctac gcgatggaag atatgagcaa aatcgaaggc attaccattt acgggccgaa 780

agatgcaagt aaacgttgtg gtttagtgac ttttaattta gaaggcgcac acccacatga 840

tattgcgact atcttggacg aagatggggt ggcgattcga gctggtcatc actgtgcaca 900

accgttgatg aaatggctgg acgtttcttc cacagctcgc gcaagcttga tatcgaattc 960

ctgcagcccg ggggatccgc ccgggctaga gcggccgcca ccgcggtgga gctccagctt 1020

tgtctagt 1028

<210> 10

<211> 1108

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 10

taagacaggg tcccctcgag gtcgacggta tcgataagct tgatatcgaa tttcgttaca 60

aaaagaaaag aacttgtgga aaattatcaa aatagtattc aaatagtgga acaagctgag 120

gaaaattatg cggatattgg tttattagcg gatgcagcac gcggcaaaaa cgctcggaga 180

ttaacctttg aacgttacat tttagcgatg tttttagata cgattatcca ccgagccaat 240

catcgtttat cgaaaatgac aagtggccgt tttgaactcc agaggaaaat ggaaaaagca 300

aaaggaaacg tccaaagtgg gttagaactt gaagtttttg atgaatacac gggattaaca 360

cgacatgtaa aaacactttc gggggggcgaa agctttaaaa cctcgttagc ccttgcttta 420

tcactcgcag aagtcgttca agaaatggct ggtggaattt cgcttgaaac catgtttatt 480

gatgaaggat tcgggacact tgatcctgaa tcacttgaag ccgcggtgga atgtttactg 540

gaaacacaag aaaatggacg cttagttggg attatttccc atgtaccaga actaaaagaa 600

cgaatttccg caaggctaga ggtaaccgca acaaatcacg gaagtaccac taaatttatt 660

acagctagta gctaaaagac cgcatgcgtt gccgtccctc gtcttttcct atataatagt 720

agtttagagt aatggacggt tttgggagga agaaagtaat ggagcacttt acagcaattc 780

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aaatcattca gtttcgtgaa aaagatgcag cagaccattt ttcaacgtat tttattgatc 900

aaaatgtcgt agaagatgca gtaatgaaaa ttatgcgtgt agctgtgctg attttcagtt 960

gaacgcgatt tgcaacacat ctacgcaacc catttaaaat ggaaaagaaa gcaaaaagca 1020

gccaaacaga ttttaaaaat cgattctgca gcccggggat ccgcccgggc tagagcggcc 1080

gccaccgcgg tggagctcag ctttcgtg 1108

<210> 11

<211> 1041

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 11

atagaccggg tccactcgag gtcgacggta tcgataagct ttgattcgaa tcatccaggg 60

catcttggct tttccgcgga tcggagacca gctgaggctg ataaattggt taaactctta 120

gcaaaaggag agtatcagaa agtttcctat ccccttcctc aaaacaaccg tgaaatatgg 180

gattggcaaa aaagaagcga catatttagc gcttaatgaa tcaactgtaa aaagttcagg 240

aggccctttt gtagttgatg ttgtgattaa cgatattcat tttgagcgat ttcgtggaga 300

tggcctttgt atgtcaacac ctagtgggac gacggcatac aataaatcgc taggtggggc 360

acttatgcat ccttctattg aagcaatgca gttaacagag atggcatcga ttaataatcg 420

tgtgtaccgg acaatcggta gcccactagt ttttccgaaa catcatgttg ttagtttgca 480

accggttaat gacaaggact ttcaaatttc tgtagaccat ttgagcattt tgcatcggga 540

tgtacaagaa attcggtatg aagtatctgc aaaaaaaatt cactttgcca gatttaggtc 600

atttccattt tggcgtcgtg tacacgattc gtttattgaa gattaagcta gcaggaggaa 660

gcatgtgttt ttagaatgga aagtcgaaac tgaagaagat gggctcttac ttcgcacgtt 720

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aaaaattgaa gtgaatagcg aagaacaaaa tgttttgtat cacgtaaaag taggcgataa 840

agtgaggctt acttttccaa cagagcaaca aaatgaacga ttgcttgcgg aatataccaa 900

tttagatatt gtttttgaag atgatttttt attaattatc aataaaccgg ccgggatggc 960

ttccattcca tcacaatatc acccaaatgg gatccgcccg ggctagagcg gccgccaccg 1020

cggtggagct cagttgtcag t 1041

<210> 12

<211> 1143

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 12

ttcgcgggtc ccctcgaggt cgacggtatc gataagcttg atatcgaatt caacaagcgc 60

cgttaaaaat gatcatattg tcgtacttcc agcagaactt ttcggaacca atcctggaat 120

taaaatttga tcaagcattg gattatatga cagatgagat aaataaggtg gataactaat 180

gacaactgtg aaggcgcatg atccgcggcg aaaacgtaga cggataactt ttattgtagt 240

aatcatttta cttattttag ctttttttcta cggactgaca actgggtccg tgaaaattac 300

atatagtgac gcttggcaga cgctaactgg cgggggaagc gacctagcga accaattgat 360

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ggtttcagcg ggtggtggtt ttgttgccat tttaatgaca ttagcatttc ctgcgttagc 540

ttcctttgtg ccgattggtg cgtttttagg ggcgtttgga acagctattt tgatttattt 600

gcttgcatgg gatcgcggtg tttcgccttt acgcgtaatt ttgtcggggg tagcgattaa 660

tgcgtttatt ggagcgatga cttctggcgt aatggtgctt tatagcaacc gggtccaaag 720

tgtcatttct tggatgacag gaacgctctc cgggaaaagt tggtatcatt tggatatgat 780

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gctagaagtt ggttcggatc cgccggctag agcggccgcc accgcgtgag tcagtgttct 1140

ttt 1143

<210> 13

<211> 1221

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 13

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tgaaaatgaa atgctaattc ctaaaaactt aattatcgca actgggtcca aaccgcgcac 120

attaagcggt ttaacaatcg atgaggaaca tgttttatca tctgacggcg cgcttaacct 180

agaaacttta ccaaaatcaa ttattattgt tggcggtggg gttatcggaa tggaatgggc 240

ttcgatgatg catgatttcg gtgtagaagt tacggtgcta gaatatgcag accgaatttt 300

gccaacagaa gataaagaag tggccaaaga attagcaaga ctttataaaa agaaaaaatt 360

aaacatgcat acatctgctg aagttcaagc agctagttat aaaaaaacag atactggtgt 420

ggaaattaaa gcaatcatta aaggcgaaga gcagactttc acagcagata aaattcttgt 480

ttcagttggt cgttctgcta atacagaaaa catcggctta caaaatacag atatcgcgac 540

cgaaaacggc tttatccaag taaatgattt ttaccaaaca aaagaaagtc acatctatgc 600

gattggagac tgcattccaa cgattcaact cgcgcacgtt gcaatggaag aaggaacaat 660

tgcagccaac catattgccg gaaaagcagc cgaaaaactt gactacgact tagttccccg 720

ctgtatttat acttctacag aaatcgcaag tgtcggtatc acagaagaac aagcaaaaga 780

acggggtcat gaagtgaaaa aaggcaaatt cttcttccgt ggtatcggga aagcgctcgt 840

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agcgtgagca tgattggacc gcacgttacg gacatgatta gcgaagccgc tttagcacaa 960

