Appendix 1: PRISMA Checklist

<table>
<thead>
<tr>
<th>Section/topic</th>
<th>#</th>
<th>Checklist item</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Report on page #</td>
</tr>
<tr>
<td>TITLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>1</td>
<td>Identify the report as a systematic review, meta-analysis, or both.</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structured summary</td>
<td>2</td>
<td>Provide a structured summary including, as applicable: background; objectives;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>data sources; study eligibility criteria, participants, and interventions; study</td>
</tr>
<tr>
<td></td>
<td></td>
<td>appraisal and synthesis methods; results; limitations; conclusions and implemen-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tations of key findings; systematic review registration number.</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rationale</td>
<td>3</td>
<td>Describe the rationale for the review in the context of what is already known.</td>
</tr>
<tr>
<td>Objectives</td>
<td>4</td>
<td>Provide an explicit statement of questions being addressed with reference to par-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ticipants, interventions, comparisons, outcomes, and study design (PICO)</td>
</tr>
<tr>
<td>METHODS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol and registration</td>
<td>5</td>
<td>Indicate if a review protocol exists, if and where it can be accessed (e.g., Web</td>
</tr>
<tr>
<td></td>
<td></td>
<td>address), and, if available, provide registration information including registra-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tion number.</td>
</tr>
<tr>
<td>Eligibility criteria</td>
<td>6</td>
<td>Specify study characteristics (e.g., PICO, length of follow-up) and report charac-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>teristics (e.g., years considered, language, publication status) used as criteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for eligibility, giving rationale.</td>
</tr>
<tr>
<td>Information sources</td>
<td>7</td>
<td>Describe all information sources (e.g., databases with dates of coverage, contact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with study authors to identify additional studies) in the search and date last</td>
</tr>
<tr>
<td></td>
<td></td>
<td>searched.</td>
</tr>
<tr>
<td>Search</td>
<td>8</td>
<td>Present full electronic search strategy for at least one database, including any</td>
</tr>
<tr>
<td></td>
<td></td>
<td>limits used, such that it could be repeated.</td>
</tr>
<tr>
<td>Study selection</td>
<td>9</td>
<td>State the process for selecting studies (i.e., screening, eligibility, included</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in systematic review, and, if applicable, included in the meta-analysis).</td>
</tr>
<tr>
<td>Data collection process</td>
<td>10</td>
<td>Describe method of data extraction from reports (e.g., piloted forms, inde-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pendently, in duplicate) and any processes for obtaining and confirming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>data from investigators.</td>
</tr>
</tbody>
</table>
**Cell-based therapies for COVID-19: A living, systematic review**
doi:10.5867/medwave.2020.11.8078

<table>
<thead>
<tr>
<th>Section/topic</th>
<th>#</th>
<th>Checklist item</th>
<th>Reported on page #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data items</td>
<td>11</td>
<td>List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.</td>
<td>9</td>
</tr>
<tr>
<td>Risk of bias in individual studies</td>
<td>12</td>
<td>Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.</td>
<td>9,11</td>
</tr>
<tr>
<td>Summary measures</td>
<td>13</td>
<td>State the principal summary measures (e.g., risk ratio, difference in means).</td>
<td>10</td>
</tr>
<tr>
<td>Synthesis of results</td>
<td>14</td>
<td>Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$) for each meta-analysis.</td>
<td>11</td>
</tr>
<tr>
<td>Risk of bias across studies</td>
<td>15</td>
<td>Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).</td>
<td>11</td>
</tr>
<tr>
<td>Additional analyses</td>
<td>16</td>
<td>Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.</td>
<td>11</td>
</tr>
</tbody>
</table>

**RESULTS**

| Study selection | 17| Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.                                                 | 12, Appendix      |

<table>
<thead>
<tr>
<th>Section/topic</th>
<th>#</th>
<th>Checklist item</th>
<th>Reported on page #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study characteristics</td>
<td>18</td>
<td>For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.</td>
<td>N/A</td>
</tr>
<tr>
<td>Risk of bias within studies</td>
<td>19</td>
<td>Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).</td>
<td>N/A</td>
</tr>
<tr>
<td>Results of individual studies</td>
<td>20</td>
<td>For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.</td>
<td>N/A</td>
</tr>
<tr>
<td>Synthesis of results</td>
<td>21</td>
<td>Present results of each meta-analysis done, including confidence intervals and measures of consistency.</td>
<td>N/A</td>
</tr>
<tr>
<td>Risk of bias across studies</td>
<td>22</td>
<td>Present results of any assessment of risk of bias across studies (see Item 15).</td>
<td>N/A</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Additional analysis</td>
<td>23</td>
<td>Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**DISCUSSION**

