(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 May 2013 (23.05.2013)

WIPO | PCT

(10) International Publication Number
WO 2013/072521 A3

(51) International Patent Classification:
A23K 1/00 (2006.01) *A23K 1/18* (2006.01)
A23K 1/165 (2006.01) *A23K 1/16* (2006.01)
A23K 1/175 (2006.01)

(21) International Application Number:
PCT/EP2012/072979

(22) International Filing Date:
19 November 2012 (19.11.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11189542.1 17 November 2011 (17.11.2011) EP

(71) Applicants: **DSM IP ASSETS B.V.** [—/NL]; Het Overloon 1, NL-6411 The Heerlen (NL). **NOVOZYMES A/S** [—/DK]; Krogshoejvej 36, DK-2880 Bagsvaerd (DK).

(72) Inventors: **WARD, Nelson**; DSM Nutritional Products Ltd, 45 Waterview Blvd. B. 788 R. 3028, Parsippany, NJ 07054 (US). **KNAP, Inge**; DSM Nutritional Products Ltd, P.O.Box 2676, CH-4002 Basel (CH).

(74) Common Representative: **NOVOZYMES A/S**; Krogshoejvej 36, DK-2880 Bagsvaerd (DK).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
24 April 2014

WO 2013/072521 A3

(54) Title: USE OF ACID STABLE PROTEASES IN ANIMAL FEED, PREFERABLY TO INCREASE PERFORMANCE OF COCCI-VACCINATED BROILER CHICKENS

(57) Abstract: The invention relates to the use of at least one acid stable protease in poultry feed in combination with anti-coccidial vaccination of birds for increasing the performance of vaccinated animals. It has been found surprisingly that the additions of at least one acid stable protease according to the invention to the diet of "cocci"-vaccinated birds have a significant improvement of animal performance. The inventors found that especially the use of serin proteases improve the performance of vaccinated broiler chickens, in particular the use of serin proteases increases weight gain and improves Feed Conversion Ratio (FCR) of cocci-vaccinated birds.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2012/072979

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:

   a. (means)

   [ ] on paper

   [X] in electronic form

   b. (time)

   [ ] in the international application as filed

   [ ] together with the international application in electronic form

   [X] subsequently to this Authority for the purpose of search

2. [X] In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/072979

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23K1/00 A23K1/165 A23K1/175 A23K1/18 A23K1/16
ADD.

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)
A23K

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, BIOSIS, EMBASE, FSTA, WPI Data, Sequence Search

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01/58276 A2 (HOFFMANN LA ROCHE [CH]; OESTERGAARD PETER RAHBEK [DK]; SJOEHOLM CARSTE) 16 August 2001 (2001-08-16) cited in the application	4-8
Y	page 11, line 31 - line 38; claims 6-10; examples 2, 6, 7; sequences 1, 2 page 12 - page 17	1-8

X	US 2007/104764 A1 (JENSEN EJNER B [DK] ET AL JENSEN EJNER BECH [DK] ET AL) 10 May 2007 (2007-05-10)	1-6
Y	paragraphs [0077] - [0088], [0237] - [0274]; sequences 59-63	1-8

Y	US 2006/134091 A1 (APAJALAHTI JUHA [FI] ET AL) 22 June 2006 (2006-06-22) paragraphs [0007], [0115], [0118] - [0128]; example 1	1-8

	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] 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	Date of mailing of the international search report
21 February 2014	27/02/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Baminger, Ursula

2

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/072979

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	PEEK H W ET AL: "Dietary protease can alleviate negative effects of a coccidiosis infection on production performance in broiler chickens", ANIMAL FEED SCIENCE AND TECHNOLOGY, ELSEVIER, AMSTERDAM, NL, vol. 150, no. 1-2, 30 March 2009 (2009-03-30), pages 151-159, XP026031558, ISSN: 0377-8401, DOI: 10.1016/J.ANIFEEDSCI.2008.08.006 [retrieved on 2008-09-24] Chapters 2.3, 2.5 and 4	1-8
Y	WILLIAMS R B ET AL: "The efficacy and economic benefits of paracox, a live attenuated anticocidial vaccine, in commercial trials with standard broiler chickens in the United Kingdom", INTERNATIONAL JOURNAL OF PARASITOLOGY, PERGAMON PRESS, GB, vol. 29, 1 February 1999 (1999-02-01), pages 341-355, XP002969285, ISSN: 0020-7519, DOI: 10.1016/S0020-7519(98)00212-4 Chapter 2.4	1-8
X,P	WO 2012/110778 A2 (DUPONT NUTRITION BIOSCI APS [DK]; MILLAN LUIS FERNANDO ROMERO [GB]) 23 August 2012 (2012-08-23)	4-8
Y,P	page 27, line 9 - page 29, line 22; claims; examples page 62, line 6 - page 63, line 3 page 44 - page 47	1-8
Y,P	US 2012/225050 A1 (KNIGHT CHRIS D [US] ET AL) 6 September 2012 (2012-09-06) claims; example 3	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/072979