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gacaaaatga ctttaagagc agtttacaga agataataat aaatgtatga aacatgctat 1140

ggcaaagact agacgagcgt tgtgatgctg aacgtctggc agtcgttccg tctggtagac 1200

agaactgcca aattggggaa a 1221

<210> 14

<211> 1026

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 14

tgcgcgggtc ccctcgaggt cgacggtatc gataagcttg atatcgaatt caaaagtaaa 60

caagagcaaa cagtatccgc accaactaag aagaaagcag caactgcgac aaacccatcg 120

gaaaatgcag caactaatga gccagaagaa acgaaagagc ctgaaccagt agaagaaaag 180

ccaaaggaaa caattgtaaa aaatcaagaa attgataact atttacaaaa aattggtttt 240

agtggttcgg cacttgtagt tcgcgatgga gaaactatca tacaaaaagg gtatatgtat 300

gcaaatcgtg atgacaaagt attgaataca ccagatactt tgttttatat tggatcttct 360

caaaaagcaa tcatagcaac tgcactttta caattagaag aaaaaggtaa aataaacacg 420

aatgatccaa tttcgaagta tatacctgat tttcctaatg gtaataagat tttagtgaag 480

aactttatga atcatacatc tggtattgtt ggacgaccaa acttaacaag taatatgaca 540

ccggatcaaa ttgttaaagc tattgagaag cggggaatta aatcacaacc tgggaaatgg 600

gattatatgg atgctaatta tactgtagtg ggttatcttg tagaaaaaat tagtgggcaa 660

cctttagcca catatcttca agaaaatata tttaaccctg caggaatgaa gcatacagga 720

tactatcaaa aagatgttga tgggggaaaa aacgtatcaa caggctataa aattgatgaa 780

aatggagtct ttcaaagtcc aaagcttgca gacttaacga aattatatgg tgcaggggac 840

attagtatgt ctacaacgga tatgtatttg tttgacaaag cattgatgga taaaaaattg 900

atttctgaag caagtttgaa gaaatgttca caaaaggaag caaatcaact tatggaatgg 960

gattctatgt ggatccgccc gggctagagc ggccgccacc gcggtggagc tcagctttgt 1020

ctagtg 1026

<210> 15

<211> 1224

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 15

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aaccaatcaa agcattaatt atcaatttgg cagaaacgct caaaatcgat tacaaagatt 120

tgtccaaatg tacgataaaa acaacgaata aagcgatatt actaagcgat gatgacaaat 180

tgactaattt tcaaattgcg gacggagaca ttttagaaat tttatagaaa aaaaggagaa 240

taaaaacgat gaataagaca atagaaatgg acggaataac ttacgatttt acttatgagg 300

atctagtttg gagcattacg tttccaaaat caaaaacaca cgctaaagaa ctcgcacaac 360

tagaactatt agaaaaacct gcgacacatt ttactcctgc aaaaatctca agtgatagcg 420

attcgtatac aatttcttat gagattgcga aacgtactta tggatttgaa caagttcgaa 480

aaatgggacg tgaagataaa ctgcgcgcac tgcggaatat tgcggattta ggcgaattgt 540

taaacacgcg ctatacattc tttttacacc cggataatct gattttcgat attaacctag 600

tgccaagtat tgttcatcgg ggcattaaaa atatattacc gccatatgaa ctaacagaag 660

aaacttttt caaacaatat caatgtttcg ttattgcgat gttttctaag aaattctctt 720

ttgaaaactt gtataatggc tcgctatcag gggctagagg aacgcaattt gagaagagta 780

tattagatgc aaaaacggta caagatattg ctactatttt agaagaagct tacgtgaaag 840

agcatgcggc ggttcaaaaa aatatggcaa gcgtaccgaa gaaaaaatac agtactttcc 900

gtgggttggc ggttggtttc attatcgtcg ctattttact tgcaattcca gtaagttatt 960

ttgccttcgt taaagtccct ctgcaaaatg atttactacg gcaacgagat ttctgaaaac 1020

agattacgat aagtgatacg gtctagaaat ggtggatccg cccgggctag agcggcgcac 1080

gcgtgagctc agcttgtcta gttgggggggg tattagtaag acattaaacc tatgatatag 1140

gttgcataag ctcagcaaac gctgaaatcc aacactagtc ggtcagccaa tatctcgtat 1200

aaagccacgg atgtgatcca ctag 1224

<210> 16

<211> 1179

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 16

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attatccgtc gcctggcaat ctatctttgt gcctttgtaa tttgttttaa attgatgtga 120

aagtgaggat gtttccttaa tttctatgaa agctaaattt agtttagtgg aggctaaata 180

ataattttga atcatttttt catattgtat ttgtgtctta aagatagaag cactaccagt 240

aacgattaaa attgaaataa gcgcaatgaa aatggtaaat gggagcgtaa atgcattagt 300

cttcatggat tggataccac ttctggtaat gcgaatacag atgtatatat ctgagtatta 360

gagtcttgca ccgttaaatg aagttgtttt tctttcttga ttaattgata atctttcaca 420

ttagtaagca atggttcatg tccttttccg tttacttgtc gtcgaactaa atcattatat 480

ttggaatagg tgataaggtc tttgccatta ctaaaagaaa gcttattccc atcaatttga 540

atattagtcg ctttttctaa ttctaaacga gtttgaatga gaaaaagttg ccattctgtt 600

gtctggtcaa tgttgctaag ttggatagtc ttgttgtagc attgaaaaaa taatggaatg 660

agcgagctaa tacttaaaat gattgtaata gacaagattg tttcaagaag agtgaaagca 720

ggtgagccgc ttctaaaaga tacatttttc ttccaattta tttgttgcac aaatttggat 780

acctccttga taatggaaac tttggatacg ttcatcctta aagttaaccg gaacattttt 840

gtggcgtaat agttcgctat gttcataaat ttcttgatag actctgctag tttctttttg 900

atggtctagt ttttcaaaaa tagtcatagc tgtgggtaat agaaaactac aaaccattgc 960

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aaacgccctt tccgattgaa atattagctt gtagttattt gtcgaagttg tcaggtggat 1080

tgttgaaaac gattaatgga tccgcccggc tagagcgcgc caccgcggtg ggctcgcttg 1140

ctagtgtgag ggtgagatgg tttatattaa aaaaatccc 1179

<210> 17

<211> 1211

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 17

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gcaggacaaa gtgatatcac tattaaacga gtaaaagact atgtaacaaa tccaaaacct 120

aatggctacc ggagtttaca tttactctgc gaagttcctg ttttcctgac aaatcgttca 180

gaggtaatga cagtggaaat tcaaattcgg acggtcgcaa tggatttttg ggcgagtttg 240

gagcataaaa tttattataa atatcaacaa gaagctcctg ttgagttagt taatgaatta 300

caagatgccg cacgaattat cacccattta gatgaaaaaa tgaaaaactt aaatgatcaa 360

attgataaat ataaaaaaga aaaagaaaat taatctaata tggagcttta tttctttgca 420

agtgagatgg atgcaaagaa ataaagctgt tttatatttg cgagatagtt tattttgctt 480

cataataata taggagaaaa atgaaagggg acgatacata ttggagatat ttttatatgt 540

tttagcatta cttgtagcca tctttatttc taatttactc aaccggtttg ttccctttgt 600

ttcggtaccg ctgatccaaa ttggtcttgg tgtattaatt gccattatgc cgattacgtt 660

taatttgcaa ttaaacccag aacttttttct agtcatgttt attgcgcctt tgctatttaa 720

tgatggcagg cagactgata aagcagctct ttggggtatg cgaatgccga ttttagtatt 780

agcgctcgga ctggtgtttg caacggttgt cgtgattggg tattttgttc actggatgat 840

tccgacgatt ccactagcag ctgcttttgc cttagcagca gctcttgcgc caacggatgc 900

tgtagcagtt agttctcttt ctgggcggat taatttaccc aaacggatta tgatttgctt 960

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tagtcgactt atttgagtcg gtgaaactgc ggatgtgaat gctcgcgcct cgcatggaga 1140

gtacgttcat gctatcgaag ttgagccact tctagttgta ttagcggctg ggcaatacat 1200

tttctggaat c 1211

<210> 18

<211> 1007

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 18

atggaaggtc ccctcgaggt cgacggtatc gataagcttg aatcgaatct ttctgggatt 60

gcggttggga cgctgcaaat tacctactaa aaaacgtcca aactttgcgg aggttcgctg 120

atgctaaaca aagtcaagca gcacaaaaat aacttttaaa aaaggagttc aatatgcaac 180

ttcatgctat gtgggatgag tatcctgcac tttccaaaga tttacaagaa gtcttacaaa 240

cgattgaaaa aaatattcaa attcgcgata aacacgttga gcaaaatgtg aaagatttga 300

ttcatgccgg cgggaaatta ctgcgcccag cttttgcact tctttctgct caagctggtc 360

ctgattatga taaagaccgc gctgtttcga ttgctgctgc acttgaagta cttcatatgg 420

caacgttgat tcatgatgat gtcgttgatg attctccgtt acgccgtggc atcccgacaa 480

ttcattctaa atatggtcgt aattatgctg tttatacagg cgattattta ttctgcatct 540

gtttcaaaat tctatccgca catgcttctt ccgtggagaa cattgaattt aatagtaaaa 600

atatcgaaaa aatcttaatg ggcgaactag atcaaatgcg cacgagctat aaaatgaacg 660

tgaccgttcg cgagtattta acccgtattt ctggtaaaac agcacaatta tttgcgctta 720

gttgttactc cggtgcaaca ggtagtaaag caacacgaat gacagttgca aaatgttata 780

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gtacagatga aggtcttggc aaacccgttt taaatgatat gaaacaaggt atttattctc 900