<table>
<thead>
<tr>
<th>Summary of evidence</th>
<th>24</th>
<th>Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limitations</td>
<td>25</td>
<td>Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).</td>
<td>N/A</td>
</tr>
<tr>
<td>Conclusions</td>
<td>26</td>
<td>Provide a general interpretation of the results in the context of other evidence, and implications for future research.</td>
<td>12</td>
</tr>
</tbody>
</table>

**FUNDING**

| Funding                     | 27 | Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review. | 14 |


For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org).

**APPENDIX 2 - Search strategies - Cell-based therapies for COVID-19: A living systematic review**

L·OVE platform strategies

Search strategies used in the L·OVE platform for the following question:

**Cell-based therapies for Coronavirus infection**

The components below are combined by the system with the boolean operator AND

Population component: Coronavirus

This is the population component of the search strategy used by L·OVE platform to automatically retrieve potentially eligible articles from Epistemonikos Database (see [special COVID-19 methods](#))

Date: 16 April, 2020 (this strategy is continuously improved any time a relevant article is missed)

- coronavir* OR coronavirus* OR "corona virus" OR "virus corona" OR "corono virus" OR "virus corono" OR hcov* OR "covid-19" OR covid19* OR "covid 19" OR "2019-nCoV" OR cv19* OR "cv-19" OR "cv 19" OR "n-
Cell-based therapies for COVID-19: A living, systematic review

doi:10.5867/medwave.2020.11.8078

cov" OR ncov* OR "sars-cov-2" OR "sars-cov2" OR "SARS-Coronavirus-2" OR "SARS-Coronavirus2" OR (wuhan* AND (virus OR viruses OR viral)) OR (covid* AND (virus OR viruses OR viral)) OR "sars-cov" OR "sars-cov-2" OR "severe acute respiratory syndrome" OR "mers-cov" OR "mers cov" OR "middle east respiratory syndrome" OR "middle-east respiratory syndrome" OR "covid-19-related" OR "SARS-CoV-2-related" OR "2019-nCoV-related" OR "cv-19-related" OR "n-cov-related"

**Intervention component: Cell-based therapies**

This is the intervention component of the strategy used by L·OVE platform to automatically retrieve potentially eligible articles from Epistemonikos Database

The terms below are combined by the system with the boolean operator OR

Date: 13 April, 2020 (this strategy is continuously improved any time a relevant article is missed)

<table>
<thead>
<tr>
<th>Relevant terms in L·OVE taxonomy</th>
<th>Search strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell-based therapies</td>
<td>&quot;cell therapy&quot; OR &quot;cell therapies&quot; OR &quot;cell-therapy&quot; OR &quot;cell-therapies&quot;</td>
</tr>
<tr>
<td>Stem-cell therapy</td>
<td>&quot;stem-cell&quot; OR &quot;stem-cells&quot; OR &quot;stem cell&quot; OR &quot;stem cells&quot; OR &quot;cell therapy&quot; OR &quot;cell-therapy&quot; OR &quot;cell-therapies&quot;</td>
</tr>
<tr>
<td>Hematopoietic stem cells</td>
<td>((stem* OR &quot;bone marrow&quot; OR &quot;bone-marrow&quot;) AND (transplant* OR rescue)) OR BMT OR HSC*</td>
</tr>
<tr>
<td>Mesenchymal stem cells</td>
<td>MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR ((mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medical* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*)</td>
</tr>
<tr>
<td>Bone marrow mesenchymal stromal cells</td>
<td>&quot;bm-msc&quot; OR &quot;bm msc&quot; OR bmmsc* OR &quot;bm-mscs&quot; OR &quot;bm mscs&quot; OR &quot;bm-scs&quot; OR &quot;bm scs&quot; OR &quot;bm-sc&quot; OR hbmmsc* OR &quot;hbm msc&quot; OR hbmmscs* OR &quot;hbm mscs&quot; OR &quot;hbm scs&quot; OR &quot;hbm sc&quot; OR &quot;hbm ms&quot; OR &quot;hbm-msc&quot; OR &quot;hbm-mscs&quot; OR &quot;hbm-mscs&quot; OR &quot;hbm-sc&quot; OR &quot;hbm sc&quot; OR (&quot;bone-marrow-derived&quot;) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR (mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*)</td>
</tr>
<tr>
<td>Adipose mesenchymal stromal cells</td>
<td>&quot;ad-msc&quot; OR &quot;ad msc&quot; OR admsc* OR &quot;ad-mscs&quot; OR &quot;ad mscs&quot; OR &quot;ad-scs&quot; OR &quot;ad-sc&quot; OR adsc* OR &quot;ad-scs&quot; OR &quot;ad scs&quot; OR &quot;ad-sc&quot; OR &quot;ha-se&quot; OR &quot;ha-sc&quot; OR hasc* OR &quot;ha-scs&quot; OR &quot;ha sc&quot; OR (&quot;bone-marrow-derived&quot;) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR (mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*)</td>
</tr>
<tr>
<td>Amniotic fluid mesenchymal stromal cells</td>
<td>&quot;af-msc&quot; OR &quot;af msc&quot; OR afmsc* OR &quot;af-mscs&quot; OR &quot;af mscs&quot; OR &quot;af-scs&quot; OR &quot;af-sc&quot; OR &quot;af-scs&quot; OR &quot;af scs&quot; OR afsc* OR &quot;af-scs&quot; OR &quot;af scs&quot; OR afmsc* OR (&quot;bone-marrow-derived&quot;) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR (mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*)</td>
</tr>
</tbody>
</table>
Cell-based therapies for COVID-19: A living, systematic review

