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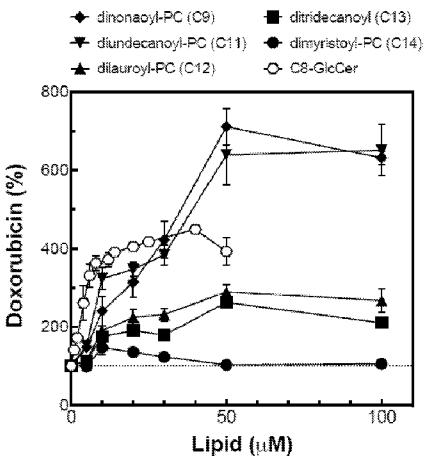
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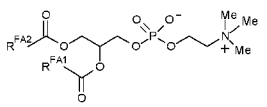
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[Continued on next page]

(54) Title: COMPOUNDS AND THEIR USE IN THERAPY

FIGURE 1





(57) Abstract: The present invention pertains generally to the field of therapy and medical treatment, and more specifically to certain compounds of the following formula (for convenience, collectively referred to herein as "short-chain phosphatidylcholine lipids" and "SCPC lipids"), which, inter alia, are useful in methods of improving drug delivery, bioavailability, and efficacy. The present invention also pertains to pharmaceutical formulations, and more specifically to co-formulations of known drugs (e.g., amphiphilic drugs) (e.g., anthracyclines) (e.g., doxorubicin) with these SCPC lipids, and their use, for example, in therapy.

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A. CLASSIFICATION OF SUBJECT MATTER
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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)
A61K

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, WPI Data, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MAYER LAWRENCE D ET AL: "The use of transmembrane pH gradient-driven drug encapsulation in the pharmacodynamic evaluation of liposomal doxorubicin", JOURNAL OF LIPOSOME RESEARCH, vol. 4, no. 1, 1994, pages 529-553, XP008170969, ISSN: 0898-2104 abstract page 531, last paragraph - page 532, paragraph 1; table 1 page 544, paragraph 2; table 4 ----- -/--	1-5, 10-55

[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
11 August 2014	23/12/2014

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	Epskamp, Stefan

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

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YASUYUKI SADZUKA ET AL: "Effects of intraperitoneal administration of liposomes and methods of preparing liposomes for local therapy", TOXICOLOGY LETTERS, vol. 126, no. 2, 1 January 2002 (2002-01-01), pages 83-90, XP055132467, ISSN: 0378-4274, DOI: 10.1016/S0378-4274(01)00447-7 abstract page 84, left-hand column, paragraph 3 paragraph [02.1] - paragraph [2.2.3] paragraph [03.1]; figure 2 paragraph [03.4]; figure 5 -----	1-5, 10-55
X	Yasuyuki Sadzuka ET AL: "Physical properties and tissue distribution of adriamycin encapsulated in polyethyleneglycol-coated liposomes", Advanced Drug Delivery Reviews, 1 January 1997 (1997-01-01), pages 257-263, XP055132429, DOI: 10.1016/S0169-409X(96)00466-8 Retrieved from the Internet: URL:http://www.sciencedirect.com/science/article/pii/S0169409X96004668 abstract paragraph [02.1] - paragraph [02.2] paragraph [03.5]; figure 6 -----	1-5, 10-55
X	MATSUMOTO Y ET AL: "Specific inhibitory effect of hybrid liposomes on growth of human lymphoma-human lymphocyte B hybridoma cells in vitro", BIOLOGICAL & PHARMACEUTICAL BULLETIN (OF JAPAN), PHARMACEUTICAL SOCIETY OF JAPAN, TOKYO, JP, vol. 16, no. 2, 1 January 1993 (1993-01-01), pages 213-215, XP009029804, ISSN: 0918-6158 page 213, paragraph 4 abstract page 214, paragraph 2 - paragraph 3; table 2 -----	1-5, 10-55
A	DATABASE WPI Week 201374 Thomson Scientific, London, GB; AN 2013-U42854 XP002728345, & CN 102 716 085 A (HAINAN LINGKANG PHARM CO LTD) 10 October 2012 (2012-10-10) abstract -----	1-5, 10-55
2	-/--	