taccgcttat ttatgcaatg aaaggtcact tggcggattc ctgcagcccg ggggatccgc 960

ccgggctaga gcggccgcca ccgcggtgga gctgagcttt gtctagt 1007

<210> 19

<211> 1237

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 19

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ctgaaaatga aatgctaatt cctaaaaact taattatcgc aactgggtcc aaaccgcgca 120

cattaagcgg tttaacaatc gatgaggaac atgttttatc atctgacggc gcgcttaacc 180

tagaaacttt accaaaatca attattattg ttggcggtgg ggttatcgga atggaatggg 240

cttcgatgat gcatgatttc ggtgtagaag ttacggtgct agaatatgca gaccgaattt 300

tgccaacaga agataaagaa gtggccaaag aattagcaag actttataaa aagaaaaaat 360

taaacatgca tacatctgct gaagttcaag cagctagtta taaaaaaaca gatactggtg 420

tggaaattaa agcaatcatt aaaggcgaag agcagacttt cacagcagat aaaattcttg 480

tttcagttgg tcgttctgct aatacagaaa acatcggctt acaaaataca gatatcgcga 540

ccgaaaacgg ctttatccaa gtaaatgatt tttaccaaac aaaagaaagt cacatctatg 600

cgattggaga ctgcattcca acgattcaac tcgcgcacgt tgcaatggaa gaaggaacaa 660

ttgcagccaa ccatattgcc ggaaaagcag ccgaaaaact tgactacgac ttagttcccc 720

gctgtattta tacttctaca gaaatcgcaa gtgtcggtat cacagaagaa caagcaaaag 780

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tacgcgtgag catgattgga ccgcacgtta cggacatgat tagcgaagcc gctttagcac 960

aagttttaaa tgcaacgccg tggggaagtg ggcaacacga ttcacccgca cccaacttta 1020

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taaaggagaa caaaaatgac ttaaagagca gtttacggag ataataataa atgtatgaaa 1140

catgctatgg cgaaagacta acgacgatgt ggtgctgaac cggtctggca agtcgttcca 1200

ttctgtaagg aagaactgcc caaattgagg gacaact 1237

<210> 20

<211> 1248

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 20

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gcaggacaaa gtgatatcac tattaaacga gtaaaagact atgtaacaaa tccaaaacct 120

aatggctacc ggagtttaca tttactctgc gaagttcctg ttttcctgac aaatcgttca 180

gaggtaatga cagtggaaat tcaaattcgg acggtcgcaa tggatttttg ggcgagtttg 240

gagcataaaa tttattataa atatcaacaa gaagctcctg ttgagttagt taatgaatta 300

caagatgccg cacgaattat cacccattta gatgaaaaaa tgaaaaactt aaatgatcaa 360

attgataaat ataaaaaaga aaaagaaaat taatctaata tggagcttta tttctttgca 420

agtgagatgg atgcaaagaa ataaagctgt tttatatttg cgagatagtt tattttgctt 480

cataataata taggagaaaa atgaaagggg acgatacata ttggagatat ttttatatgt 540

tttagcatta cttgtagcca tctttatttc taatttactc aaccggtttg ttccctttgt 600

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tgatggcagg cagactgata aagcagctct ttggggtatg cgaatgccga ttttagtatt 780

agcgctcgga ctggtgtttg caacggttgt cgtgattggg tattttgttc actggatgat 840

tccgacgatt ccactagcag ctgcttttgc cttagcagca gctcttgcgc caacggatgc 900

tgtagcagtt agttctcttt ctgggcggat taatttaccc aaacggatta tgaatttgct 960

tgaaaggtga ggcattaatt aatgatgcgt caggactagt tgcccttcca gttcgcgatt 1020

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gctcgcggac ttggcatgga agatgtacgt tcaatgctta ttcaagttga cgcattacta 1200

gttattagca gcggaagaaa tacatgtttt cttggaaatt tataacgg 1248

<210> 21

<211> 1222

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 21

taagacaaga ccccctcgag gtcgacggta tcgataagct tctaaaacat tggcgcatga 60

caacagatcg tcaccgcaca tctgatgaat taggaatgac agtcttgaac ttttttcgc 120

atgcaaattt aacgccttct gatattcaag gaattattat ttcgtccgtc gttccaccaa 180

ttatgcacgc gatggaaaca atgtgtgtac gttattttaa tatccgacca ttaatcgttg 240

gtccaggaat aaaaactggt ttaaatctca aagtagataa tccgcgcgaa attggatctg 300

accgaatcgt aaacgccgta gctgcatctg aagaatacgg taccccggtt atcgtagtcg 360

attttggcac tgcaaccaca ttttgctata tcgatgaatc aggtgtatac caaggtggcg 420

cgattgctcc aggcattatg atttcgaccg aagccctcta taaccgtgcc gcaaaacttc 480

ctcgtgtaga tattgctgaa tctagccaaa tcatcggtaa atccaccgtg tcatctatgc 540

aagcgggtat tttttacggt tttgtaggcc aatgcgaagg gattatcgca gaaatgaaaa 600

agcaatccaa cgcaagccca gtagtagttg caacaggcgg gctcgctcgg atgataacag 660

aaaaatcttc cgcagtagac attttagatc catttttaac attaaaaggt ctagaacttc 720

tatatagaag aaacaaaccg actagagaaa aataaaagga gttttatata atgagtgagg 780

atttagttaa agcgttagcc tacgatggca tggcgcgtgt atatgcagca gtaacaaccg 840

aaacaatcaa agaagcgcaa agaagacatg atacatggtc agtttcctct gccgcacttg 900

gcagaacgat gacagggacg cttttccttg tagcaatgca aaaagaagat caaaaaatca 960

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gatcagagga tacgtacaat ccacacgtca tttcagcgac taatgagctg aaactaatgt 1080

cccccgtgag ctccgcgttg tatgggggtt tagataaaac caccccccctc acgtatagcg 1140

ttgagctcta tgttcacaat aaaattgcac actgatccac aaactcggca gcggtgacct 1200

aatgctcaag tcctggagag ca 1222

<210> 22

<211> 1228

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 22

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tagtaatgct tattttgtac ctatcgcaaa agtcttagaa gatcgaaatg cagataacaa 120

agattaacct aattcactat tgtcagatga ttatttccat cctaatcata caggatacga 180

gaagatgaca acggaattag acaaggccat cgtaaaacaa ttaaacgaag gcaatattcc 240

caaatagaaa ggtgttaaaa tcgtgcagag agaaacacga tcggctccaa aaaaaacaaa 300

acgcaattat tggaaatggg tttgtattat attaattagt gtacttctta tttcatctgg 360

ctggatttac gtagcagtat tcaaacttag tccacaagat gaacccacgc catcccttat 420

tagcaataaa tcaatggttg aatttcaaac aagtacaacg aaagcagatt taaatcaatt 480

gattagttcc tatatagaag actttagcaa agagcaagat attggttata aagtgttcgt 540

agcaaataac gttaatttta ctgcagaagc cgaaatcttt ggtgaaccag tcgaactacg 600

gttgaaattt tcacccgaag tagtagataa tggaaatgtt gaattgacgc tcaaagacat 660

gtcagttggc gctttgccac taccggtgtc ttatgtaatg aattatgtaa gcaaaaatta 720

taaattccct gattgggtga caattatgcc taaaaaggaa aaaatctatc tttccctaga 780

taaactaaaa cttcaaggcg acacaaaagt acgtgctgat acgctaaatt tgaagaaaga 840

cgatatttcg tttacacttt tagtaccagt taagtaattt agctggctga atcctagtta 900

gggggcattt ttatgacaaa agaatcactt gaaaaagcaa catttgctgg aggatgcttt 960

tggtgtatgg taaaaccttt tgatacgcaa ccgggaattg aagaagttgt ttcgggttac 1020

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acagagcatc caatcacatt gatcgcgttt tcgatatgaa aaatagtcga gtatatgcaa 1140