doi:10.5867/medwave.2020.11.8078

<table>
<thead>
<tr>
<th>Umbilical cord mesenchymal stromal cells</th>
<th>(stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*))</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;huc-msc&quot; OR &quot;huc msc&quot; OR &quot;huc mscs&quot; OR &quot;huc mscs&quot; OR &quot;uc-msc&quot; OR &quot;uc msc&quot; OR &quot;uc-mscs&quot; OR &quot;uc mscs&quot; OR &quot;ucmcs&quot; OR &quot;wj-msc&quot; OR &quot;wj msc&quot; OR &quot;wj-mscs&quot; OR &quot;wj mscs&quot; OR &quot;wmsc&quot; OR &quot;wmscs&quot; OR (umbilical* OR cord OR cord-derived OR wharton* OR jelly*) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR ((mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*))</td>
<td></td>
</tr>
<tr>
<td>Peripheral blood mesenchymal stromal cells</td>
<td>&quot;b-msc&quot; OR &quot;b msc&quot; OR &quot;b-mscs&quot; OR &quot;b mscs&quot; OR bmcs OR &quot;bd-sc&quot; OR &quot;bd sc&quot; OR &quot;bd-scs&quot; OR &quot;bd scs&quot; OR hds OR (menstrual* AND (stem* OR stromal*)) OR ((blood* OR menstrual*) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR ((mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*))</td>
</tr>
<tr>
<td>Dental pulp mesenchymal stromal cells</td>
<td>&quot;dp-msc&quot; OR &quot;dp msc&quot; OR &quot;dp mscs&quot; OR dpmsc OR &quot;hdp msc&quot; OR &quot;hdp-mscs&quot; OR &quot;hdp mscs&quot; OR hdpmsc OR ((dental* OR pulp OR molar OR teeth) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR (mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*))</td>
</tr>
<tr>
<td>Synovial mesenchymal stromal cells</td>
<td>synov* AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR ((mesenchymal* OR &quot;tissue-derived&quot; OR &quot;derived-mesenchymal&quot;) AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR (&quot;tissue-derived&quot; AND mesenchymal*))</td>
</tr>
<tr>
<td>Human embryonic stem cells</td>
<td>&quot;e-sc&quot; OR &quot;e sc&quot; OR esc OR &quot;e-sc&quot; OR &quot;e-scs&quot; OR escs OR &quot;he-sc&quot; OR &quot;he sc&quot; OR &quot;hescs&quot; OR (embryo OR embryonic* OR &quot;embryo-derived&quot;) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR mesenchymal* OR stem OR stem OR multipotent* OR progenitor*))</td>
</tr>
<tr>
<td>Cell-based immunotherapies</td>
<td>&quot;cell-based&quot; OR (cell* AND immunotherap*)</td>
</tr>
<tr>
<td>Natural Killer cell therapy</td>
<td>nk* OR (natural* AND killer*) OR &quot;natural-killer&quot;</td>
</tr>
</tbody>
</table>

