

Alliance for Cell Therapy Now
Compilation of Published Articles on Role of Cell-Based Therapies in Treating Patients with COVID-19
As of March 21, 2021

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
1	Expanded Umbilical Cord Mesenchymal Stem Cells (UC-MSCs) as a Therapeutic Strategy In Managing Critically Ill COVID-19 Patients: The Case for Compassionate Use	MSC	Atturi, S., Manchikanti, L., & Hirsch, J. A. (2020). Expanded Umbilical Cord Mesenchymal Stem Cells (UC-MSCs) as a Therapeutic Strategy In Managing Critically Ill COVID-19 Patients: The Case for Compassionate Use. <i>Pain Physician</i> , 23 (2), E71-E83.	https://www.painphysicianjournal.com/current/pdf?article=NzAyNA%3D%3D&journal=125	3/1/2020	Pain Physician Journal	This manuscript describes the pathogenesis of coronavirus and the clinical evidence for treatment of COVID-19 with stem cells along with the urgent need for various solutions. The limited but emerging evidence regarding UC-MSC in managing COVID-19 suggests that it might be considered for compassionate use in critically ill patients to reduce morbidity and mortality in the United States.
2	Mesenchymal Stem Cell Infusion Shows Promise for Combating Coronavirus (COVID-19)- Induced Pneumonia	MSC	Shetty, A. K. (2020). Mesenchymal Stem Cell Infusion Shows Promise for Combating Coronavirus (COVID-19)- Induced Pneumonia. <i>Aging and Disease</i> , 11 (2), 462–464. https://doi.org/10.14336/AD.2020.0301	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7069463/	3/9/2020	Aging and Disease	This study shows that intravenous infusion of MSCs is a safe and efficient approach for treating patients with COVID-19 pneumonia, including in elderly patients displaying severe pneumonia. MSC therapy inhibiting the overactivation of the immune system and promoting endogenous repair by improving the lung microenvironment after the SARS-CoV-2 infection found in this study is striking. Additional studies in a larger cohort of patients are needed to validate this therapeutic intervention further.
3	Mesenchymal Stem Cells and Management of COVID-19 Pneumonia	MSC	Metcalfe, S. M. (2020). Mesenchymal stem cells and management of COVID-19 pneumonia. <i>Medicine in Drug Discovery</i> , 5, 100019. https://doi.org/10.1016/j.medidd.2020.100019	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7147223/	3/19/2020	Medicine in Drug Discovery	This article considers new approaches to improve patient's biological resistance to COVID-19 using stem cells, and how benefit might be scaled and simplified using synthetic stem cells to meet logistical needs within a short time frame. The finding that MSC are safe and can reverse severe critical disease with high potency is a major breakthrough representing an entirely new biological approach to treatment that needs to be developed urgently.
4	MSCs Transplantation May be a Potential Therapeutic Strategy for COVID-19 Treatment	MSC	Wang, X.-Y. (2020). MSCs transplantation may be a potential therapeutic strategy for COVID-19 treatment. <i>European Review for Medical and Pharmacological Sciences</i> , 24 (8), 4537–4538. https://doi.org/10.26355/eurrev_202004_21037	https://www.europeanreview.org/wp-content/uploads/4537-4538.pdf	4/1/2020	European Review for Medical and Pharmacological Science	This report, combined with the progress of preclinical and clinical research, comments on the efficacy of MSCs in the treatment of COVID-19. On the basis of ensuring the survival rate and activity of MSCs, it is worth an attempt to utilize MSCs transplantation to treat severe COVID-19 to curb the progression of critically ill patients and reduce the mortality.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
5	Mesenchymal Stem Cells for Coronavirus (COVID-19)-Induced Pneumonia: Revisiting the Paracrine Hypothesis with New Hopes?	MSC	Öztürk, S., Elçin, A. E., & Elçin, Y. M. (2020). Mesenchymal Stem Cells for Coronavirus (COVID-19)-Induced Pneumonia: Revisiting the Paracrine Hypothesis with New Hopes? <i>Aging and Disease</i> , 11 (3), 477–479. https://doi.org/10.14336/AD.2020.0403	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7220290/	4/2/2020	Aging and Disease	This study comments on the possible therapeutic effects of MSCs in COVID-19 infection. Mesenchymal stem cells bear a promising potential for regenerative medicine therapies and they repair damaged tissue through secretion of immune modulatory and anti-inflammatory molecules acting in a paracrine fashion.
6	Mesenchymal Stromal Cell Secretome for Severe COVID-19 Infections: Premises for the Therapeutic Use	MSC	Bari, E., Ferrarotti, I., Saracino, L., Perteghella, S., Torre, M. L., & Corsico, A. G. (2020). Mesenchymal Stromal Cell Secretome for Severe COVID-19 Infections: Premises for the Therapeutic Use. <i>Cells</i> , 9 (4). https://doi.org/10.3390/cells9040924	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7226831/	4/9/2020	Cells	This article discusses how mesenchymal stem cell secretome could offer a new therapeutic approach in treating COVID-19 pneumonia, due to the broad pharmacological effects it shows, including anti-inflammatory, immunomodulatory, regenerative, pro-angiogenic and anti-fibrotic properties.