caacgatcga cgatgcagca gcatcatgac ggtgactcgc tgcgctttgc gtgttattca 1200

ctattgggca tactactaga acaacatc 1228

<210> 23

<211> 1263

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 23

ttgcgttgga ccccctcgag gtcgacggta tcgataagct taactgaccg ttttaaccgt 60

ttagacaaag aaaaatatgg tgtaattaaa gacatcacag ataaagacta ctaccaaaac 120

tctttccact atgatgttcg taaaaaaatt accccatttg aaaaaattga ttttgaaaaa 180

gattatccag aattttgctc tggcggattc attcattatt gtgagtatcc aaaaatggtt 240

cacaatacga aagcacttga ggctgtatgg gattactctt atgatcgcgt agcttatctt 300

ggtacaaata caccaatcga taaatgttac gaatgtgatt ttgaaggtga atttgttcct 360

acagaagaag gcttcaaatg cccaagctgt ggcaacaccg accccgaaaa agcagatgtt 420

gtaaaacgta cgtgtggcta tttaggcaac ccaatgaaac gtccaatggt tcatggacgt 480

cacgtagaaa ttagcaatcg cgtgaaacat atggagaact taggtgaata atccaaaacc 540

gtgtgaatgg aagtcgaatg aattatccag agggtatatc gctgactata aagcattcaa 600

ttttgtcgat ggagagggcg ttcggtgcag tttatatgta tctggatgcc ctttccactg 660

cgaaggctgc tacaacaaag ccgcgcaatc atttaaatac ggcaaacctt acacaaaaga 720

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cagggctgaa ggccatagag gtgccaagtt ccgggggggtt caatagaatg atcaactcca 1200

ttactgcctg cgctaactgc agctttcagt gcagggaacc tagtgagtca ggcacttgac 1260

ata 1263

<210> 24

<211> 1256

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 24

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acaacagatc gtcaccgcac atctgatgaa ttaggaatga cagtcttgaa ctttttttcg 120

catgcaaatt taacgccttc tgatattcaa ggaattatta tttcgtccgt cgttccacca 180

attatgcacg cgatggaaac aatgtgtgta cgttatttta atatccgacc attaatcgtt 240

ggtccaggaa taaaaactgg tttaaatctc aaagtagata atccgcgcga aattggatct 300

gaccgaatcg taaacgccgt agctgcatct gaagaatacg gtaccccggt tatcgtagtc 360

gattttggca ctgcaaccac attttgctat atcgatgaat caggtgtata ccaaggtggc 420

gcgattgctc caggcattat gatttcgacc gaagccctct ataaccgtgc cgcaaaactt 480

cctcgtgtag atattgctga atctagccaa atcatcggta aatccaccgt gtcatctatg 540

caagcgggta ttttttacgg ttttgtaggc caatgcgaag ggattatcgc agaaatgaaa 600

aagcaatcca acgcaagccc agtagtagtt gcaacaggcg ggctcgctcg gatgataaca 660

gaaaaatctt ccgcagtaga cattttagat ccatttttaa cattaaaagg tctagaactt 720

ctatatagaa gaaacaaacc gactacagaa aaataaaagg agttttatat aatgagtgat 780

gatttagtta aagcgttagc ctacgatggc atggcgcgtg tatatgcagc agtaacaacc 840

gaaacaatca aagaagcgca aagaagacat gatacatggt cagtttcctc tgccgcactt 900

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actctcgaga tccaacaatg tcatgcaatc gcgcgatgag catatgacgc tgatct 1256

<210> 25

<211> 1239

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 25

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caggtatgct tgggacacaa atatttagtt ttagccgttt agcgtggaaa attcttcaag 120

aaacaggtgg attatctaaa actttcttaa gtcagacagg tatagaaatg gttatcagaa 180

aagcagccct tgatcaaaaa gataaattaa aaatcttttc aagagctact tctagaaagg 240

gtttttattc agagttagcg aatttattta aagaaatgaa acaagaagag gtttccattg 300

aagacatggt caagagcgct acgaatctgt ctacaagtgt gaataataaa gtgcatgata 360

tctcgctaat ctatcaaaag tatgaggaat tattagcgga taaattcctt gaaaatgaag 420

actatttgag attgcttgca gaaaaaattg ccgatagtga ttatttaaat cagactgaaa 480

tagtcattga tggttttact tctttctcaa aacaagagct gacagttatt ggagaattaa 540

tgcggaaatg tgataaagta acgatttctt tgacgcttaa tgttcctgaa attcagcatg 600

gactagatga atacagtatg ttcaaagcaa gtacagaagc gtattatgct ctattagagt 660

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ctattttgac aagaaatctt ggagattatg acgttttatg tgaaacggtg atggaagcat 960

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<210> 26

<211> 637

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 26

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agctctatat ttcatcggtc aaaaaggtac ggatgatgaa ttgctaactg gagataaaat 120

ttataaaatc catttcccag cagacgaact tccagcagaa cttgcaaatg ctttttggtc 180

cgttacctta tatagtgttc cggattatca tgttatcccg aacgaattaa ataagttctg 240

catcaataat tacacaggtc caaaactaag tgaagatggc agcttgactc tttacattgc 300

gtctgaaaaa ccggcagatg tagatccagg gaactggcta ccaagtaaag ctgggaaaga 360

attctcacta aacttccgac tatatgttcc gaaaaaagaa gtattagaag ggaaagtatt 420

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tatacttagc ttttttgtgc tttatactgt taaaagacta ttttaatagg ttttgatgag 540

agtaaagctt gatatcgaat tcctgcagcc cgggggatcc gcccgggcta gagcggccgc 600

caccgcggtg gagctccagc ttttgttccc tttatgg 637

<210> 27

<211> 1237

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 27

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ttcacaatta agtttctaac ctcagctttt tggtcatcac caagttcgat ataagctgca 180

acttttcttg ctttatcttg aaactcagct gcttttggca ttttatctgg ataagttgcc 240

agcagttctt ctaaattgga ataaatttct tctaagagga actctgcatt agtgaaatgc 300

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gcagcccggg ggatccgccc gggctagagc ggccgccacc gcggtggagc tccagctttt 720

gttcctaggg gggggggaaa ataaatataa aaaaaagggg gttttgtttt taacaagggt 780

gtttgcgggt atcagggtgt gaattgctaa ccagttccac aattccaccg aacccgcatt 840

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<210> 28

<211> 1253

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 28

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ctagagcggc cgccaccgcg gtggagctcc agcttttgtt cccttagggg ggggaaataa 720

taaaaaaaaa cccccgtcct ataaccaaat tagaatctgt tcgcaaattt gaaatttttt 780

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ggagctaacg tgagcgaatt cggaccgaac tatatatctc ggcgactttc atg 1253

<210> 29

<211> 1283

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 29

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caaatagctg ataacaaaat gactttagcc gatgcgctaa aagaacaact acatttaatg 180

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gcgcgcgaat gtattttact acaaatcgaa cgctcgccgg atgctccata tattgcctat 420

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<210> 30

<211> 1223

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 30

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ttcggacctc cagtaagtat taccttacct tcatcctgga catgggtaga tcacctggtt 180

tcgggtctac gacctgttac ttatgcgccc tattcagact cgctttcgct acggctccgc 240

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gagtatttag ccttgggaga tggtcctccc ggattccgac ggaatttcac gtgttccgcc 480

gtactcagga tccactctgg agggaaagcc atttcaacta ccgggctgtt accgtctttg 540

gcgggccttt ccagaccgct tcatttataa ctttcttttg taactccgta tagagtgtcc 600

tacaacccca agaagcaagc ttgatatcga attcctgcag cccgggggat ccgcccgggc 660

tagagcggcc gccaccgcgg tggagctcca gcttttgttc tcttaggggg gggttttttt 720

attttaccac acccggtggg gcaaatttct gggctgtcgt ctgtgtgcca gaagtgaaat 780

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tgggtaacgc actcaagcac aaggacgtat ggcatgaacg gtcagagcgg gcatcgcgga 1140

gtctgcttcg cctggtacgt gactgagagc tcaacgtcac gtgaccaacg ttacgatgac 1200

ggaacttgag tattccgtgg atc 1223

<210> 31

<211> 1300

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 31

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tttagcgctt gtcggtatta agacgcgtgg tatctatctt gccgagcgct tgcataagcg 120