Single-block search strategy in L·OVE platform for the question: mesenchymal stromal cells for COVID-19 (adapted for simplicity)

Date: April 13, 2020
Cell-based therapies for COVID-19: A living, systematic review

doi:10.5867/medwave.2020.11.8078

((coronavir* OR coronavirus* OR "corona virus" OR "virus corona" OR "virus corono" OR hcov* OR "covid-19" OR covid19* OR "covid 19" OR "2019-nCoV" OR cv19* OR "cv-19" OR "cv 19" OR "n-cov" OR ncov* OR "sars-cov-2" OR "sars-cov2" OR "SARS-Coronavirus-2" OR "SARS-Coronavirus2" OR (wuhan* AND (virus OR viruses OR viral)) OR (covid* AND (virus OR viruses OR viral)) OR "sars-cov" OR "sars-coronavirus" OR "severe acute respiratory syndrome" OR "mers-cov" OR "mers cov" OR "middle east respiratory syndrome" OR "middle-east respiratory syndrome" OR "covid-19-related" OR "SARS-CoV-2-related" OR "2019-nCoV-related" OR "cv-19-related" OR "n-cov-related")] AND ("cell therapy" OR "cell therapies" OR "cell-therapy" OR "cell-therapies" OR "mesenchymal cell" OR "mesenchymal cells" OR MSC OR MSCs OR HMSC* OR stemstromal* OR stromalstem* OR nestcell* OR ((mesenchymal* OR "tissue-derived" OR "derived-mesenchymal") AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR ("tissue-derived" AND mesenchymal*))

Additional searches in electronic databases

Search strategy for Pubmed/MEDLINE

Search date: 24.04.2020

#1 coronavir*
#2 coronavirus*
#3 "corona virus"
#4 "virus corona"
#5 "corono virus"
#6 "virus corono"
#7 hcov*
#8 "covid-19"
#9 covid19*
#10 "covid 19"
#11 "2019-nCoV"
#12 cv19*
#13 "cv-19"
#14 "cv 19"
#15 "n-cov"
#16 ncov*
#17 "sars-cov-2"
#18 wuhan*[Tiab] AND (virus OR viruses OR viral)
#19 covid* AND (virus OR viruses OR viral)
#20 "sars-cov"
#21 "sars cov"
#22 "sars-coronavirus"
#23 "severe acute respiratory syndrome"
#24 "mers-cov"
#25 "mers cov"
Cell-based therapies for COVID-19: A living, systematic review

doi:10.5867/medwave.2020.11.8078

#26 "middle east respiratory syndrome"
#27 "middle-east respiratory syndrome"
#28 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27
#29 "cell therapy" OR "cell therapies" OR "cell-therapy" OR "cell-therapies"
#30 MSC OR MSCs OR "mesenchymal cell" OR "mesenchymal cells"
#31 HMSC*
#32 stemstromal*
#33 stromalstem*
#34 nestcell*
#35 (mesenchymal* OR "tissue-derived" OR "derived-mesenchymal") AND (stromal* OR stem OR multipotent* OR progenitor*)
#36 (medicinal* AND signalling* AND (cell OR cells))
#37 stromal* AND (stem OR multipotent*)
#38 "tissue-derived" AND mesenchymal*
#39 #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38
#40 #28 AND #39

Search strategy for EMBASE (Elsevier)

Search date: 24.04.2020

#1. coronavirus*
#2. coronavir*
#3. 'corona virus'
#4. 'virus corona'
#5. 'corono virus'
#6. 'virus corono'
#7. hcov*
#8. 'covid-19'
#9. covid19*
#10. 'covid 19'
#11. '2019-ncov'
#12. cv19*
#13. 'cv-19'
#14. 'cv 19'
#15. 'n-cov'
#16. ncov*
#17. 'sars-cov-2'
Cell-based therapies for COVID-19: A living, systematic review

doi:10.5867/medwave.2020.11.8078

#18. wuhan*:ti,ab AND (virus OR viruses OR viral)
#19. covid* AND (virus OR viruses OR viral)
#20. 'sars-cov'
#21. 'sars cov'
#22. 'sars-coronavirus'
#23. 'severe acute respiratory syndrome'
#24. 'mers-cov'
#25. 'mers cov'
#26. 'middle east respiratory syndrome'
#27. 'middle-east respiratory syndrome'
#28. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27
#29. 'cell therapy' OR 'cell therapies' OR 'cell-therapy' OR 'cell-therapi'
#30. msc OR mscs OR 'mesenchymal cell' OR 'mesenchymal cells'
#31. hmsc*
#32. stemstromal*
#33. stromalstem*
#34. nestcell*
#35. (mesenchymal* OR 'tissue-derived' OR 'derived-mesenchymal') AND (stromal* OR stem OR multipotent* OR progenitor*)
#36. medicinal* AND signalling* AND (cell OR cells)
#37. stromal* AND (stem OR multipotent*)
#38. 'tissue-derived' AND mesenchymal*
#39. #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38
#40. #28 AND #39