7	Mesenchymal Stem Cell Therapy for COVID-19: Present or Future	MSC	Golchin, A., Seyedjafari, E., & Ardeshiryajimi, A. (2020). Mesenchymal Stem Cell Therapy for COVID-19: Present or Future. <i>Stem Cell Reviews and Reports</i> , 1–7. https://doi.org/10.1007/s12015-020-09973-w	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7152513/	4/13/2020	Stem Cell Reviews and Reports	This study considers mesenchymal stem cell (MSC) therapy to improve patient's immunological responses to COVID-19 using MSCs and discusses the aspects of this proposed treatment. However, currently, there are no approved MSC-based approaches for the prevention and/or treatment of COVID-19 patients, but clinical trials are ongoing.
8	CD147 as a Target for COVID-19 Treatment: Suggested Effects of Azithromycin and Stem Cell Engagement	MSC	Ulrich, H., & Pillat, M. M. (2020). CD147 as a Target for COVID-19 Treatment: Suggested Effects of Azithromycin and Stem Cell Engagement. <i>Stem Cell Reviews and Reports</i> , 1–7. https://doi.org/10.1007/s12015-020-09976-7	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7167302/	4/20/2020	Stem Cell Reviews and Reports	This article discusses CD147, a receptor on host cells, as a novel route for SARS-CoV-2 invasion. The possible direct viral invasion of progenitor/stem cells via CD147 or ACE2, could result in the decline of these cellular stocks and failing lung repair. Clinical tests with allogeneic MSCs from healthy individuals are underway to enhance endogenous lung repair and suppress inflammation.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
9	Current Status of Potential Therapeutic Candidates for the COVID-19 Crisis	MSC	Zhang, J., Xie, B., & Hashimoto, K. (2020). Current status of potential therapeutic candidates for the COVID-19 crisis. <i>Brain, Behavior, and Immunity</i> , 87, 59–73. https://doi.org/10.1016/j.bbi.2020.04.046	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7175848/	4/22/2020	Brain, Behavior, and Immunity	This article summarizes the current potential therapeutic approaches for diseases related to COVID-19 infection and introduce their mechanisms of action, safety, and effectiveness. Intensive research and clinical trials are underway to assess the efficacy of existing drugs and identify potential therapeutic targets to develop new drugs for treating COVID-19.
10	Adipose Stem Cells (ASCs) and Stromal Vascular Fraction (SVF) as a Potential Therapy in Combating (COVID-19)-Disease	MSC	Gentile, P., & Sterodimas, A. (2020a). Adipose Stem Cells (ASCs) and Stromal Vascular Fraction (SVF) as a Potential Therapy in Combating (COVID-19)-Disease. <i>Aging and Disease</i> , 11 (3), 465–469. https://doi.org/10.14336/AD.2020.0422	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7220297/	4/22/2020	Aging and Disease	This article discusses adipose stem cells (ASCs) are a therapy for COVID-19. The MSCs could represent an effective, autologous and safe therapy, and the potential use possibilities in COVID-19 of the most common MSCs represented by ASCs are reported.
11	Mesenchymal Stem Cell (MSc) Secretome: A Possible Therapeutic Strategy for Intensive-Care COVID-19 Patients	MSC	Deffune, E., Prudenciatti, A., & Moroz, A. (2020). Mesenchymal stem cell (MSc) secretome: A possible therapeutic strategy for intensive-care COVID-19 patients. <i>Medical Hypotheses</i> , 142, 109769. https://doi.org/10.1016/j.mehy.2020.109769	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7252028/	4/25/2020	Medical Hypotheses	This article hypothesizes MSC secretome testing and production to be used as an alternative approach in SARS-Cov-2 patients in critical conditions.
12	Adipose-Derived Stromal Stem Cells (ASCs) as a New Regenerative Immediate Therapy Combating Coronavirus (COVID-19)-Induced Pneumonia	MSC	Gentile, P., & Sterodimas, A. (2020b). Adipose-derived stromal stem cells (ASCs) as a new regenerative immediate therapy combating coronavirus (COVID-19)-induced pneumonia. <i>Expert Opinion on Biological Therapy</i> , 1–6. https://doi.org/10.1080/14712598.2020.1761322	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7196919/	4/29/2020	Expert Opinion Biological Therapy	This article discusses the possibility of mesenchymal stem cell treatment as a safe and efficient approach in selected patients with COVID-19 pneumonia. ASCs, A-Se-MiR, and each type of MSCs may offer new and alternative approaches for the COVID-19 therapy.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
13	Mesenchymal Stem Cells as a Potential Therapy for COVID-19	MSC	Liu, S., Peng, D., Qiu, H., Yang, K., Fu, Z., & Zou, L. (2020). Mesenchymal stem cells as a potential therapy for COVID-19. <i>Stem Cell Research & Therapy</i> , 11. https://doi.org/10.1186/s13287-020-01678-8	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7197031/	5/4/2020	Stem Cell Research and Therapy	This commentary summarizes the clinical trials of MSCs treatments on ALI/ARDS and raises MSCs as a hopefully alternative therapy for severe or critical COVID-19. MSCs can balance the inflammatory response and has been mentioned to be effective on ALI/ARDS from both infectious and noninfectious causes previously, presenting an important opportunity to be applied to COVID-19.