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 93/18785 A1 (NOVO NORDISK AS [DK]) 30 September 1993 (1993-09-30) page 2, line 17 - page 3, line 15 page 8, line 6 - line 14 page 12, line 1 - line 9 examples claims -----	1-5, 10-55

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2014/061379

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 102716085 A	10-10-2012	NONE	
WO 9318785 A1	30-09-1993	AU 3888793 A	21-10-1993
		EP 0631504 A1	04-01-1995
		JP H07504669 A	25-05-1995
		WO 9318785 A1	30-09-1993

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2014/061379

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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.:
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:

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 No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

see additional 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 fees, this Authority did not invite payment of additional fees.

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.:

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.:

5(completely); 1-4, 10-55(partially)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 5(completely); 1-4, 10-55(partially)

   A pharmaceutical formulation comprising: (i) doxorubicin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

   ---

2. claims: 1-4, 10-55(all partially)

   A pharmaceutical formulation comprising: (i) daunorubicin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

   ---

3. claims: 1-4, 10-55(all partially)

   A pharmaceutical formulation comprising: (i) epirubicin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

   ---

4. claims: 1-4, 10-55(all partially)

   A pharmaceutical formulation comprising: (i) aclarubicin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

   ---

5. claims: 1-4, 10-55(all partially)

   A pharmaceutical formulation comprising: (i) idarubicin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

   ---

6. claims: 1-4, 10-55(all partially)

   A pharmaceutical formulation comprising: (i) valrubicin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

   ---

7. claims: 1-4, 10-55(all partially)

   A pharmaceutical formulation comprising: (i) mitoxantrone, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

   ---

8. claims: 1, 2, 6, 7, 10-55(all partially)

   A pharmaceutical formulation comprising: (i) camptothecin,

or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

9. claims: 1, 2, 6, 7, 10-55(all partially)

A pharmaceutical formulation comprising: (i) topotecan, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

10. claims: 1, 2, 6, 7, 9-55(all partially)

A pharmaceutical formulation comprising: (i) irinotecan, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

11. claims: 1, 2, 6, 7, 9-55(all partially)

A pharmaceutical formulation comprising: (i) vincristine, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

12. claims: 1, 2, 6, 7, 9-55(all partially)

A pharmaceutical formulation comprising: (i) vinorelbine, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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13. claims: 1, 2, 6, 7, 9-55(all partially)

A pharmaceutical formulation comprising: (i) vinblastine, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

14. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) PIK-75, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

15. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) GSK1059615, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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16. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) ZSTK474, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

17. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) GDC-0941, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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18. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) AZD6482, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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19. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Danusertib, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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20. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) PHA-793887, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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21. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) PIK-93, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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22. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) MK-2206 dihydrochloride, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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23. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) PIK-90, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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24. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) BEZ235, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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25. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) PI-103, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

26. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) BI 2536, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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27. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) AZD7762, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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28. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) NVP-ADW742, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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29. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Temsirolimus, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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30. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Crizotinib, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

---

31. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) JNJ-7706621, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

32. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Pelitinib, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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33. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Sutinib Malate, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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34. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) XL-184, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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35. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Hesperadin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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36. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Ponatinib, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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37. claims: 1, 8, 10-55(all partially)

A pharmaceutical formulation comprising: (i) Regorafenib, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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38. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) dactinomycin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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39. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) plicamycin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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40. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) teniposide, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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41. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) raltitrexed, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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42. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) rapamycin, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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43. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) gemcitabine, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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44. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) melphalan, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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45. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) acrichine, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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46. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) tamoxifen, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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47. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) bortezomib, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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48. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) nilotinib, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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49. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) ABT737, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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50. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) erPC, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.

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51. claims: 1, 9-55(all partially)

A pharmaceutical formulation comprising: (i) perifosine, or a salt thereof; (ii) a short-chain phosphatidylcholine lipid as defined in claim 1.