Search strategy for CENTRAL (The Cochrane Library Issue 1, 2019)

Search date:24.04.2020

#1 coronavir*:ti,ab,kw
#2 coronavirus*:ti,ab,kw
#3 "corona virus":ti,ab,kw
#4 "virus corona":ti,ab,kw
#5 "corono virus":ti,ab,kw
#6 "virus corono":ti,ab,kw
#7 hcov*:ti,ab,kw
#8 "covid-19":ti,ab,kw
#9 covid19*:ti,ab,kw
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doi:10.5867/medwave.2020.11.8078

#10 "covid 19":ti,ab,kw
#11 "2019-nCoV":ti,ab,kw
#12 cv19*:ti,ab,kw
#13 "cv-19":ti,ab,kw
#14 "cv 19":ti,ab,kw
#15 "n-cov":ti,ab,kw
#16 ncov* :ti,ab,kw
#17 "sars-cov-2"
#18 (wuhan* AND (virus OR viruses OR viral)):ti,ab,kw
#19 covid* AND (virus OR viruses OR viral):ti,ab,kw
#20 "sars-cov":ti,ab,kw
#21 "sars cov": :ti,ab,kw
#22 "sars-coronavirus":ti,ab,kw
#23 "severe acute respiratory syndrome":ti,ab,kw
#24 "mers-cov":ti,ab,kw
#25 "mers cov":ti,ab,kw
#26 "middle east respiratory syndrome":ti,ab,kw
#27 "middle-east respiratory syndrome":ti,ab,kw
#28 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27
#29 ("cell therapy" OR "cell therapies" OR "cell-therapy" OR "cell-therapies") :ti,ab,kw
#30 (MSC OR MSCs OR "mesenchymal cell" OR "mesenchymal cells") :ti,ab,kw
#31 HMSC*:ti,ab,kw
#32 stemstromal*:ti,ab,kw
#33 stromalstem*:ti,ab,kw
#34 nestcell*:ti,ab,kw
#35 (mesenchymal* OR "tissue-derived" OR "derived-mesenchymal") AND (stromal* OR stem OR multipotent* OR progenitor*):ti,ab,kw
#36 (medicinal* AND signalling* AND (cell OR cells)):ti,ab,kw
#37 (stromal* AND (stem OR multipotent*)):ti,ab,kw
#38 ("tissue-derived" AND mesenchymal*):ti,ab,kw
#39 #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38
#40 #28 AND #39

Databases and registries automatically screened by Epistemonikos Database for COVID-19 ('COVID-19 repository')

Updated daily or more than daily

PubMed
Cell-based therapies for COVID-19: A living, systematic review
doi:10.5867/medwave.2020.11.8078

https://www.ncbi.nlm.nih.gov/pubmed/ coronavirus* OR coronovirus* OR "corona virus" OR "virus corona" OR "corono virus" OR "virus corono" OR hcov* OR "covid-19" OR covid19* OR "covid 19" OR 2019-nCoV OR cv19* OR "cv-19" OR "cv 19" OR "n-cov" OR ncov* OR "sars-cov-2" OR (wuhan*[tiab] AND (virus OR viruses OR viral OR coronav*)) OR (covid* AND (virus OR viruses OR viral)) OR "sars-cov" OR "sars cov" OR "sars-coronavirus" OR "severe acute respiratory syndrome" OR "mers-cov" OR "mers cov" OR "middle east respiratory syndrome" OR "middle-east respiratory syndrome"

COVID-19 SARS-CoV-2 preprints from medRxiv and bioRxiv
https://connect.medrxiv.org/relate/content/181
* All the articles in this list are uploaded
Clinicaltrials.gov

https://clinicaltrials.gov/
Search date: 23.04.2020
"SARS-COV-2" OR "Sars-CoV2" OR nCoV OR COVID OR Coronavirus OR Corona OR "covid-19" OR covid19 OR "covid 19" OR "2019-nCoV" OR cv19 OR "cv-19" OR "cv 19" OR "n-cov" OR coronavirus