14	Extracellular Vesicles from Mesenchymal Stem Cells as a Covid-19 Treatment	MSC	O'Driscoll, L. (2020). Extracellular vesicles from mesenchymal stem cells as a Covid-19 treatment. <i>Drug Discovery Today</i> , 25 (7), 1124–1125. https://doi.org/10.1016/j.drudis.2020.04.022	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7202814/	5/6/2020	Drug Discovery Today	This article discusses the potential advantages of MSC-EVs over MSCs as a treatment for COVID-19. MSC-EVs bear the benefits of MSCs and then some; research focused on their exploitation as a therapeutic option in COVID-19 is warranted, while giving due consideration to the fact that they might also exacerbate some of the symptoms.
15	The Current Understanding and Potential Therapeutic Options to Combat COVID-19	MSC	Pooladanda, V., Thatikonda, S., & Godugu, C. (2020). The current understanding and potential therapeutic options to combat COVID-19. <i>Life Sciences</i> , 254, 117765. https://doi.org/10.1016/j.lfs.2020.117765	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7207108/	5/8/2020	Life Science	This review focuses on possible therapeutic options for COVID-19 such as repurposing drugs including antimalarials, antivirals, antiparasitic drugs, and anti-HIV drugs, as well as monoclonal antibodies, vaccines as potential treatment options. It also summarizes the latest research progress on the usage of stem cell therapy, human convalescent serum, interferon's, in the treatment of COVID-19.
16	Cell-Based Therapy to Reduce Mortality from COVID-19: Systematic Review and Meta-Analysis of Human Studies on Acute Respiratory Distress Syndrome	MSC	Qu, W., Wang, Z., Hare, J. M., Bu, G., Mallea, J. M., Pascual, J. M., Caplan, A. I., Kurtzberg, J., Zubair, A. C., Kubrova, E., Engelberg-Cook, E., Nayfeh, T., Shah, V. P., Hill, J. C., Wolf, M. E., Prokop, L. J., Murad, M. H., & Sanfilippo, F. P. (2020). Cell-based therapy to reduce mortality from COVID-19: Systematic review and meta-analysis of human studies on acute	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7300743/	5/9/2020	Stem Cells Translational Medicine	This analysis of published reports demonstrated the potential benefits, minimal risks, and presumptive mechanisms of MSC therapy for ARDS, which support the rationale for treatment of COVID-19 patients with pulmonary disease. Adequately powered clinical trials are urgently needed to test clinical outcomes in patients with COVID-19 syndrome and SARS-CoV-2 infection, and should use well-characterized MSC products with documented safety profiles from FDA-approved studies.
17	Mesenchymal Stem Cell Use in Acute Respiratory Distress Syndrome: a Potential Therapeutic Application	MSC	Freitag, J., Wickham, J., Shah, K., & Tenen, A. (2020). Mesenchymal stem cell use in acute respiratory distress syndrome: A potential therapeutic application. <i>Future Science OA</i> , 6 (6). https://doi.org/10.2144/foa-2020-0048	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7351095/	5/12/2020	Future Science Open Access	This article discusses the potential role of mesenchymal stem cells in combating the inflammatory cascade through immunomodulatory mechanisms and assisting in tissue repair. Early-phase clinical trials have shown safety in the intravenous application of MSC therapy for ARDS, which represents a promising breakthrough in the active management of a

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
18	Combating COVID-19 with Mesenchymal Stem Cell Therapy	MSC	Rajarshi, K., Chatterjee, A., & Ray, S. (2020). Combating COVID-19 with mesenchymal stem cell therapy. <i>Biotechnology Reports</i> , 26, e00467. https://doi.org/10.1016/j.btre.2020.e00467	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7224671/	5/14/2020	Elsevier	In this review highlights all the implications associated with mesenchymal stem cell (MSC) therapy application in case of COVID-19. MSC therapy offers a promising approach towards mitigating the delirious effects of the infection in the COVID-19 patients.
19	Reducing Mortality and Morbidity in Patients with Severe COVID-19 Disease by Advancing Ongoing Trials of Mesenchymal Stromal (Stem) Cell (MSC) therapy — Achieving Global Consensus and Visibility for Cellular Host-Directed Therapies	MSC	Zumla, A., Wang, F.-S., Ippolito, G., Petrosillo, N., Agrati, C., Azhar, E. I., Chang, C., El-Kafrawy, S. A., Osman, M., Zitzvogel, L., Galle, P. R., Locatelli, F., Gorman, E., Cordon-Cardo, C., O'Kane, C., McAuley, D., & Maeurer, M. (2020). Reducing mortality and morbidity in patients with severe COVID-19 disease by advancing ongoing trials of Mesenchymal Stromal (stem) Cell (MSC)	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7231497/	5/17/2020	International Journal of Infectious Diseases	This editorial focuses specifically on the background to, and the rationale for, the use and evaluation of mesenchymal stromal cells (MSCs) in treatment trials of patients with severe COVID-19 disease. MSC therapy could turn out to be an important contribution to bringing an end to the high COVID-19 death rates and preventing long-term functional disability in those who survive disease.