gatacttgaa attgagggta ttgatgtgcc agttggggat attgacatta cactttatcg 180

cgatgatttg tctttcaaag atgataaaac tcgcgaaccc gctgtacatg ggacgaacat 240

tccatttgat attaatggaa agaaggtcgt tcttgtagat gatgtgcttt atacaggtcg 300

aactgtgcgt gccgcaatgg acgcattaat ggatgtaggt agacctgcgc aaattcacct 360

tgcagtgctt gctgatcggg gtcatagaga gcttccaatc agagcagact acgtagggaa 420

aaacattcca acctcaggga acgagcgagt agaagttcgc ttaacagatg tggatcatgc 480

agaagatgca gttattatta acaaaaatga ataacaatgt aacacttttt taaaagcagt 540

cctgtgaggc tgacaaagag tgattaattt ctatagggga ttattctata ctctttgtcg 600

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agcccggggg atccgcccgg gctagagcgg ccgccaccgc ggtggagctc cagcttttgt 780

tccttaaggg gggtttaata attataaaaa acaacccccc atggattcac ctgtgtttaa 840

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atccattgaa tacctttacg gaacacaccg ttactgcaaa aggctcgatc aatgaacaag 1260

aaccggtaaa gtggcccact ctcttaccat gaggggtcgt 1300

<210> 32

<211> 705

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 32

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ttcgattgga atttctccgc tacccacacc tcatccccgc acttttcaac gtgcgtgggt 120

tcggacctcc agtaagtatt accttacctt catcctggac atgggtagat cacctggttt 180

cgggtctacg acctgttact tatgcgccct attcagactc gctttcgcta cggctccgct 240

ttttccgctt aaccttgcaa caaatcgtaa ctcgccggtt cattctacaa aaggcacgct 300

atcacccatt aacgggctct aactacttgt aggcacacgg tttcaggaac tgtttcactc 360

cccttccggg gtgcttttca cctttccctc acggtactgg ttcactatcg gtcactaggg 420

agtatttagc cttgggagat ggtcctcccg gattccgacg gaatttcacg tgttccgccg 480

tactcaggat ccactctgga gggaaagcta tttcaactac cgggctgtta ccgtctttgg 540

cgggcctttc cagaccgctt catttataac tttcttttgt aactccgtat agagtgtcct 600

acaaccccaa gaagcaagct tgatatcgaa ttcctgcagc ccgggggatc cgcccgggct 660

agagcggccg ccaccgcggt ggagctccag cttttgttcc cttag 705

<210> 33

<211> 1246

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 33

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gtacccggag tcacaatcaa tgaagtgtgt ggatctggct taaaatcggt tatgcttggc 120

agacaagcaa ttcaactagg ggaagctgac atcgtagcag taggagggac cgaaaatatg 180

tcccaagcac cacttttact taatcccgag ctagccggtg aagaaatcaa tccaaaaaaa 240

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gctcataact ctcaaatgaa ggccgcaagt gcacaagaaa aaaacctttt tgaagaagaa 420

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aattcctgca gcccggggga tccgcccggg ctagagcggc cgccaccgcg gtggagctcc 540

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<210> 34

<211> 627

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 34

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tagtggccat gaatgatacg atactttatt cgcttattta ccaatgtagt gaggataaaa 180

atattgataa acgagcgacg taacgaaatt ccgtcttcct acaactaagt tagcgtaaag 240

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acaccaagtt tgtttcattc gcatcacctt ttatttgttc gttgtactat atatataacc 420

gttctaaata aatgtaaacg ctttattagt aaaatgatta taaagtcata gtttgaattt 480

taagccaggc cttttgtcag aggaaataag ccattagaat atcatcaaca aattcgcctt 540

gaataatgaa ttcctgcagc ccgggggatc cgcccgggct agagcggccg ccaccgcggt 600

ggagctccag cttttgttcc ctttatg 627

<210> 35

<211> 1273

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 35

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ttgataaaat ttttaaatta tagtctttaa aatatgtcaa aaatatgaat gtgaagtaaa 180

taactttctc gttccgctac tcattaagga aaaatttcct ccattcatct aaaaaaaaga 240

gaagacaaaa tttgtcttct ctttttcta atagctttat ttaaaaactg attatttatt 300

cactgcttgc gctgctgtaa ttaacgttaa gttataaacg tcatctgtat tacaaccacg 360

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aggtatgcgg attcggtgat ggctaagtca ggcctcatct tagtctgtcg atacgatatg 1260

tacgcatacc gca 1273

<210> 36

<211> 733

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 36

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aacagttaga tactggaagt ctggtgaaag tccagcacgg tcccgccact gtaaggagtt 120

agacactcta agtcaggtct tttatctaat tgttttaact ggttatactg cttcgaggca 180

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taaaacaaat aagcccactg taaatggttt ggtgccgaga agctgaacga gctacgtttt 300

atcaagcacc atacgcacaa agatgtgcac cgcttcgttt tatggtgggc aatgatcttt 360

tcaacgacga aaagagtgat acaaggaatg tatcttcatt gcctatttac aaaaaaagat 420

ttgacatttc cacgtgtttg gtttttaata aagtggacaa ataaaatatt ttacggtaca 480

aaggcgtact gtttacttag caaagaagct ttgagttgga agagaaaatt tctctactca 540

aagcttcttt tttaatttta aaaaactagg aggtaatctc atgcaaaaag ttagttttaa 600

aacagacctt tacattggcc aaggagcaac agatcgttta ctcgatttta aagacaaaca 660

aatctttatc gtaacggatc cgcccgggct agagcggccg ccaccgcggt ggagctccag 720

cttttgtccc tag 733

<210> 37

<211> 857

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 37

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cgtagcagca gccctttttc aaatgaacgg aataaaaatt atttcagaat ttgtgtttta 780

aagtgcgagc gaacccattg gatccgcccg ggctagagcg gccgccaccg cggtggagct 840

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<210> 38

<211> 702

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 38

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tagtattgct tcgtgttgtt gatactaaat gggttgatca tattgatgca atggatcatt 120

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cagaaggctt cgaaatgttt gaagcgatgg tatcttccat cgatgaagac gtggcgcgtt 240

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caattaatcc tgctgaaggt aaaccagaag cgaaacgcca accaatccgc aaagatcaac 360

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gtaaagaagc atagattaaa acaatttaaa aagcgcctgc aagacggcgc tttttgctat 480

gaaagtttgt aagtaaattc aaaaaaggtg gaattagaat ggaattagca gaaattcgta 540

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agcatggaag ttcgaattgc tgagttagaa gaccaaatgt tggatccgcc cgggctagag 660

cggccgccac cgcggtggag ctccagcttt tgttccctta tg 702

<210> 39

<211> 1240

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

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ggaagattta gcacgcgacc gcgcgaaaaa attatttgga gctgaatatg cgaacgttca 120

accacactca ggtgctcaag cgaatatggc ggtttatcat acagtgcttg aaccaggtga 180

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tttcccagga attcctgcag cccgggggat ccgcccgggc tagagcggcc gccaccgcgg 660

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<210> 40

<211> 1277

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 40

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agtgaagttg caggacgaat ggcggctcag attggtgcac aatttttaca aagaacgaat 180

ggtggtatgg gtgtcttgct tggtggtgta cctggtgtag agagaagtga agtggttatc 240

attggtggtg gaatcgctgg aacaaatgca gccaaaattg cagctggttt aggtgccaat 300

gtgaccatcc tagatatgaa tctgaaacga ttgcgtgagc tggatgatat ttttggtaat 360

caagtccaaa cgttaatgtc gaatgatttt aatattgaaa cagctgtgaa aaaagctgat 420

ttggttattg gagcagtatt aattccagga gcaaaagcac cgaaactcgt caaagagcat 480

gtggtcaaac aaatgattcc aggttctgtc cttgtggata ttgcgattga ccaaggtggg 540

atttttgaaa ctacagatca tgtttccacg cacgacaatc caacctatga aaaatatggt 600

gtgcttcatt atgctgttgc aaatatgcca ggagcagtac cgcggtggag ctccagcttt 660

tgttccctta tgggggggtat taaaaaaaaa aaaccccccc ctttgggggga atttttttac 720

atcgtcggtg tcgaggggaa aaaattgtta tccccccact atttccacat agcataagat 780

cccggatgca taaaagtggg agggcctggg ggagcgtact gagtcaccta actctcatta 840

acttgcgttg cgctctctgc gcgcatttcc acccggcaaa cctgttctca caactgcatt 900

aatgaatcgg ccaaaccgcg agtatgaggc gtttgcttat tgcgcgctct tccgcttcca 960

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aaacataggc cagctgaagg tcaacgtacc ggtaacatgg ccctgtagct aggcattgtc 1140

ccccgggtcc agctcgactg aaagcatctc aaataatcga cgtctcagta gagggtagac 1200

agaacatcga acggactgga gactagtcag tagcttccca ctgggatctc gcgatcgtga 1260

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<210> 41

<211> 757

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 41

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cacttgggct tggtgggtca aatggacatt tgctcgcact gcaatacgca cttgatcctg 120