ISRCTN registry
https://www.isrctn.com/
Search date: 23.04.2020
MSC OR MSCs OR HMSC OR stem OR stromal OR mesenchymal OR multipotent OR progenitor
Chinese Clinical Trial Registry

http://www.chictr.org.cn/
Search date: 23.04.2020
Separate searches for the following terms:
coronavirus; coronovirus; corona virus; virus corona; corono virus; virus corono; hcov; covid-19; covid19; covid 19; 2019-nCoV; cv19; cv-19; cv 19; n-cov; ncov; sars-cov-2; sars-cov2; SARS-Coronavirus-2; SARS-Coronavirus2

Iranian Registry of Clinical Trials
https://www.irct.ir/
Search date: 23.04.2020
((coronavir* OR coronovirus* OR "corona virus" OR "virus corona" OR "corono virus" OR "virus corono" OR hcov* OR "covid-19" OR covid19* OR "covid 19" OR 2019-nCoV OR cv19* OR "cv-19" OR "cv 19" OR "n-cov" OR ncov* OR "sars-cov-2" OR "sars-cov2" OR "SARS-Coronavirus-2" OR "SARS-Coronavirus2" OR (wuhan* AND (virus OR viruses OR viral)) OR (covid* AND (virus OR viruses OR viral)) OR "sars-cov" OR "sars cov" OR "sars-coronavirus" OR "severe acute respiratory syndrome" OR "mers-cov" OR "mers cov" OR "middle east respiratory syndrome" OR "middle-east respiratory syndrome" OR "covid-19-related" OR "SARS-CoV-2-related" OR "SARS-CoV2-related" OR "2019-nCoV-related" OR "cv-19-related" OR "n-cov-related")) AND (MSC OR MSCs OR HMSC* OR stemstromal* OR stromals* OR nestcell* OR ((mesenchymal* OR "tissue-derived" OR "tissue derived" OR "derived-mesenchymal") AND (stromal* OR stem OR multipotent* OR progenitor*)) OR (medicinal* AND signalling* AND (cell OR cells)) OR (stromal* AND (stem OR multipotent*)) OR ("tissue-derived" AND mesenchymal*))

Other databases and websites specialised in COVID-19 manually searched for this review
Google Scholar
https://scholar.google.com/
Cell-based therapies for COVID-19: A living, systematic review

doi:10.5867/medwave.2020.11.8078

Search date: 23.04.2020
allintitle:"COVID-19"| COVID19|2019nCoV|"Corona Virus"| Coronavirus | "CoV 2"| CoV2 | COVID | nCoV | SARS2 | SARSCoV | "SARS-CoV"

EU Clinical Trials Register: Clinical trials for covid-19
Search date: 23.04.2020
* All the references in this list were screened

NIPH Clinical Trials Search (Japan)
Search date: 23.04.2020
https://rctportal.niph.go.jp/en/
Separate searches for the following terms:
coronavirus; coronovirus; corona virus; virus corona; corono virus; virus corono; hcov; covid-19; covid19; covid 19; 2019-nCoV; cv19; cv-19; cv 19; n-cov; ncoy; sars-cov-2; sars-cov2; SARS-Coronavirus-2; SARS-Coronavirus2

Clinical Research Information System (Korea)
Search date: 23.04.2020
Separate searches for the following terms:
coronavirus; coronovirus; corona virus; virus corona; corono virus; virus corono; hcov; covid-19; covid19; covid 19; 2019-nCoV; cv19; cv-19; cv 19; n-cov; ncoy; sars-cov-2; sars-cov2; SARS-Coronavirus-2; SARS-Coronavirus2

ICTRP Search Portal
Search date: 10.04.2020 (resource was not available on 23 April, 2020)
http://apps.who.int/trialsearch
MSC OR MSCs OR HMSC OR stem OR stromal OR mesenchymal OR multipotent OR progenitor

Cochrane COVID-19 Study Register
Search date: 23.04.2020
https://covid-19.cochrane.org/
MSC OR MSCs OR HMSC OR stem OR stromal OR mesenchymal OR multipotent OR progenitor
Resources scanned without using a search strategy


NIHR: Innovation observatory: COVID-19 Updates (http://www.io.nih.ac.uk/covid-19-updates/)

COVID-19: a living systematic map of the evidence (http://epi.ioe.ac.uk/COVID19_MAP/covid_map_v8.html)


