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- (74) Agents: **SPRATT, Gwendolyn, D.** et al.; Needle & Rosenberg, P.C., 127 Peachtree Street, N.E., Suite 1200, Atlanta, GA 30303-1811 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
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(54) Title: ADULT HUMAN DENTAL PULP STEM CELLS *IN VITRO* AND *IN VIVO*

(57) Abstract: The present invention provides a culture of isolated adult human dental pulp stem cells that can differentiate into dentin/pulp tissue that can be used to produce a tooth in a human being. The present invention further provides a method of regenerating human dentin/pulp tissue.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/23053

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 C12N5/06 A61K35/32				
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 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 practical, search terms used) MEDLINE, EPO-Internal, BIOSIS, PAJ, WPI Data, EMBASE				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	YOKOSE S ET AL: "Establishment and characterization of a culture system for enzymatically released rat dental pulp cells." CALCIFIED TISSUE INTERNATIONAL. UNITED STATES FEB 2000, vol. 66, no. 2, February 2000 (2000-02), pages 139-144, XP002201504 ISSN: 0171-967X the whole document --- -/--	1-9		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. </td> <td style="width: 50%; border: none;"> <input checked="" type="checkbox"/> Patent family members are listed in annex. </td> </tr> </table>			<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.	<input checked="" type="checkbox"/> Patent family members are listed in annex.
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° Special categories of cited documents :				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> *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 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 </td> <td style="width: 50%; border: none;"> *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 </td> </tr> </table>			*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 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
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 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 <p style="text-align: center; font-size: 1.2em;">7 June 2002</p>		Date of mailing of the international search report <p style="text-align: center; font-size: 1.2em;">21/06/2002</p>		
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. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer <p style="text-align: center; font-size: 1.2em;">Moreau, J</p>		

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/23053

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>STANISLAWSKI L ET AL: "In vitro culture of human dental pulp cells: some aspects of cells emerging early from the explant." CLINICAL ORAL INVESTIGATIONS. GERMANY SEP 1997, vol. 1, no. 3, September 1997 (1997-09), pages 131-140, XP002201505 ISSN: 1432-6981 the whole document</p> <p style="text-align: center;">---</p>	1-9
X	<p>MAGLOIRE H ET AL: "An in vitro model of human dental pulp repair." JOURNAL OF DENTAL RESEARCH. UNITED STATES DEC 1996, vol. 75, no. 12, December 1996 (1996-12), pages 1971-1978, XP008003973 ISSN: 0022-0345 the whole document</p> <p style="text-align: center;">---</p>	1-9
X	<p>US 5 885 829 A (MOONEY D.J. ET AL.) 23 March 1999 (1999-03-23) column 126 -column 132</p> <p style="text-align: center;">---</p>	1-9
X	<p>CASASCO A ET AL: "Cell proliferation in developing human dental pulp. A combined flow cytometric and immunohistochemical study." EUROPEAN JOURNAL OF ORAL SCIENCES. DENMARK DEC 1997, vol. 105, no. 6, December 1997 (1997-12), pages 609-613, XP008003974 ISSN: 0909-8836 the whole document</p> <p style="text-align: center;">---</p>	1-6
A	<p>LENNON D P ET AL: "A CHEMICALLY DEFINED MEDIUM SUPPORTS IN VITRO PROLIFERATION AND MAINTAINS THE OSTEOCHONDRAL POTENTIAL OF RAT MARROW-DERIVED MESENCHYMAL STEM CELLS" EXPERIMENTAL CELL RESEARCH, SAN DIEGO, CA, US, vol. 219, no. 1, July 1995 (1995-07), pages 211-222, XP000981537 ISSN: 0014-4827 the whole document</p> <p style="text-align: center;">---</p> <p style="text-align: center;">-/--</p>	1-9

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/23053

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	<p>GRONTHOS S ET AL: "Postnatal human dental pulp stem cells (DPSCs) in vitro and in vivo."</p> <p>PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES, vol. 97, no. 25, 5 December 2000 (2000-12-05), pages 13625-13630, XP002201506 December 5, 2000 ISSN: 0027-8424 the whole document</p> <p style="text-align: center;">-----</p>	1-9

INTERNATIONAL SEARCH REPORT

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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:

Although claims 6-9 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
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:

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.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/23053

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5885829	A	23-03-1999	AU 3214797 A	05-01-1998
			EP 0915967 A1	19-05-1999
			WO 9745533 A1	04-12-1997