tgttgaggga acttggagcg gaaacgatat taaaagggca atttacggta gataaacaaa 180

ttgaacggct cggggatggg ctgtatgaaa ttgaatcttc agcgaaagaa cggttagaca 240

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tggaattgtt gtcgagtgct tttcaatcgg tgaaagaatt aggaattgat tggccgtcaa 420

cgaatgcgga tttggcgatg gtgacagaaa atattgttaa ttcttctgct tttgttttgg 480

aacgaaacgg caaattaatt tctacgatta ccgttcgttt tccgtgggag agcagctcac 540

ctccttctaa atatccattt gtttggtggt ttgcaacggc accggaactc gcaggacagg 600

ggattggcga taaattatta acatatgtag aagaacgagt acttcgtgac acgctaaaag 660

caccggcact gacacttgga acttctgcca gaaaacatcc atggttgctg gatatgtatc 720

tgcgccgcgg tggagctcca gcttttgttc cttatgg 757

<210> 42

<211> 563

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 42

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ttcaagtgag tgaagacggg aaagctgttc atttgttgtg gggctataca gacggcggac 180

tgccaacgag tgaacttcca gcgcatttta tgagtcacat tgcaagactt tctgtggatc 240

cggaaaaccg cgttgttatg cattgtcacg ctactcattt gctcgcgatg acatttacac 300

atgagctgac ggaacgagca tttacaagaa ctttatggca aatgtgtacg gaatgtttag 360

tcgtttttcc agaaggtgtt gggattattc cttggctggt tcctggtacg aatgaaattg 420

gagaagctac atctgaaaaa atgaaggaaa atcgtttaat tgtttggcca catcacggaa 480

tttatggtgc gggacaatca atggatgaaa catttggatt aattgaaacc gcggtggagc 540

tccagctttt gttcccttta tag 563

<210> 43

<211> 1232

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

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taagtcacac atggctctcc gtctgctact gcagcaattt cacgtaaaat aggggctaca 180

aggtcatatg ccttgcgttg accacctggc atgatagaag gacctttcag cgcgccctct 240

tctccgcctg atacaccagt tccgatgaaa ttaaatcctt cttcacttag ttctttatta 300

cgacgaatcg tatctttgaa gaaagcatta ccgccatcaa ttaaaatatc gccttcgttt 360

aagaaaggtt taactgcttc aatcatcata tctgtagcat cgccagcttt taccataata 420

aggatacggc gaggcacttc aagagattcg acaaattcct ctaaactata agttggtact 480

aatttttgt ccgcattctc ttccataact gctttcgttt tttcagtcga gcggttaaag 540

atagatactg tatgaccgcg gtggagctcc agcttttgtt cccttatggg gggtaatata 600

taaaaaaaca gcccctagac aaaatcatgg cagacctgtg tgccagagta gaaatctgct 660

cacactcaca attcaacaca acatacgaaa tcgtaagttg aaaatgttgg gttgccgaag 720

ccaatgagct aactcaaact cattgtaatt gcgctggctg tccgtgatcg agtacggatc 780

gctaacgttc tcgcggcatc aatgatatga atctgcgcgg tgcacaggca gatgcgtttg 840

ggtatggcgc gctcttccgg ctcacgactc ggtctctcgc tcttgtcgtg cgggtgcggc 900

aagctgtctc tcaaagtcga aatcgggttt tccgcttaac gctgagatat ggcatgacac 960

agatgatgag cagatagagc agcatgactg gcagaagtcg atgaaacgta agagtgctgg 1020

gcttgcttgc attgtttcat acgcctctga cgcatcgtga acgagcatcc catgaaacga 1080

tcgactacgg tgtcgagttg ccagaccgat caagacttct aaggcgatcc agccgttaag 1140

cctcctggaa gatcttaccg tgatttgacg gttccggatc acggaatata tcggatactt 1200

gattaccctc tagtgtaacc ttggagacaa tc 1232

<210> 44

<211> 1286

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 44

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tactggaaga acatttgcgc ttgtgcgaag acgatccaag tgatgtgctt caaaattgct 180

tacgccgata gcgcgaacaa gcccctcatc atataatttt tctacagcac gccaagtatc 240

gaaaaatgta ttttgttttg gccaatgaac taaatataaa tcaatttgat ctagttgcaa 300

ttttttctgt gatttttcaa aagcccgaag cgtttcatcg taaccttgct ctgtattcca 360

catctttgtt gttacgaaaa attcatctct tttcaagccg cttgacgcaa aaaagtctcc 420

aagttctttt tcattatggt aaaatgaagc cgtatcaaat aagcgatacc caacatccac 480

cgcggtggag ctccagcttt tgttcccttt ataggggttt tttatattaa aacagccgcc 540

atggccacgg catggccaag ggccgtgtct gggaaaaaat ttgcgctcac catactatta 600

caacacaaga gacgagcccc aaaacatgaa aagtaaggga gtgccgtgcg agtgagctaa 660

gctaacttac ttgagttgcg ctgcgcgccc tgttcgctat ccggaaagca aacgtgccgt 720

gtcaactgct gaatcggatc aggcgccgcg agaggcgatg cgcgtttgcg tattgtgcgc 780

tcttccgctc cctctgacat cgatgcgctg ggtctcggct ggtgcggcta cgcgcggatc 840

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agagcaagtg accgtaaagg acattgatag gcaagggccc gcaaacagga gagcggtgcg 960

cgctgtttga ctttttctc aggcttcgtg atagtaacca acaatctcta agatcaagtc 1020

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acaaggctgc cttcctgctt ttcgccctgc ttgcgatact tagactggat tacctagtat 1140

accattacct tccattcgct gcaatttgtg gcagctatgt cgaacgttct ctacaatatg 1200

ttaagggttg ttcagttatc ggcgatgtct gtgtttacgg ttaccatccc gtgtccagtg 1260

atgtgtttgt gtcatcgcta attcgc 1286

<210> 45

<211> 1285

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 45

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cgccggaatc acaggtgttc ccggtgttac tgcaaaaatc gttggcgcat tatctgaaaa 120

aaatatccca attttacaat cagcggatag tcatactact atttgggtat tagtaagaga 180

aaaggactta atttcagcag tcaatgccct tcatgacgta ttttgtttgg aaattaagta 240

aggaggaaat gaaagatgga tttagggaaa gtaattacag caatggtgac accaattcac 300

ccagagaaag ataaagtatg caaaaaaaga attcatcatc tcgtgaatca cttaatcaaa 360

aatggctcag acggtttagt aatcgctgga acaactggcg aatctccaac tttatcccat 420

gatgaaaaaa taaaattatt tcgccaagta attgaaacta atgacggacg tgcgaaatta 480

attgctggaa caggctccaa taacacagct gaaacaatcg cttttacaaa agaagttgcc 540

acgcttggtg gtatggatgc tgttttaatc gtagctccat attacaataa accaaatcaa 600

gatggcttgt atgcccattt tgccgcggtg gagctccagc ttttgttccc ttatgggggg 660

tgtataaaat ataaaacccc ccccccgtta agatccaggt ttgttcctag tcgcgagtga 720

tgaaacaact ccaggctcac acccccctaaa agccagaagg ggtgaagtgt tatattgtga 780

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agatcagccg cgttgacatc tcgtgcgctc gtcgcccttc ctgcctcact gactgcgtgt 960

cgttcgattc gctgcggatc caactaggct ggatcaactg caggtaaagg ggggatattc 1020

aggggcatcc agtggaagtc gcgaggatac tacatgctag acactccgac gcccaaaggc 1080

ccatcgaatc ggctgaagta aggccctcaa atgggcgcgc tagcccccgg atatgtcgtt 1140

accgttgacc cagtcctaag atgaacctca ctgtaaatcg ctaaacgttg acacaggcgt 1200

ccaaatcctg aacaagacta ggcagttaac tcagggtgaa gtccctgtga aatatacttc 1260

ccgtgcgata gcatgtactg actct 1285

<210> 46

<211> 588

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 46

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aagtcacaca tggctctccg tctgctactg cagcaatttc acgtaaaata ggggctacaa 180

