

(51) International Patent Classification:
A61K 31/122 (2006.01)(21) International Application Number:
PCT/IN2011/000751(22) International Filing Date:
31 October 2011 (31.10.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
3024/MUM/2010 1 November 2010 (01.11.2010) IN(71) Applicant (for all designated States except US): **VIRIDIS BIOPHARMA PVT. LTD** [IN/IN]; 6/10 Jogani Industrial Complex, V.N. Purav Marg, Chunabhatti, Mumbai 400022 (IN).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **DILIP, Mehta** [IN/IN]; 8, Pavlova 10 Little Gibbs Road, Malabar Hill, Mumbai 400006 (IN). **RAMA, Vaidya** [IN/IN]; 5th Floor,Tanisha Building, L-Raheja Road, Off S.V. Road, Juna Khar, Khar (W), Mumbai (IN). **DE SOUZA, Anselm** [IN/IN]; A-13, Michael Apartments, P.K Road, Mulund (W), Mumbai 400080 (IN). **YOGESH, Dound** [IN/IN]; 1/18, Kashmiri Building, Majaswadi, Joheshwari (E), Mumbai 400060 (IN). **ASHOK, Vaidya** [IN/IN]; 5th Floor, Tanisha Building, L-Raheja Road, Off S.V. Road, Juna Khar, Khar (W), Mumbai (IN).(74) Agent: **SANTHANAM, Kausalya**; 203 Quiescent Heights, Mind Space Malad (W), Mumbai 400064 (IN).

(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, 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, 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.

[Continued on next page]

(54) Title: DYNAMIC BALANCING OF AUTONOMIC NERVOUS SYSTEM THROUGH VITAMIN MK-7

◆ Para
■ Sym

Figure 5: ECG changes in rat model with 500 µg of MK-7

5.1. ECG changes in male rats



Male Rat - 1

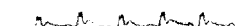


Male Rat - 2

5.2. ECG changes in female rats



Female Rat - 1



Female Rat - 2

(57) Abstract: Sympathovagal balance is essential in maintaining internal homeostasis. Imbalance in this can lead to many disease conditions such as cardiovascular diseases, type 2 diabetes mellitus, high blood pressure, gastroesophageal reflux disease (GERD), IBS, depression, COPD, etc. Sudden cardiac death and Myocardial infarction are result of autonomic dysfunction. Many drugs have been proposed for these conditions but lack in correcting the condition and can themselves produce side effects, such as prolongation of QT interval. Inventors of current invention observed serendipitously that vitamin MK-7 can restore the sympathovagal balance and also have cardio protective effect by shortening of QT interval and prolongation of RR interval. Further to this, it was also observed that vitamin MK-7 improves cardiac output, left ventricular work, HDL cholesterol and reduces blood sugar.



(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, MD, 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).

- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
- *of inventorship (Rule 4.17(iv))*

Published:

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

(88) Date of publication of the international search report:

19 May 2016

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

INTERNATIONAL SEARCH REPORT

11/000751-17-09-2012
International application No.
PCT/IN2011/000751

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61K 31/122 (2012.01)

USPC - 514/682

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)

IPC(8) - A61K 31/122; A61P 3/10, 9/10, 9/12, 25/00, 25/24; C07C 50/14 (2012.01)

USPC - 514/682; 568/328

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)

PatBase, Proquest, Google, Google Patents

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0130618 A1 (VAIDYA et al) 27 May 2010 (27.05.2010) entire document	8, 9
X	US 2008/0305096 A1 (VERDEGEM et al) 11 December 2008 (11.12.2008) entire document	10
X	WO 2010/103545 A2 (MEHTA et al) 16 September 2010 (16.09.2010) entire document	11
Y	US 2006/0166948 A1 (VERMEER) 27 July 2006 (27.07.2006) entire document	1-7
Y	MALLIANI et al. Sympathovagal balance: a reappraisal. Circulation, 98:2640-2643, 1998. Retrieved from the internet: <URL: http://circ.ahajournals.org/content/98/23/2640.2.full.pdf+html > entire document	1-7
Y	MARK. Clinical electrocardiography and arrhythmias. Harvard-MIT Division of Health Sciences and Technology, 2004. Retrieved from the internet: <URL: http://ocw.mit.edu/courses/health-sciences-and-technology/hst-542j-quantitative-physiology-org-an-transport-systems-spring-2004/readings/clin_elec_card.pdf > entire document	5-7

☐ Further documents are listed in the continuation of Box C.

* 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

20 April 2012

Date of mailing of the international search report

17 MAY 2012

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774