US007563613B2

(12) **United States Patent**
Dennis et al.

(10) **Patent No.: US 7,563,613 B2**
(45) **Date of Patent: Jul. 21, 2009**

(54) **DETOXIFICATION AND DECONTAMINATION USING NANOTECHNOLOGY THERAPY**

(75) Inventors: **Donn M. Dennis**, Gainesville, FL (US); **Charles R. Martin**, Gainesville, FL (US); **Timothy E. Morey**, Gainesville, FL (US); **Richard E. Partch**, Potsdam, NY (US); **Dinesh O Shah**, Gainesville, FL (US); **Manoj Varshney**, Gainesville, FL (US)

(73) Assignee: **University of Florida**, Gainesville, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 316 days.

(21) Appl. No.: **11/195,046**

(22) Filed: **Aug. 1, 2005**

(65) **Prior Publication Data**

US 2005/0271734 A1 Dec. 8, 2005

Related U.S. Application Data

(62) Division of application No. 09/978,344, filed on Oct. 16, 2001, now Pat. No. 6,977,171.

(60) Provisional application No. 60/281,293, filed on Apr. 3, 2001.

(51) **Int. Cl.**

C02F 3/34	(2006.01)
A61K 9/14	(2006.01)
A61K 38/43	(2006.01)

(52) **U.S. Cl.** **435/262**; 424/94.1; 424/489

(58) **Field of Classification Search** 424/94.1, 424/489; 435/262

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,449,613	A	9/1995	Dordick
5,667,764	A	9/1997	Kopia
5,695,775	A	12/1997	Van Blucher
5,914,436	A	6/1999	Klabunde
5,990,373	A	11/1999	Klabunde
5,993,831	A	11/1999	Ribier
6,057,488	A	5/2000	Koper
6,395,299	B1	5/2002	Babich

FOREIGN PATENT DOCUMENTS

WO	WO 00/47236 A1	8/2000
WO	WO 01/17648 A1	3/2001

OTHER PUBLICATIONS

Graham et al. 1999. How Similar Are P-450s and What Can Their Differences Teach Us? Archives of Biochemistry and Biophysics, vol. 369, pp. 24-29.*

Koper et al., *Development of Reactive Topical Skin Protectants against Sulfur Mustard and Nerve Agents*, J Appl. Toxicol. 19, S59-S70 (1999).

Gill and Ballesteros, Degradation of Organophosphorous Nerve Agents by Enzyme-Polymer Nanocomposites: Efficient Biocatalytic Materials for Personal Protection and Large-Scale Detoxification, Biotechnology and Bioengineering vol. 70, No. 4, pp. 400-410 (2000).

International Search Report for PCT/US02/06114.

* cited by examiner

Primary Examiner—Jon P Weber
Assistant Examiner—Kailash C Srivastava
(74) *Attorney, Agent, or Firm*—Brinks Hofer Gilson & Lione

(57) **ABSTRACT**

A method of removing a toxic compound comprising contacting the toxic compound with a particle having two regions, the first region containing a detoxifying enzyme and the second region containing a material selected to partition the toxic compound into the second region. The particle may be a nanoparticle.

13 Claims, 9 Drawing Sheets