Abstract: The subject invention relates to the identification of genes involved in the desaturation of polyunsaturated fatty acids at carbon 5 (i.e., ω5-desaturase*) and at carbon 6 (i.e., ω6-desaturase*) and to uses thereof. In particular, Δ5-desaturase may be utilized, for example, in the conversion of dihomo-g-linolenic acid (DGLA) to arachidonic acid (AA) and in the conversion of 20:4n-3 to eicosapentaenoic acid (EPA). Delta-6 desaturase may be used, for example, in the conversion of linoleic (LA) to g-linolenic acid (GLA). AA or polyunsaturated fatty acids produced therefrom may be added to pharmaceutical compositions, nutritional compositions, animal feeds, as well as other products such as cosmetics.
(15) Information about Correction:
Previous Correction:
see PCT Gazette No. 15/2003 of 10 April 2003, Section II

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7  C12N9/02  A01H5/00  A01H7/00  A61K35/00

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 7  C12N  A01H  A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, BIOSIS, SEQUENCE SEARCH, MEDLINE, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.

Patent family members are listed in 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 document 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 relating 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

Date of the actual completion of the international search

20 January 2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. +31-70 340-2040, Tx. 51 651 epo nl, Fax. +31-70 340-2016

Authorized officer

Keller, Y
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<td>SAITO M. ET AL.: &quot;Identification delta-5 fatty acid desaturase from the cellular slime mold Dictyostelium discoideum&quot; EUR. J. BIOCHEM., vol. 265, 1999, pages 809-814, XP002215761 abstract; figures 1,2; table 1</td>
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</tr>
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<td>WO 00 20603 A (DAS TAPAS;ABBOTT LAB (US); MUKERJI PRADIP (US); HUANG YUNG SHENG) 13 April 2000 (2000-04-13) in particular seq id no 19 abstract; claim ALL</td>
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<tr>
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<td>WO 02 26946 A (BIO ORIGINAL FOOD &amp; SCIENCE CORP) 4 April 2002 (2002-04-04) abstract claim ALL in particular seq id no 3</td>
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Form PCT/R/A/210 (continuation of second sheet) (July 1992)
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<td>LOPEZ ALONSO D ET AL: &quot;Plants as 'chemical factories' for the production of polyunsaturated fatty acids&quot; BIOTECHNOLOGY ADVANCES, ELSEVIER PUBLISHING, BARKING, GB, vol. 18, no. 6, October 2000 (2000-10), pages 481-497, XP002208312 ISSN: 0734-9750 the whole document</td>
<td>1-35</td>
</tr>
<tr>
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<td>WO 00 75341 A (ZAEHRINGER ULRICH ; BASF AG (DE); HEINZ ERNST (DE); SPERLING PETRA) 14 December 2000 (2000-12-14) abstract seq id no 12</td>
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INTERNATIONAL SEARCH REPORT

Box I  Observations where certain claims were found unsearchable (Continuation of item 1 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 II  Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.

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.: 

Remark on Protest

□ The additional search fees were accompanied by the applicant's protest.

X No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (1)) (July 1998)
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-5, 8, 9, 11-24, 31-34, (partially), 35
   A polypeptide having a delta 5 desaturase activity from Saprolegna i.e SEQ ID No 19 and 20, and related subject matter.

2. Claims: 1-4, 6-8, 9, 11-24, 31-34, (partially), 35
   A polypeptide having a delta 5 desaturase activity from Thraustochytrium i.e SEQ ID No 28 and 29, and related subject matter.

3. Claims: 1-4, 8, 9, 11-24, 31-34, (partially), 35
   A polypeptide having a delta 5 desaturase activity from Isochrysis i.e SEQ ID No 34 and 35, and related subject matter.

   A polypeptide having a delta 5 desaturase activity from Thraustochytrium i.e SEQ ID No 30 and 31, and related subject matter.

5. Claims: 1-5,8, 10-18, 25-34, (partially), 35
   A polypeptide having a delta 6 desaturase activity from Saprolegnia i.e SEQ ID No 13 and 14, and related subject matter.