20	Mesenchymal Stem Cells-Bridge Catalyst Between Innate and Adaptive Immunity in COVID 19	MSC	Rao, V., Thakur, S., Rao, J., Arakeri, G., Brennan, P. A., Jadhav, S., Sayeed, M. S., & Rao, G. (2020). Mesenchymal stem cells-bridge catalyst between innate and adaptive immunity in COVID 19. <i>Medical Hypotheses</i> 143 109845	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7232064/	5/18/2020	Medical Hypotheses	This article summarizes treatments for critically-ill COVID-19 patients. Mesenchymal stem cells are known to suppress overactive immune responses as well as bring about tissue regeneration and repair. This immuno-modulatory effect of MSCs could hold potential to manage a patient with severe symptoms of COVID 19 infection due to a dysfunctional
21	Rationale for the Clinical Use of Adipose-Derived Mesenchymal Stem Cells for COVID-19 Patients	MSC	Rogers, C. J., Harman, R. J., Bunnell, B. A., Schreiber, M. A., Xiang, C., Wang, F.-S., Santidrian, A. F., & Mineev, B. R. (2020). Rationale for the clinical use of adipose-derived mesenchymal stem cells for COVID-19 patients. <i>Journal of Translational Medicine</i> , 18. https://doi.org/10.1186/s12967-020-02380-2	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7232924/	5/18/2020	Journal of Translational Medicine	This literature summary reviews the scientific rationale and need for clinical studies of adipose-derived stem cells (ASCs) and other types of mesenchymal stem cells in the treatment of patients who suffer with COVID-19. ASCs, an abundant type of MSC, are proposed as a therapeutic option for the treatment of COVID-19 in order to reduce morbidity and mortality. Additionally, when proven to be safe and effective, ASC treatments may reduce the demand on critical hospital resources.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
22	MSC Therapies for COVID-19: Importance of Patient Coagulopathy, Thromboprophylaxis, Cell Product Quality and Mode of Delivery for Treatment Safety and Efficacy	MSC	Moll, G., Drzeniek, N., Kamhieh-Milz, J., Geissler, S., Volk, H.-D., & Reinke, P. (2020). MSC Therapies for COVID-19: Importance of Patient Coagulopathy, Thromboprophylaxis, Cell Product Quality and Mode of Delivery for Treatment Safety and Efficacy. <i>Frontiers in Immunology</i> , 11. https://doi.org/10.3389/fimmu.2020.01091	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7249852/	5/19/2020	Frontiers in Immunology	In order to minimize the evident risk of high doses of poorly characterized unregulated cell products, this article proposes three decisive steps for integrating innate immune hemocompatibility testing into the standard characterization and clinical routines or IV applied cell therapies; and this article also encourages the considerations of alternative non-intravascular application regimes, which may prove to be safer and more efficient alternatives in the long-run.
23	Characteristics of Registered Studies for Coronavirus Disease 2019 (COVID-19): A Systematic Review	MSC	Yang, M., Shang, Y., Tian, Z., Xiong, M., Lu, C., Jiang, Y., Zhang, Y., Zhang, Y., Jin, X., Jin, Q., Zhang, Y., Willcox, M. L., & Liu, J. (2020). Characteristics of registered studies for Coronavirus disease 2019 (COVID-19): A systematic review. <i>Integrative Medicine Research</i> , 9 (3), 100426. https://doi.org/10.1016/j.imr.2020.100426	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7239016/	5/20/2020	Integrative Medicine Research	This study systematically reviews available registered studies for COVID-19 with the analyses of their distributions and characteristics. 393 studies were registered for the prevention, treatment, diagnosis and prognosis of COVID-19.
24	Hypothesis for the Management and Treatment of the COVID-19-Induced Acute Respiratory Distress Syndrome and Lung Injury Using Mesenchymal Stem Cell-Derived Exosomes	MSC	Taghavi-Farahabadi, M., Mahmoudi, M., Soudi, S., & Hashemi, S. M. (2020). Hypothesis for the management and treatment of the COVID-19-induced acute respiratory distress syndrome and lung injury using mesenchymal stem cell-derived exosomes. <i>Medical Hypotheses</i> , 144, 109865. https://doi.org/10.1016/j.mehy.2020.109865	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7242964/	5/22/2020	Medical Hypotheses	This article reviews the use of MSCs as one of the immunomodulating and tissue regenerating cells that have previously shown satisfactory effects on ARDS and cytokine storms.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
25	Can Stem Cells Beat COVID-19: Advancing Stem Cells and Extracellular Vesicles Toward Mainstream Medicine for Lung Injuries Associated With SARS-CoV-2 Infections	MSC	Chrzanowski, W., Kim, S. Y., & McClements, L. (2020). Can Stem Cells Beat COVID-19: Advancing Stem Cells and Extracellular Vesicles Toward Mainstream Medicine for Lung Injuries Associated With SARS-CoV-2 Infections. <i>Frontiers in Bioengineering and Biotechnology</i> , 8. https://doi.org/10.3389/fbioe.2020.00554	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7264098/	5/26/2020	Frontiers in Bioengineering and Biotechnology	This review article outlines the mechanisms of cytokine storm and lung damage caused by SARS-CoV-2 virus leading to COVID-19 disease and how mesenchymal stem cells (MSCs) and their secreted EVs can be utilized to tackle this damage by harnessing their regenerative properties, which gives them potential enhanced clinical utility compared to other investigated pharmacological treatments.
26	SARS-CoV-2 Infection and Stem Cells: Interaction and Intervention	MSC	Yu, F., Jia, R., Tang, Y., Liu, J., & Wei, B. (2020). SARS-CoV-2 infection and stem cells: Interaction and intervention. <i>Stem Cell Research</i> , 46, 101859. https://doi.org/10.1016/j.scr.2020.101859	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7263221/	6/1/2020	Stem Cell Research	This review focuses on the possible involvement of ACE2+ stem/progenitor cells from both the upper and lower respiratory tracts in coronavirus infection. Viral infection-associated acute respiratory distress syndrome and acute lung injury occur because of dysregulation of the immune response. Mesenchymal stem cells appear to be a promising cell therapy given that they favorably modulate the immune response to reduce lung injury.