COVID-19 Special Collection (JBI) (https://jbi.global/ebp/covid-19)

Cell-based therapies for COVID-19: A living, systematic review
doi:10.5867/medwave.2020.11.8078

BMJ: Coronavirus (covid-19): Latest news and resources (http://bmj.com/coronavirus)
Oxford COVID-19 Evidence Service (https://www.cebm.net/covid-19/)
NICE Rapid Guideline and Summaries on COVID-19 (https://www.nice.org.uk/covid-19)

APPENDIX 3 - Description of relevant studies - Cell-based therapies for COVID-19: A living systematic review

INCLUDED STUDIES
No studies were found

EXCLUDED STUDIES

<table>
<thead>
<tr>
<th>Study name</th>
<th>Reason for exclusión</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liang et al</td>
<td>Not a comparative study (case report)</td>
</tr>
<tr>
<td>Leng et al</td>
<td>Not a comparative study (case series)</td>
</tr>
</tbody>
</table>

References to excluded studies


Leng et al, Zikuan, Zhu, Rongjia, Hou, Wei, Feng, Yingmei, Yang, Yanlei, Han, Qin, Shan, Guangliang, Meng, Fanyan, Du, Dongshu, Wang, Shihua. Transplantation of ACE2-mesenchymal stem cells improves the outcome of patients with COVID-19 pneumonia. Aging and disease. 2020;11(2):216-228. Epistemonikos
Ongoing Studies

References to ongoing randomised trials

Puren Hospital Affiliated to Wuhan University of Science and Technology. Clinical Research of Human Mesenchymal Stem Cells in the Treatment of COVID-19 Pneumonia. clinicaltrials.gov. 2020;

Clinical Trial for Human Mesenchymal Stem Cells in the Treatment of Severe Novel Coronavirus Pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020


Cancelled by the investigator Clinical study of mesenchymal stem cells in treating severe novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020


Severe novel coronavirus pneumonia (COVID-19) patients treated with ruxolitinib in combination with mesenchymal stem cells: a prospective, single blind, randomized controlled clinical trial. Chinese Clinical Trial Registry. 2020;

Tianhe Stem Cell Biotechnologies Inc. Stem Cell Educator Therapy Treat the Viral Inflammation Caused by Severe Acute Respiratory Syndrome Coronavirus 2. clinicaltrials.gov. 2020;


Umbilical cord Wharton’s Jelly derived mesenchymal stem cells in the treatment of severe novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;


Rigshospitalet, Denmark. ASC Therapy for Patients With Severe Respiratory COVID-19. clinicaltrials.gov. 2020;

Clinical trials of mesenchymal stem cells for the treatment of pneumonitis caused by novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;


Renmin Hospital of Wuhan University. Safety and Efficacy Study of Allogeneic Human Dental Pulp Mesenchymal Stem Cells to Treat Severe COVID-19 Patients. clinicaltrials.gov. 2020;


Key techniques of umbilical cord mesenchymal stem cells for the treatment of novel coronavirus pneumonia (COVID-19) and clinical application demonstration. Chinese Clinical Trial Registry. 2020;


Instituto de Investigación Sanitaria de la Fundación Jiménez Díaz. BAttLe Against COVID-19 Using Mesenchymal Stromal Cells. clinicaltrials.gov. 2020;

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doi:10.5867/medwave.2020.11.8078

Camillo Ricordi. Use of UC-MSCs for COVID-19 Patients. clinicaltrials.gov. 2020;

Cancelled by the investigator Clinical Study of NK Cells in the Treatment of Novel Coronavirus Pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;

Xinxiang medical university. NK Cells Treatment for Novel Coronavirus Pneumonia. clinicaltrials.gov. 2020;

Puren Hospital Affiliated to Wuhan University of Science and Technology. Therapy for Pneumonia Patients Infectected by 2019 Novel Coronavirus. clinicaltrials.gov. 2020;

Cancelled by the investigator Clinical Study for Cord Blood Mesenchymal Stem Cells in the Treatment of Acute Novel Coronavirus Pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;

Clinical study for natural killer (NK) cells from umbilical cord blood in the treatment of novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;

Clinical study of human NK cells and MSCs transplantation for severe novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;


Mesenchymal Stem Cell Therapy for Acute Respiratory Distress Syndrome in Coronavirus Infection: A Phase 2-3 Clinical Trial. Iranian Registry of Clinical Trials. 2020;