6. Claims: 1-5,8, 10-18, 25-34, (partially), 35
   A polypeptide having a delta 6 desaturase activity from Thraustochytrium i.e SEQ ID No 32 and 33, and related subject matter.
### INTERNATIONAL SEARCH REPORT

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<tr>
<td></td>
<td></td>
<td>AU 2881292 A</td>
<td>03-05-1993</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BG 61791 B1</td>
<td>30-06-1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BG 98695 A</td>
<td>31-05-1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BR 9206613 A</td>
<td>11-04-1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CA 2120629 A1</td>
<td>15-04-1993</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CN 1072722 A B</td>
<td>02-06-1993</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CN 1174236 A</td>
<td>25-02-1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CZ 9400817 A3</td>
<td>13-09-1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EP 0666918 A1</td>
<td>16-08-1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HU 69781 A2</td>
<td>28-09-1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL 103407 A</td>
<td>22-09-1999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 7503605 T</td>
<td>20-04-1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MX 9205820 A1</td>
<td>01-04-1993</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NZ 244685 A</td>
<td>27-06-1994</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RO 113256 B1</td>
<td>29-05-1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RU 2152996 C2</td>
<td>20-07-2000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2002108147 A1</td>
<td>08-08-2002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 9306712 A1</td>
<td>15-04-1993</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 555206 A</td>
<td>03-09-1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 5614393 A</td>
<td>25-03-1997</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 568905 A</td>
<td>18-11-1997</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 5663068 A</td>
<td>02-09-1997</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 5789220 A</td>
<td>04-08-1998</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 6355861 B1</td>
<td>12-03-2002</td>
</tr>
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<td></td>
<td></td>
<td>ZA 9207777 A</td>
<td>21-04-1993</td>
</tr>
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|                                       |                 | WO 0020603 A1           | 13-04-2000      |

| WO 0226946 A                         | 04-04-2002      | AU 1844702 A             | 08-04-2002      |
|                                       |                 | WO 0226946 A2           | 04-04-2002      |
|                                       |                 | US 2002156254 A1        | 24-10-2002      |

<p>|                                       |                 | AU 7114798 A             | 11-11-1998      |
|                                       |                 | AU 720725 B2             | 08-06-2000      |
|                                       |                 | AU 7114898 A             | 11-11-1998      |
|                                       |                 | BG 103796 A              | 31-05-2000      |
|                                       |                 | BG 103798 A              | 31-05-2000      |
|                                       |                 | BR 9808506 A             | 23-05-2000      |
|                                       |                 | BR 9809083 A             | 01-08-2000      |
|                                       |                 | CN 1253587 T             | 17-05-2000      |
|                                       |                 | CN 1253588 T             | 17-05-2000      |
|                                       |                 | HU 0001295 A2            | 28-07-2000      |
|                                       |                 | JP 200157239 T           | 25-12-2001      |
|                                       |                 | JP 2001623092 T          | 20-11-2001      |
|                                       |                 | NO 994924 A              | 30-11-1999      |
|                                       |                 | NO 994926 A              | 30-11-1999      |
|                                       |                 | NZ 337458 A              | 28-07-2000      |
|                                       |                 | NZ 337459 A              | 28-07-2000      |
|                                       |                 | PL 336067 A1             | 05-06-2000      |
|                                       |                 | PL 336077 A1             | 05-06-2000      |
|                                       |                 | SK 139799 A3             | 16-05-2000      |
|                                       |                 | SK 139999 A3             | 16-05-2000      |
|                                       |                 | TR 9902466 T2            | 21-07-2000      |</p>
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<th>Publication date</th>
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<tr>
<td>US 5972664 A</td>
<td></td>
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<td></td>
<td>WO 9846764 A1</td>
<td>22-10-1998</td>
</tr>
<tr>
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<td></td>
<td>WO 9846765 A1</td>
<td>22-10-1998</td>
</tr>
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<td>US 6432684 B1</td>
<td>13-08-2002</td>
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<td>US 6428990 B1</td>
<td>06-08-2002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 6051754 A</td>
<td>18-04-2000</td>
</tr>
<tr>
<td>WO 9961602 A</td>
<td>02-12-1999</td>
<td>AU 4544799 A</td>
<td>13-12-1999</td>
</tr>
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<td></td>
<td></td>
<td>CA 2329159 A1</td>
<td>02-12-1999</td>
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<td></td>
<td>EP 1080189 A1</td>
<td>07-03-2001</td>
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<td>JP 2002516093 T</td>
<td>04-06-2002</td>
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<td>AU 4104200 A</td>
<td>28-09-2000</td>
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<td>WO 0053770 A1</td>
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<td>AU 5971000 A</td>
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