27	Mesenchymal Stem Cell-Based Therapy for COVID-19: Possibility and Potential	MSC	Xiong, J., Bao, L., Qi, H., Feng, Z., & Shi, Y. (2020). Mesenchymal Stem Cell-based Therapy for COVID-19: Possibility and Potential. <i>Current Stem Cell Research & Therapy</i> . https://doi.org/10.2174/1574888X15666200601152832	https://pubmed.ncbi.nlm.nih.gov/32479246/	6/1/2020	Current Stem Cell Research and Therapy	This study summarizes the clinical outcomes of MSCs for ARDS patients in some preclinical and clinical studies and discusses the application of MSCs for patients with COVID-19 in China and the related important issues with MSCs use during the outbreak. Given the previous preclinical and clinical studies, MSCs therapy has been shown safety and efficacy in the treatment of respiratory failure or ARDS. Based on similar principles, MSCs therapy may also be an effective therapy in the treatment of COVID-19.
28	Harnessing HLA-E-Restricted CD8 T Lymphocytes for Adoptive Cell Therapy of Patients with Severe COVID-19	T-Reg	Caccamo, N., Sullivan, L. C., Brooks, A. G., & Dieli, F. (2020). Harnessing HLA-E-restricted CD8 T lymphocytes for adoptive cell therapy of patients with severe COVID-19. <i>British Journal of Haematology</i> , 190 (4), e185–e187. https://doi.org/10.1111/bjh.16895	https://onlinelibrary.wiley.com/doi/full/10.1111/bjh.16895	6/1/2020	British Journal of Haematology	This article proposes that the utilisation of HLA-E-restricted CD8 T cells may offer several advantages to improve T-cell immunotherapy in patients with COVID-19, such as the simultaneous capacity to kill infected cells and inhibit intracellular infections, and to reduce the extent of the inflammatory response and limit collateral tissue damage, which is an important component in the pathogenesis of COVID-19.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
29	Current Treatment Approaches for COVID-19 and The Clinical Value of Transfusion-Related Technologies	MSC	Li, Y., Liu, S., Zhang, S., Ju, Q., Zhang, S., Yang, Y., & Wang, H. (2020). Current treatment approaches for COVID-19 and the clinical value of transfusion-related technologies. <i>Transfusion and Apheresis Science</i> , 59 (5). https://doi.org/10.1016/j.transci.2020.102839	https://www.trasci.com/article/S1473-0502(20)30142-7/fulltext	6/3/2020	Transfusion and Apheresis Science	This article summarizes the current potential therapeutic approaches for diseases related to COVID-19 infection and discusses the clinical value of blood transfusion-related technologies used in COVID-19 treatment.
30	Novel Therapeutic Approaches for Treatment of COVID-19	MSC	Hossein-khannazer, N., Shokoohian, B., Shpichka, A., Aghdaei, H. A., Timashev, P., & Vosough, M. (2020). Novel therapeutic approaches for treatment of COVID-19. <i>Journal of Molecular Medicine (Berlin, Germany)</i> , 1–15. https://doi.org/10.1007/s00109-020-01927-6	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7268974/	6/3/2020	Journal of Molecular Medicine	This article summarizes the therapeutic approaches that are used to treat COVID-19. It seems that MSC therapy could be a novel therapeutic approach for the treatment of COVID-19. MSC therapy could inhibit excessive immune system reaction, modulate inflammatory milieu, and prevent virus-mediated cytokine storm.
31	Current Status of Cell-Based Therapies for Respiratory Virus Infections: Applicability to COVID-19	MSC	Khoury, M., Cuenca, J., Cruz, F. F., Figueroa, F. E., Rocco, P. R. M., & Weiss, D. J. (2020). Current status of cell-based therapies for respiratory virus infections: Applicability to COVID-19. <i>The European Respiratory Journal</i> , 55 (6). https://doi.org/10.1183/13993003.00858-2020	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7144273/	6/4/2020	European Respiratory	This review presents current clinical investigations of cell-based therapy approaches for COVID-19. To provide a rational strategy to maximise potential therapeutic use, it is critically important to understand the relevant pre-clinical studies and postulated mechanisms of MSC actions in respiratory virus-induced lung injuries.
32	Human iPSC-Derived Alveolar and Airway Epithelial Cells Can be Cultured at Air-Liquid Interface and Express SARS-CoV-2 Host Factors	iPSC	Abo, K. M., Ma, L., Matte, T., Huang, J., Alysandratos, K. D., Werder, R. B., Mithal, A., Beermann, M. L., Lindstrom-Vautrin, J., Mostoslavsky, G., Ikonomou, L., Kotton, D. N., Hawkins, F., Wilson, A., & Villacorta-Martin, C. (2020). Human iPSC-derived alveolar and airway epithelial cells can be cultured at air-liquid interface and express SARS-CoV-2 host factors. <i>BioRxiv</i> . https://doi.org/10.1101/2020.06.03.132630	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7302183/	6/4/2020	bioRxiv	This article compares pluripotent stem cell (iPSC)-derived alveolar and airway epithelial cells to primary lung epithelial cell controls, focusing on expression levels of genes relevant for COVID-19 disease modeling.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
33	Mesenchymal Stem Cell Therapy for Acute Respiratory Distress Syndrome: from Basic to Clinics	MSC	Qin, H., & Zhao, A. (2020). Mesenchymal stem cell therapy for acute respiratory distress syndrome: From basic to clinics. <i>Protein & Cell</i> , 1–16. https://doi.org/10.1007/s13238-020-00738-2	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7282699/	6/9/2020	Protein Cell	This article provides a comprehensive review of the mechanisms and optimization of MSC therapy in ARDS and highlights the potentials and possible barriers of MSC therapy for COVID-19 patients with ARDS.