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0158276 A2	16-08-2001	AT 311762 T	15-12-2005
		AT 393576 T	15-05-2008
		AU 777210 B2	07-10-2004
		AU 781415 B2	19-05-2005
		AU 3544601 A	20-08-2001
		AU 4236601 A	20-08-2001
		BR 0108164 A	21-01-2003
		BR 0108165 A	25-02-2003
		CA 2395266 A1	16-08-2001
		CA 2395343 A1	16-08-2001
		CN 1398161 A	19-02-2003
		CN 1398162 A	19-02-2003
		CN 101238853 A	13-08-2008
		DE 60115602 T2	10-08-2006
		DE 60133802 T2	25-06-2009
		DK 1257175 T3	10-04-2006
		DK 1257176 T3	18-08-2008
		EP 1257175 A2	20-11-2002
		EP 1257176 A2	20-11-2002
		EP 1642506 A2	05-04-2006
		ES 2305061 T3	01-11-2008
		JP 4777573 B2	21-09-2011
		JP 4933013 B2	16-05-2012
		JP 2003521907 A	22-07-2003
		JP 2003521908 A	22-07-2003
		MX PA02007613 A	13-12-2002
		MX PA02007614 A	13-12-2002
		PL 357638 A1	26-07-2004
		PL 357668 A1	26-07-2004
		TW I259759 B	11-08-2006
		TW I270348 B	11-01-2007
		WO 0158275 A2	16-08-2001
		WO 0158276 A2	16-08-2001
US 2007104764 A1	10-05-2007	AT 513904 T	15-07-2011
		AU 2004270815 A1	17-03-2005
		BR PI0413833 A	24-10-2006
		CA 2536782 A1	17-03-2005
		CN 1845989 A	11-10-2006
		DK 1680503 T3	03-10-2011
		EP 1680503 A1	19-07-2006
		ES 2368221 T3	15-11-2011
		JP 2007504810 A	08-03-2007
		NZ 545564 A	31-07-2008
		US 2007104764 A1	10-05-2007
		WO 2005024002 A1	17-03-2005
		ZA 200601544 A	25-04-2007
US 2006134091 A1	22-06-2006	AT 247977 T	15-09-2003
		AU 776287 B2	02-09-2004
		AU 2363901 A	18-06-2001
		BR 0016280 A	27-08-2002
		CA 2393464 A1	14-06-2001
		DE 60004879 D1	02-10-2003
		DE 60004879 T2	03-06-2004
		DK 1237569 T3	24-11-2003
		EP 1237569 A1	11-09-2002
		ES 2204740 T3	01-05-2004

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2012/072979

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		GB 2358135 A	18-07-2001
		JP 4786103 B2	05-10-2011
		JP 5010024 B2	29-08-2012
		JP 2003516133 A	13-05-2003
		JP 2011041576 A	03-03-2011
		MX PA02005577 A	10-09-2004
		PL 356152 A1	14-06-2004
		PT 1237569 E	30-01-2004
		TW 581663 B	01-04-2004
		US 2003059498 A1	27-03-2003
		US 2006134091 A1	22-06-2006
		WO 0141795 A1	14-06-2001
WO 2012110778 A2	23-08-2012	AR 084893 A1	10-07-2013
		AU 2012216898 A1	18-07-2013
		CA 2825618 A1	23-08-2012
		CN 103533843 A	22-01-2014
		EP 2675286 A2	25-12-2013
		TW 201234977 A	01-09-2012
		WO 2012110778 A2	23-08-2012
US 2012225050 A1	06-09-2012	NONE	