ggtcatatgc cttgcgttga ccacctggca tgatagaagg acctttcagc gcgccctctt 240

ctccgcctga tacaccagtt ccgatgaaat taaatccttc ttcacttagt tctttattac 300

gacgaatcgt atctttgaag aaagcattac cgccatcaat taaaatatcg ccttcgttta 360

agaaaggttt aactgcttca atcatcatat ctgtagcatc gccagctttt accataataa 420

ggatacggcg aggcacttca agagattcga caaattcctc taaactataa gttggtacta 480

atttttgtc cgcattctct tccataactg ctttcgtttt ttcagtcgag cggttaaaga 540

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<210> 47

<211> 405

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 47

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tgatttttaa tgtacctgta atgttattta gggtaaaaac aagttacaat gttagcagta 120

gaaaagacca atgtgggttc ttttttattt tgtcttaata actctaaacc acagacaaat 180

ataaattgga aatcaacgta ataatcgtat ttcctattac aataatcgag atattgtcac 240

accctgaaat ataattgtaa tgcaattaac ctatagatga aaaactgtca tggtataatt 300

aagcttgata tcgaattcct gcagcccggg ggatccgccc gggctagagc ggccgccacc 360

gcggtggagc tccagctttt gttcccttta tgggggggtta aataa 405

<210> 48

<211> 1319

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 48

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aatgattttt aatgtacctg taatgttatt tagggtaaaa acaagttaca atgttagcag 120

tagaaaagac caatgtgggt tctttttttat tttgtcttaa taactctaaa ccacagacaa 180

atataaattg gaaatcaacg taataatcgt atttcctatt acaataatcg agatattgtc 240

acaccctgaa atataattgt aatgcaatta acctatagat gaaaaactgt catggtataa 300

ttaagcttga tatcgaattc ctgcagcccg ggggatccgc ccgggctaga gcggccgcca 360

ccgcggtgga gctccagctt ttgttcccctt tagggggggt taatttgatt gctatgatag 420

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tatcgtggta ggatatactg tggtaacgtt ggtgtccaat taagaatggt ctgagcctta 540

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actagctttc accctaaata gagatgcggg tacattaaaa ttcagtacag ttctcgctcg 660

cggactaaag ctatccactt aacctttctg ggggggggag cagataccca attctcccta 720

tagggagtac gtattacata tagaataagg atataacgca tgtaagaaca tgtgagcaaa 780

aagactgcat aaggacaggc accaaccaaa ggcggcttgc tggcgtgatt ccatacgtac 840

ccccccccccc gacgacaaca caaacatcaa tcctcgagtc agagggtggg gaaaccaacc 900

cgactaaaca gataccaggc attccttctg gcaggaagct ctgcgctcaa cttttccgac 960

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<210> 49

<211> 1320

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 49

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atcttcttcg atgacgattg aaagtgctca ttcgctatgt gacgaaattg aggcagagat 120

tatgaatttt tatgctaaag cggaagttct tatccactta gagccggaag aagaacgggt 180

ccttaccaga atttaatccg agctctttct attcgatttg ttgctaaagt gttacaatag 240

gtagaaataa gactggaaag gacaatgagt atgacaactt ctattttaat tgctgatgat 300

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caagcttgat atcgaattcc tgcagcccgg gggatccgcc cgggctagag cggccgccac 420

cgcggtggag ctccagcttt tgttcccttt atggggtttt aatcgatcgc tctcgtgtgt 480

gcgggtcctg tttgttccct ggaaaaattt ggtcttaccc ttataaatca cattgtagca 540

gcacccctac aattaaatgg cgtagtggtg actggaccgc aagctaaaac ccattggata 600

gttgcgctgc tgatggcttt cgggacggga aacctgagcg cgcctacttc attgaatcaa 660

tcggccaggt tacgagagac aggcacgttc tacggtttgg cgccctcgta tcccttccct 720

cgctgaatca ctcgttctcg ttcggttcgg gcggcgtgca gcgagctgta cccgctcact 780

cgaagggcgg tgatttccgt tatccactta atctagagat aacgcagaac ataacatgcc 840

aaacaaaagg caaaaggacg ggcactgaac caaaggaggg ctcgcgttgg atggagttgt 900

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ctcgctgaat cacctaaacc cacaccggct ttccgcctcc cccgcttaca ccccgattac 1260

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1320

<210> 50

<211> 410

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 50

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ttagttggaa ttggtgtgtt agttgaatcc gaatatgcgg aagagcgctt agtggatgat 120

tacgtatctc ttgtaaaaat aaaaaatgtg aacatgaaag aaaaacaaat cgaagttgtt 180

gatgggaatt actttaatag ttgattctaa accctggaaa aatattctgg ggtttttctt 240

ttttgagacg aattgctact aaaaacaaat cagccctccg atgtacttca ctcagttaac 300

ttttgtggta gaatgaattc ctgcagcccg ggggatccgc ccgggctaga gcggccgcca 360

ccgcggtgga gctccagctt ttgttccctt taggggggt taattagaat 410

<210> 51

<211> 308

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 51

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atgtttatcg gggcttttct cttagcgatg tttactttac ctgaattatg gtgggtaatt 120

attgtactcg ttgttcttgt tgttctgatt gttgtattca cattcgggtc tatgggtaaa 180

cactttgcca ttattcagaa gttaattgac cgagtgaatt cctgcagccc gggggatccg 240

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ttaataaa 308

<210> 52

<211> 1283

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 52

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ttctaatctg agtcctcatg ctaaaattgg ggatccgccc gggctagagc ggccgccacc 180

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aacagcgaag acgcgcggag aagcgatttt cgcttattgg gttcttcccc ttcctctctt 480

ttgactcggg acgctccctc gatcgcttgc ggtgagtgtt tccaccgcac acaaatgcgg 540

gcttacggcc ttcggcggaa ttacaggata attcgcgtat gagcatgtga gaaaaacggg 600

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atagatacag acgcttctcc ctgcaaacgg ccctcgtgcg ctctctgtgc gaccctgcag 780

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cctcccattc gtaccgacta ctgcgcctta ttcggtgata attgtcttga agtctatcca 960

cgcaagtgac aacgacttga tcatctctgg ctgcagctgc tgcctgatat gtattattta 1020

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agctgccaac aaagaaacaa agtggttgtg taagtcatgc ggtcttgtct gagacatgct 1140

actttacccg aacaagaaag atgcttgtac atgtgtttcc gccaaaaaaa acatctctca 1200

attgcaatgc gtttttattt gcgaacgcga ttcagctctc gccagggatt gcctctctga 1260

gaatatacgc atttcgctgc ggt 1283

<210> 53

<211> 1261

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 53

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aaggtaaatt cgtacgtcaa tccggtggac gtggacaata tggtcacgtt tggattgaat 180

tcctgcagcc cgggggatcc gcccgggcta gagcggccgc caccgcggtg gagctccagc 240

ttttgttccc tttagcaggg gttaatttaa cgcctatagt taacaatgac acatggtttt 300

cctcagagag atagaggatt cctcccgccc gggggaacat gcggggcgag agcgtcagcg 360

ggggggggggg gtcttgtttt tgttgcgtgg acggttccat atacgaatta aatctctgaa 420

gcatttgcag taaaaataaa tgaaatgctt tcaactgatg ggagacgtcc aacactcgtt 480

ggggggggag gttcgcataa ggggcattaa tattacttca atctgtgatg gacctccctt 540

tttgtttctt gggagctgtg caatttcaac tcactcataa gggtaaatac agttatgcag 600

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aaataaaaag gcccgtttct ggcgtatttt ttatgctcgg cgcccttgtg agcatcacaa 720

aaaacgacac tctcttagag atggcgaacc cccacatgac tatatgacac cctacgcttc 780

tccctgtaaa agccctcgtg cgctctctgt gctacactgc cgcttacagg atactacctc 840

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agtcagggta ggcgtacctc cccaacgctg cggctgtgtt ggacgaacca tcccgttcag 960

ccgacggctg cgccgtatta tggtagctac cgtcttgatg actaccccgg aaggaaacag 1020

cttattacct ctgcagtccg cactcgctga tagcttaatt tatagctgag gtaggtacgt 1080

agcgcgttcg taccttactt gaaatgagat cgggcgaccc tacgactgaa cctacacaaa 1140

cgtatgggtg cacgtccgct tgcttgtaat ccagtaactt aacgtccaga agatagttgc 1200

cagtatccgg ccagcaaccc actcccgttg tgttccgtgt cacagtgcga gtcaggcacg 1260

g 1261

<210> 54

<211> 285

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 54

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gaagcgatgc gtcaaatgga gacagctgca agtattcata cggattataa agcagttagt 120