34	Endothelial Progenitor Cells and Mesenchymal Stem Cells to Overcome Vascular Deterioration and Cytokine Storm in Critical Patients with COVID-19	MSC	Karahmet, F., & Kocaman, S. A. (2020). Endothelial progenitor cells and mesenchymal stem cells to overcome vascular deterioration and cytokine storm in critical patients with COVID-19. <i>Medical Hypotheses</i> , 144, 109973. https://doi.org/10.1016/j.mehy.2020.109973	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7286257/	6/10/2020	Medical Hypotheses	This article discusses mesenchymal stem cell treatment for vascular deterioration and the cytokine storm in critically-ill COVID-19 patients. The restoration of vascular endothelial function and modulation of immune system by synergistic use of EPCs and MSCs may have a crucial role to overcome the vascular collapse driving forces in COVID-19 patients.
35	Current Status of Mesenchymal Stem Cell Therapy for Immune/Inflammatory Lung Disorders: Gleaning Insights for Possible Use in COVID-19	MSC	Yen, B. L., Yen, M., Wang, L., Liu, K., & Sytwu, H. (2020). Current status of mesenchymal stem cell therapy for immune/inflammatory lung disorders: Gleaning insights for possible use in COVID-19. <i>Stem Cells Translational Medicine</i> . https://doi.org/10.1002/sctm.20-0186	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7300965/	6/11/2020	Stem Cells Translational Medicine	This article reviews the mechanistic evidence for clinical use of MSCs in pulmonary immune/inflammatory disorders, and survey the ongoing clinical trials—including for COVID-19—of MSC therapy for these diseases, with some perspectives and comment on MSCT for COVID-19.
36	The Role of Extracellular Vesicles in COVID-19 Virus Infection	MSC	Hassanpour, M., Rezaie, J., Nouri, M., & Panahi, Y. (2020). The role of extracellular vesicles in COVID-19 virus infection. <i>Infection, Genetics and Evolution</i> , 85, 104422. https://doi.org/10.1016/j.meegid.2020.104422	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7293471/	6/13/2020	Infections, Genetics, and Evolution	This review discusses mesenchymal stem cells (MSCs) and MSC-derived exosomes for the treatment of COVID-19. Exosome-based strategies may include following items: inhibition of exosome biogenesis and uptake, exosome-therapy, exosome-based drug delivery system, and exosome-based vaccine. Mesenchymal stem cells can suppress nonproductive inflammation and improve/repair lung cells including endothelial and alveolar cells, which damaged by COVID-19 virus infection.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
37	Can Mesenchymal Stem Cell Therapy be the Interim Management of COVID-19?	MSC	Bamba, C., Singh, S. P., & Choudhury, S. (2020). Can mesenchymal stem cell therapy be the interim management of COVID-19? <i>Drug Discoveries & Therapeutics</i> , 14 (3), 139–142. https://doi.org/10.5582/ddt.2020.03032	https://www.jstage.jst.go.jp/article/ddt/14/3/14_2020.03032/pdf-char/en	6/16/2020	Drug Discoveries & Therapies	This article summarizes recent studies showing that MSC-therapy significantly dampens the cytokine storm in critically ill COVID-19 patients. One of the promising immune-modulator is the mesenchymal stem cells (MSCs) that can surmount the severity of COVID-19 infections.
38	Regenerative Medicine in COVID-19 Treatment: Real Opportunities and Range of Promises	MSC	Basiri, A., Pazhouhnia, Z., Beheshtizadeh, N., Hoseinpour, M., Saghazadeh, A., & Rezaei, N. (2020). Regenerative Medicine in COVID-19 Treatment: Real Opportunities and Range of Promises. <i>Stem Cell Reviews and Reports</i> , 1–13. https://doi.org/10.1007/s12015-020-09994-5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7305935/	6/20/2020	Stem Cell Reviews and Reports	This article discusses the promising features of cell-based therapy, including their regenerative properties and ability to differentiate into diverse cell lineages. The immunomodulatory effects of MSCs, which may assist in inhibiting cytokine storm and lung inflammation, are of particular interest for COVID-19 therapy.
39	Mesenchymal Stem Cell Derived Extracellular Vesicles: Promising Immunomodulators Against Autoimmune, Autoinflammatory Disorders and SARS-CoV-2 Infection	MSC	Bulut, Ö., & Gürsel, İ. (2020). Mesenchymal stem cell derived extracellular vesicles: Promising immunomodulators against autoimmune, autoinflammatory disorders and SARS-CoV-2 infection. <i>Turkish Journal of Biology</i> , 44 (3), 273–282.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7314505/	6/21/2020	Turkish Journal of Biology	This review presents the outcomes of preclinical and clinical studies utilizing MSC EVs as therapeutic agents for the treatment of a wide variety of immunological disorders. MSC EVs are preferable over MSC-based therapies due to their lower risk of immunogenicity, tumorigenicity and overall superior safety.
