



US008728515B2

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

(10) **Patent No.:** **US 8,728,515 B2**  
(45) **Date of Patent:** **May 20, 2014**

(54) **ADJUVANTS FOR USE IN VACCINATION**  
(75) Inventors: **Mark Stephen Baird**, Gwynedd (GB);  
**Juma' a Raheem Najeem**  
**Al-Dulayymi**, Gwynedd (GB); **Cornelia**  
**Theunissen**, Gwynedd (GB); **Gani**  
**Koza**, Gwynedd (GB); **Sepe Vander**  
**Beken**, Ghent (BE); **Johan Adriaan**  
**Marc Grooten**, Ghent (BE)

(73) Assignees: **Bangor University**, Gwynedd (GB);  
**Universiteit Gent**, Ghent (BE)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 641 days.

(21) Appl. No.: **12/988,587**

(22) PCT Filed: **Apr. 22, 2009**

(86) PCT No.: **PCT/GB2009/050410**

§ 371 (c)(1),  
(2), (4) Date: **Mar. 4, 2011**

(87) PCT Pub. No.: **WO2009/130508**

PCT Pub. Date: **Oct. 29, 2009**

(65) **Prior Publication Data**

US 2011/0142916 A1 Jun. 16, 2011

(30) **Foreign Application Priority Data**

Apr. 22, 2008 (GB) ..... 0807306.6

(51) **Int. Cl.**  
**A61K 9/127** (2006.01)  
**A61K 39/00** (2006.01)  
**C07C 61/00** (2006.01)  
**C07D 303/12** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **424/450; 424/184.1; 549/561; 562/500;**  
**562/506; 562/577; 562/579**

(58) **Field of Classification Search**  
USPC ..... **424/184.1, 450; 549/561; 562/500, 506,**  
**562/577, 579**

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2003/0175731 A1 9/2003 Fearon et al.  
2007/0027098 A1 2/2007 Raz et al.

OTHER PUBLICATIONS

Parant M et al., *Infection Immunity*, vol. 20, No. 1, 1978.\*

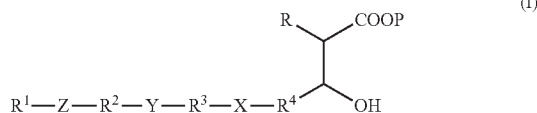
(Continued)

*Primary Examiner* — Deborah D Carr

(74) *Attorney, Agent, or Firm* — Norris McLaughlin & Marcus PA

(57) **ABSTRACT**

A compound of formula (I) for use as an adjuvant in vaccination; wherein R is an optionally-substituted alkyl, alkenyl, alkynyl, aryl, arylalkyl or alkylaryl moiety having from 1 to 50 carbon atoms; R<sup>1</sup> is an optionally-substituted alkyl, alkenyl, alkynyl, aryl, arylalkyl or alkylaryl moiety having from 1 to 40 carbon atoms; each of R<sup>2</sup>, R<sup>3</sup> and R<sup>4</sup> is independently selected from an optionally-substituted alkylene, alkenylene, alkynylene, arylene, arylalkylene or alkylarylene moiety having from 1 to 40 carbon atoms; each of X, Y and Z is independently selected from an optionally-substituted alkylene, alkenylene, alkynylene, arylene, alkylarylene or cycloalkylene, ketone, ester, amide, imide, imine, thioether, ether, thioester, thioketone; and P is selected from hydrogen, an alkyl group, a sugar residue, or a metal, phosphonium or ammonium species; wherein at least one of X, Y and Z includes a moiety selected from cyclopropyl, C=A, C-AH and C—OR<sup>5</sup>; wherein R<sup>5</sup> is alkyl or haloalkyl, and A is S, O or NR<sup>6</sup>, wherein R<sup>6</sup> maybe H or 20 alkyl.



**14 Claims, 4 Drawing Sheets**