gaagcaattt cttctagcta ctatatgtta gaagatagca tgagccaaat cagacagtca 180

cttgatcagc tcgaattcct gcagcccggg ggatccgccc gggctagagc ggccgccacc 240

gcggtggagc tccagctttt gttcccttta gcaggggtta attag 285

<210> 55

<211> 431

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 55

aaccggtggt cctcgaggtc gacggtatcg ataagcttga tatcgaattc gtgcatttat 60

gcgaaaagaa cttgaaccag tttccgatga aattatccaa gatgggctag gtggcatttt 120

tggtgtgcgc cacggagcgg aagaaggccc gcgtgtactt gttgcagctc atatggatga 180

agttggcttt atggtaacgc aaattacgga caacggcttg cttcgttttc aaaccaattg 240

gtggttggat atccgcaagt tttacaggcg caacgagtgc aaattatgac tccaattggt 300

cctgtaattg gcgtggttgc ctctgttcca ccgcatttgt tatcagaagc tgaacggagt 360

aaaccgacgg atccgcccgg gctagagcgg ccgccaccgc ggtggagctc cagcttttgt 420

tccctttagg g 431

<210> 56

<211> 905

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 56

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tgatgatggt tcaagttcac taatccacaa tggcgtggca gcagcaccgg gtcaagcgac 120

cattttcatc aaaagcaagt tttccacgca atcgaacaaa tttgccagaa cacaagttac 180

agtaaacatc gctgcgctaa acggcggacc tattactgtg aaacatgaag atacaaaagg 240

gcaagaactt gcaccacctg tcattttaaa tggtaaagac ggggatccgc ccgggctaga 300

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aatgaatctg ccaatgcgcg cggagagagg gggtacggat agagcgctct tccgcttcct 600

ccctcaccac actctctgct gctcggtcgt tcggctgcgg cgagcaggga tcatcctcac 660

tcaaaagcgg taatactggt tatcctcaaa agtcgtcggg atgacgacga gataagaaca 720

tgtggagcaa aaaggtcagc aaaaggccgg ggaacaataa aaaagacgcg ttgctgccgg 780

atttccatag gctccgcccc cctgacgagc atcacaaaaa tattcgctca tgacggatgt 840

ggcgaaaccg cacaagacta taattatatc tgcgtgtttt ctccctggaa gaacccttcg 900

atgcg 905

<210> 57

<211> 937

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 57

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atgttgcgac gggtgatgta gtggaacaag gagatttatt agtaacgttt gatatggaaa 120

aaattgcaga aaaatatgat acaaccacga tgatggtaat tacaaatacc aatgaatacg 180

cagtggtaga agctaaagag aatggtattg taacgaaagg taatcaagta atggaattaa 240

ggagtgagca aaatgagtaa tacgaagttt ccagatggct ttatgtgggg cggggcgacc 300

gcggtggagc tccagctttt gttcccttta gtgggggtta atttgatacg tggcgctcca 360

tggtcttgcc gaacgttgac tcggtaaagg aaccggcata taaacccccc tttgtttatt 420

atgccggaca ccttgttagc ctggagtttt tagtatttaa ctaagcaatc atcgtggcgg 480

tgcggcacag ctcgcccggc tcaggggaaa aagtagtaac acaagcattt ttaataatcg 540

ccgggcgtaa gcaaatggcg tctgacgtat cgcaatactg ctgcttcgtg actgacgtgt 600

tgcttcgttt cttgggcggc tcccagcaat acatcaaact caaaaagaag gaagtttttc 660

ttttcttatt agggggggagg caggatgttc ggcccatatc gacaaaatgc agccaagaca 720

agaatccaaa ttatagcgat tttttcgacc ccccccctccc tggtaacaaa aaatttagtt 780

tcctatggct gtagcgggcc aaaccggcat tacaagaacg aggcacgttt ttctgaatgc 840

aactccatcc cccgatttac ggaacccaac caaaaacgga accatatccg ccatcttttt 900

ctcgggaagc taaggagcta tcaacctcct aaaattg 937

<210> 58

<211> 1272

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 58

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catcgtttgg gtttatttta agcgcctacc tggttgtaga atttttattc ggtatcgaag 120

gcgtgctcta ctacttacta gcgggattta gcccattaaa tattttccta gtattagcac 180

tcgtgttcac cccattttac ttcttttaca cactaataga cctttggatt agccgcggtg 240

gagctccagc ttttgttccc tttagcagag gttaatttac cgagcaccgt aatctgggtt 300

aatgtggttt tcggtgtgaa attgttatct tgaaaaaatt ccacaggata taataaacgg 360

aattatatgg tgtatggcct ggggtgccta atgattgaaa taactctgat taattgcctt 420

ttgctccttg tgcactttcc attcgggaaa cctgttcgtt gatgcattaa tgaatctgcc 480

aacgcggggg gagaagaggt ttgcgtcctg ggcgctcttc cgcttcttct tcactgctga 540

cttgcgctcg gtcgttcggc tgctgcgagc ggtatcatct cactcaaagg cggtgatact 600

gttatccaca gaatcatggg ataacgcagg aaacaacatg ttagcaaaaa cgccagcaaa 660

aggccaggaa ccgtaaaaag gccgcgttcc ttggctgttt ttttttacgc tccgcccccc 720

ctgacgagca tcacaaaaaa aaaacgctca agtgagaggt agctgaaaca aacacaggac 780

taataaagat accaggcgtt tccccctgga agctcactcg tgcgctctct cgtttgtacc 840

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gtgttgaatg acccaccccg ttcagtcccg accgcagcgg cctttatcta ggtaagtaat 1020

cgtctttgag tgcaatccga gtaggaaaag aacctgatcc tcccctgctc tgccgcctcc 1080

tggcctacgt gacttagctt agccgaggct atggcagtcg tggctgtctg aaacttcatg 1140

taattgatgg ctaacttaca gcacggctat aaataacagt attggcattc tggcgctctc 1200

gcttggccaa ttctcactta ccgaataaag agaaatggat tgcatgtatt ccgcctcacc 1260

cgccataaaa ct 1272

<210> 59

<211> 448

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 59

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ataaattatt aaaacgtatc gaacgcttca ctggaaatat tccgggaagt ggcgcgctta 120

tgacatttaa agattccaat tggcttatga gtacggttgt tgctgcacaa ccacatttta 180

aagcgcaaga tgcgaatact acgattttct ggggttacgg attatatcca gaccgcgttg 240

gtgatttcgt gaaaaaacca atgaaagaat gtactgggga agaaatttta tatgaattaa 300

tgtgtcattt gaactggcaa gatgattttg aagaaattaa agcggatata atcaatgtaa 360

ttccgtgcta tatgccgtac attgacgcgc aattcgaacc gcggtggagc tccagctttt 420

gttcccttta tgggggttt atatacaa 448

<210> 60

<211> 1281

<212> DNA

<213> Random genomic DNA sequence of Listeria monocytogenes

<400> 60

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cgcggagtag aagcggcaaa ctcgatcagt aatcggacgc gatgcagaaa ttcgtaacgt 120

tatccgaatt ttatctagaa aaacaaaaaa caatccagtt ctaataggtg aaccaggtgt 180

tggtaaaaca gccattgtcg aaggattagc gcaacgtatc gttcgaaaag acgtgccaga 240

aggactgaaa gataaaacga ttatctcact cgacattggt tcccttattg ctggagctaa 300

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ggagcaagac ggaaaaattg tatattctgg ggtgcctgct gagtgagcga gctcactttc 480

attgcgttgc gctcgctgcc cgctttccat tcaggaaacc tgccttgcca gctgcattaa 540

tgaatgggcc aacgcgcggg gagaggcggg ttgcgtgctg agtgctcttc cgcttcctcg 600

ctcactgact cactgcttcg ctcgttcggt tgcggggagc gatatcattt cactcaaagg 660

aggtaatacg gttatccatt caatcaggcg ataacgcacg atagaacatg tcagcgaaaa 720

aacagcaaaa gaacagggaa cgatcaaaaa gacgcgcttg ctggcttttt ttccatacgc 780

tccgcccccc cctgactagc atcacacaaa tctacgctca agtcaagatg gtggcgagac 840

cccgaacagg aactataaag ataccatggc gttttccctt ctggaatcta cctggtgcgc 900

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gccgtccgcc tgtaatacag ataacgttaa attattggat ttcgaactcc gatacggaaa 1140

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gtgagaggaa gacgctagta t 1281