40	Therapeutic Potential of Mesenchymal Stem Cells and their Exosomes in Severe Novel Coronavirus Disease 2019 (COVID-19) Cases	MSC	Tsuchiya, A., Takeuchi, S., Iwasawa, T., Kumagai, M., Sato, T., Motegi, S., Ishii, Y., Koseki, Y., Tomiyoshi, K., Natsui, K., Takeda, N., Yoshida, Y., Yamazaki, F., Kazama, Y., Matsuda, Y., Kimura, M.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7306412/	6/22/2020	Inflammation and Regeneration	This review reports the background of severe cases of COVID-19, basic aspects and mechanisms of action of MSCs and their exosomes, and basic and clinical studies based on MSCs and exosomes for influenza-induced ARDS. The review are discuss the potential of MSC and exosome therapy in
41	Emerging Prevention and Treatment Strategies to Control COVID-19	MSC	Singh, V. K., Mishra, A., Singh, S., Kumar, P., Singh, M., Jagannath, C., & Khan, A. (2020). Emerging Prevention and Treatment Strategies to Control COVID-19. <i>Pathogens</i> , 9 (6). https://doi.org/10.3390/pathogens9060501	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7350294/	6/23/2020	Pathogens	This review discusses the promising vaccines and treatment options for COVID-19, their challenges, and potential alternative strategies. MSCs are easily expanded to clinical volume in a short amount of time, and their safety and efficacy have been thoroughly documented in many clinical trials.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
42	Flattening the COVID-19 Curve with Natural Killer Cell Based Immunotherapies	NK	Market, M., Angka, L., Martel, A. B., Bastin, D., Olanubi, O., Tennakoon, G., Boucher, D. M., Ng, J., Ardolino, M., & Auer, R. C. (2020). Flattening the COVID-19 Curve With Natural Killer Cell Based Immunotherapies. <i>Frontiers in Immunology</i> , 11. https://doi.org/10.3389/fimmu.2020.01512	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7324763/	6/23/2020	Frontiers in Immunology	This review summarizes the current understanding of how NK cells respond in both early and late coronavirus infections, and the implication for ongoing COVID-19 clinical trials. Using this immunological lens, recommendations for therapeutic strategies against COVID-19 in clearing the virus while preventing the harm of immunopathological responses are outlined.
43	Auxiliary Role of Mesenchymal Stem Cells as Regenerative Medicine Soldiers to Attenuate Inflammatory Processes of Severe Acute Respiratory Infections Caused by COVID-19	MSC	Parhizkar Roudsari, P., Alavi-Moghadam, S., Payab, M., Sayahpour, F. A., Aghayan, H. R., Goodarzi, P., Mohamadi-jahani, F., Larijani, B., & Arjmand, B. (2020). Auxiliary role of mesenchymal stem cells as regenerative medicine soldiers to attenuate inflammatory processes of severe acute respiratory infections caused by COVID-19. <i>Cell and Tissue Banking</i> , 1–21. https://doi.org/10.1007/s10561-020-09842-3	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7315014/	6/25/2020	Cell and Tissue Banking	This review focuses on the auxiliary role of mesenchymal stem cells to reduce inflammatory processes of acute respiratory infections caused by COVID-19. More investigations with a long follow-up period are demanded to increase the therapeutic outcome of MSCs besides creating the best strategy for application of them, including the best route and dose of administration.
44	'Primed' Mesenchymal Stem Cells: a Potential Novel Therapeutic for COVID19 Patients	MSC	Raza, S. S., Seth, P., & Khan, M. A. (2020). 'Primed' Mesenchymal Stem Cells: A Potential Novel Therapeutic for COVID19 Patients. <i>Stem Cell Reviews and Reports</i> , 1–10. https://doi.org/10.1007/s12015-020-09999-0	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7317273/	6/26/2020	Stem Cell Reviews and Reports	This article discusses the priming of MSCs are a novel approach to improve the responses of COVID19 patients. When transplanted in vivo, MSCs are governed by the locally regulated microenvironment, suggesting that the restorative variability could be tailored by choosing a priming regimen to specifically correct a given pathology.
45	Cellular Therapy: Shafts of Light Emerging for COVID-19	MSC	Jeyaraman, M., Ranjan, R., Kumar, R., Arora, A., Chaudhary, D., Ajay, S. S., & Jain, R. (2020). Cellular Therapy: Shafts of Light Emerging for COVID-19. <i>Stem Cell Investigation</i> , 7. https://doi.org/10.21037/sci-2020-022	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7367471/	6/30/2020	Stem Cell Investigation	This review article discusses emerging novel approaches to combat severe forms of COVID-19. Currently, these aren't approved for preventing or treating COVID-19 cases; however, clinical trials are afoot to dispense the utmost understanding in terms of efficacy and safety concerns. Mesenchymal stem cells (MSCs) have yielded the most promising results among stromal vascular fraction (SVF); placental cells; natural killer (NK) cell and platelet lysate respectively.