Histocell S.L.. Phase 1/2 clinical study to assess the feasibility, safety, tolerability and preliminary efficacy of the administration of HCR040, a drug whose active substance is HC016, allogeneic adipose-derived adult mesenchymal stem cells expanded and pulsed with H2O2, in patients with acute respiratory distress syndrome. (included patients COVID-19). EU Clinical Trials Register. 2020;

Fundación Instituto de Investigación Sanitaria Fundación Jiménez Diaz. Two-center, randomized, controlled clinical trial with two treatment arms to evaluate the safety and efficacy of intravenous administration of expanded allogeneic adipose tissue adult mesenchymal cells in critically ill patients COVID-19. EU Clinical Trials Register. 2020;

CITOSPIN S.L.. Double-blind, placebo-controlled phase I/II clinical trial to evaluate the safety and efficacy of allogeneic mesenchymal stem cells (MSV®-allo) in acute respiratory failure in patients with COVID-19 pneumonia. EU Clinical Trials Register. 2020;

Cancelled by the investigator Clinical Study of Cord Blood NK Cells Combined with Cord Blood Mesenchymal Stem Cells in the Treatment of Acute Novel Coronavirus Pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;

Cancelled by the investigator Clinical trial for umbilical cord blood CIK and NK cells in the treatment of mild and general patients infected with novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;

Qingsong Ye, Chenliang Zhou, . Safety and Efficacy Study of Allogeneic Human Dental Pulp Mesenchymal Stem Cells to Treat Severe novel coronavirus pneumonia (COVID-19) patients. Chinese Clinical Trial Registry. 2020;

Wuhan Union Hospital, China. Study of Human Umbilical Cord Mesenchymal Stem Cells in the Treatment of Novel Coronavirus Severe Pneumonia. clinicaltrials.gov. 2020;

HUMSCs and Exosomes Treating Patients with Lung Injury following Novel Coronavirus Pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;


References to other ongoing studies (not randomised)

Zhao RC. Stem cell-based therapy for coronavirus disease 2019. Stem cells and development. 2020;

Ruijin Hospital. A Pilot Clinical Study on Inhalation of Mesenchymal Stem Cells Exosomes Treating Severe Novel Coronavirus Pneumonia. clinicaltrials.gov. 2020;
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The clinical application and basic research related to mesenchymal stem cells to treat novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;

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Beijing 302 Hospital. Mesenchymal Stem Cell Treatment for Pneumonia Patients Infected With 2019 Novel Coronavirus. clinicaltrials.gov. 2020;

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Open-label, observational study of human umbilical cord derived mesenchymal stem cells in the treatment of severe and critical patients with novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;


Universidad Nacional de Colombia. Phase I / II Clinical Study of Immunotherapy Based on Adoptive Cell Transfer as a Therapeutic Alternative for Patients With COVID-19 in Colombia. clinicaltrials.gov. 2020;

Dou Qifeng. Clinical study for the efficacy of Mesenchymal stem cells (MSC) in the treatment of severe novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;

Mesenchymal stem cell utilization in reducing complications and enhancing pneumonia healing in patients infected with 2019-nCoV (phase I clinical trial). Iranian Registry of Clinical Trials. 2020;

Mesenchymal Stem Cell Therapy for Acute Respiratory Distress Syndrome in Coronavirus Infection: A Phase 1 and 2 clinical trial. Iranian Registry of Clinical Trials. 2020;

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Cell therapy in patients with coronavirus19 using mesenchymal stem cells. Iranian Registry of Clinical Trials. 2020;

ZhiYong Peng. Umbilical Cord(UC)-Derived Mesenchymal Stem Cells(MSCs) Treatment for the 2019-novel Coronavirus(nCoV) Pneumonia. clinicaltrials.gov. 2020;

CAR-T (Shanghai) Biotechnology Co., Ltd.. Novel Coronavirus Induced Severe Pneumonia Treated by Dental Pulp Mesenchymal Stem Cells. clinicaltrials.gov. 2020;

Zhang Dingyu. Safety and Effectiveness of Human embryonic stem cell-derived M cells (CAStem) for Pulmonary Fibrosis Correlated with novel coronavirus pneumonia (COVID-19). Chinese Clinical Trial Registry. 2020;


Chinese Academy of Sciences. Safety and Efficacy of CAStem for Severe COVID-19 Associated With/Without ARDS. clinicaltrials.gov. 2020;