Title: MIMENCHYAL CELLS AND OSTEOBLASTS FROM HUMAN EMBRYONIC STEM CELL

Abstract: This invention provides populations of mesenchymal cells obtained from pluripotent stem cells by differentiating them ex vivo. Multipotent mesenchymal cells can in turn be differentiated into more specialized cell types such as osteoblasts, with properties that make them suitable for reconstituting musculoskeletal cell function in an individual. The compositions, methods, and techniques described in this disclosure can be used for a variety of commercially important diagnostic, drug screening, and therapeutic applications.
### INTERNATIONAL SEARCH REPORT

**International application No.**

PC1/US02/20998

### A. CLASSIFICATION OF SUBJECT MATTER

<table>
<thead>
<tr>
<th>IPC(7)</th>
<th>C12N 5/02, 5/10, 5/08, 5/00, 15/00, 15/87</th>
</tr>
</thead>
</table>

**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)**


**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 database and, where practicable, search terms used)**

Please See Continuation Sheet

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 6,077,987 A (BREITBART et al) 20 June 2000 (20.06.2000), Abstract, column 3, lines 31-60.</td>
<td>1-3</td>
</tr>
<tr>
<td>X</td>
<td>US 5,972,703 A (LONG et al) 26 October 1999 (26.10.1999), Abstract, column 12, lines 26-35, column 15, lines 1-4.</td>
<td>4-5</td>
</tr>
</tbody>
</table>

☐ Further documents are listed in the continuation of Box C.  
☐ 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
- **B** earlier application or patent 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

- **I** 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
- **K** document member of the same patent family

Date of the actual completion of the international search: 29 January 2003 (29.01.2003)

Name and mailing address of the ISA/US:
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703)305-5230

Date of mailing the international search report: 06 MAR 2003

Authorized officer: Deputy N. Toff
Telephone No. 703-308-0196

Form PCT/ISA/210 (second sheet) (July 1998)
### Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claim Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claim 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. ☒ Claim Nos.: 6-25
   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.

Form PCT/ISA/210 (continuation of first sheet(1)) (July 1998)
Continuation of B. FIELDS SEARCHED Item 3:
WEST, EMBASE, BIOSIS, LIFESCI, SCISEARCH
search terms: mesenchymal, osteoblast(s), BMP, hTERT, telomerase