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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ALPHA-AMYLASE MUTANTS WITH ALTERED STABILITY

(57) Abstract: The present invention relates to variants (mutants) of parent Termamyl-like alpha-amylases, which variant has alpha-amylase activity and exhibits altered stability, in particular at high temperatures and/or at low pH relative, and/or low Ca²⁺ to the parent alpha-amylase.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00488

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C12N 9/28, C12N 15/56, C11D 3/386

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO INTERNAL, WPI DATA, PAJ, CHEM.ABS.DATA, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 0029560 A1 (NOVO NORDISK A/S), 25 May 2000 (25.05.00), page 15, line 12 - line 17 --	1-26
X	WO 9919467 A1 (NOVO NORDISK A/S), 22 April 1999 (22.04.99), page 9, line 10 - line 33 --	1-26
X	WO 9741213 A1 (NOVO NORDISK A/S), 6 November 1997 (06.11.97), page 15, line 25 - line 34 --	1-26
X	WO 9623874 A1 (NOVO NORDISK A/S), 8 August 1996 (08.08.96), page 29 - page 30; page 36, line 21 - line 25, claims 45-46,49 --	1-26

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 April 2002

Date of mailing of the international search report

12. 04. 2002

Name and mailing address of the International Searching Authority



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00488

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9909183 A1 (GENENCOR INTERNATIONAL, INC.), 25 February 1999 (25.02.99), page 10, line 18 - line 23 --	1-26
P,X	WO 0060059 A2 (NOVO NORDISK A/S), 12 October 2000 (12.10.00), page 12, line 6 - line 12; page 12, line 20 - line 28, claims 1-2 -- -----	1-26

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK01/00488

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: **1-26, partially**
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see next sheet *

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see next sheet **

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
Parts of claims 1-26: Variants of Termamyl-like alpha amylase having a mutation in position 49 or 170, and applications thereof.
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK01/00488

It is not possible to unambiguously identify the mutational positions "corresponding to" the positions of the parent Termamyl-like alpha-amylase (SEQ ID NO:8), for all variants of the enzyme. Because of the uncertainty in the identification of the claimed positions, the present application fails to comply with the requirements of Articles 5 and 6 PCT to such an extent that a complete search over the claimed scope is impossible. Consequently, the search has been limited to the exact mutations in the amino acid sequence of SEQ ID NO:8, and to mutated alpha-amylases in general.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established will not be the subject of an international preliminary examination (Rule 66.1(e) PCT). This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-26 (all partially)
Invention 1: mutational position, denoted T49.
2. Claims 1-26 (all partially)
Inventions 2 to 33: mutational positions, denoted D60, N104 etc...

According to Article 34 (3) (a-c) and Rule 13.2, an international application shall relate to one invention only or to a group of inventions linked by one or more of the same or corresponding "special technical features", i.e. features that define a contribution which each of the inventions makes over the prior art.

.../...

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK01/00488

Claim 1 describes mutations at 33 different positions of alpha amylase. Each mutation can be an insertion of an amino acid at the downstream position, a deletion or an amino acid exchange. It is already known to introduce mutations in several of these positions in a Termamyl-like alpha amylase (e.g. through WO 9741213 A1). The inventions of claim 1 therefore lack a common special technical feature and they have been grouped for the purpose of searching by the positions in which the mutation occurs.

The mutational positions denoted T49 and K170 have been searched.

SA 354437

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/01/02

International application No.

PCT/DK 01/00488

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	0029560	A1	25/05/00	AU	1151200 A	05/06/00
				CN	1333821 T	30/01/02
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