46	Distinct Stem/Progenitor Cells Proliferate to Regenerate the Trachea, Intrapulmonary Airways and Alveoli in COVID-19 Patients	Progenitor	Fang, Y., Liu, H., Huang, H., Li, H., Saqi, A., Qiang, L., & Que, J. (2020). Distinct stem/progenitor cells proliferate to regenerate the trachea, intrapulmonary airways and alveoli in COVID-19 patients. <i>Cell Research</i> , 1–3. https://doi.org/10.1038/s41422-020-0367-9	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7325636/	6/30/2020	Cell Research	This report shows the major cell types damaged by SARS-CoV-2 infection and demonstrates that distinct proliferating cells are present in the trachea/large airways, small airways and alveoli following SARS-CoV-2 infection.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
47	Mesenchymal Stem Cell Therapy Can Transcend Perianal Crohn's Disease: How Colorectal Surgeons Can Help in the Coronavirus Disease 2019 Crisis	MSC	Lightner, A. L., & Garcia-Olmo, D. (2020). Mesenchymal Stem Cell Therapy Can Transcend Perianal Crohn's Disease: How Colorectal Surgeons Can Help in the Coronavirus Disease 2019 Crisis. <i>Diseases of the Colon & Rectum</i> , 63 (7), 874–878. https://doi.org/10.1097/DCR.0000000000001700	https://journals.lww.com/crjournal/Citation/2020/07000/Mesenchymal_Stem_Cell_Therapy_Can_Transcend_Perianal_Crohn's_Disease:_How_Colorectal_Surgeons_Can_Help_in_the_Coronavirus_Disease_2019_Crisis.aspx	7/1/2020	Diseases of the Colon & Rectum	The purpose of this review is to help colorectal surgeons apply their experience with MSCs to Covid-19. Just as Crohn's disease is characterized by increased inflammatory cytokines and aberrant ratios of immune cells, patients with COVID-19 also exhibit hyperinflammation with a cytokine storm that results in an ARDS picture.
48	Potential of Regulatory T Cell-Based Therapies in the Management of Severe COVID-19	T-Reg	Stephen-Victor, E., Das, M., Karnam, A., Pitard, B., Gautier, J.-F., & Bayry, J. (2020). Potential of regulatory T-cell-based therapies in the management of severe COVID-19. <i>The European Respiratory Journal</i> , 56 (3).	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7331657/	7/2/2020	European Respiratory	This article proposes that CD4+CD25+FoxP3+ regulatory T cell-based therapies could be considered for the patient management.
49	Mesenchymal Stem Cells: A New Piece in the Puzzle of COVID-19 Treatment	MSC	Saldanha-Araujo, F., Melgaço Garcez, E., Silva-Carvalho, A. E., & Carvalho, J. L. (2020). Mesenchymal Stem Cells: A New Piece in the Puzzle of COVID-19 Treatment. <i>Frontiers in Immunology</i> , 11. https://doi.org/10.3389/fimmu.2020.01563	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7347794/	7/3/2020	Frontiers in Immunology	This article reviews stem cells and stem cell-derived strategies as therapeutic tools to manage COVID-19. Limited observations published so far point to the safety and efficacy of such therapies in the short-term, at least in severe and critically severe patients. A second generation of trials adhering to rigorously designed blind, randomized, placebo-controlled protocols must now be pursued, with the aid of experienced clinical and basic science investigators.
50	Mesenchymal Stromal Cells and their Secreted Extracellular Vesicles as Therapeutic Tools for COVID-19 Pneumonia?	MSC	Muraca, M., Pessina, A., Pozzobon, M., Dominici, M., Galderisi, U., Lazzari, L., Parolini, O., Lucarelli, E., Perilongo, G., & Baraldi, E. (2020). Mesenchymal stromal cells and their secreted extracellular vesicles as therapeutic tools for COVID-19.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7332437/	7/3/2020	Journal of Controlled Release	This review summarizes the experimental evidence underlying the possible use of MSCs and of MSC-EVs in severe COVID-19 infection and underlines the need to evaluate the possible efficacy of these therapeutic approaches through controlled studies under the supervision of the Regulatory Authorities.
51	Elucidating the Pivotal Role of Immune Players in the Management of COVID-19: Focus on Mesenchymal Stem Cells and Inflammation	MSC	Richard, S. A., Kampo, S., Sackey, M., Hechavarría, M. E., Buunaaim, A. D. B., Kuugbee, E. D., & Anabah, T. W. (2020). Elucidating the Pivotal Role of Immune Players in the Management of COVID-19: Focus on Mesenchymal Stem Cells and Inflammation. <i>Current Stem Cell Research & Therapy</i> . https://doi.org/10.2174/1574888X156662007	https://pubmed.ncbi.nlm.nih.gov/32628591/	7/5/2020	Current Stem Cell Research and Therapy	This review elucidates the immune players in the management of COVID-19; focusing principally on mesenchymal stem cells (MSCs) and inflammatory mediators. MSCs are capable of suppressing several kinds of cytokines via the paracrine secretion system. Therefore, MSCs therapy could be game changes in the treatment of the current COVID-19 pandemic.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
52	COVID-19 and Mesenchymal Stem Cell Treatment; Mystery or Not	MSC	Akkoc, T. (2020). COVID-19 and Mesenchymal Stem Cell Treatment; Mystery or Not. In K. Turksen (Ed.), <i>Cell Biology and Translational Medicine, Volume 10: Stem Cells in Tissue Regeneration</i> (pp. 167–176). Springer International Publishing. https://doi.org/10.1007/5584_2020_557	https://link.springer.com/chapter/10.1007%2F5584_2020_557	10-Jul-20	Advances in Experimental Medicine and Biology	This review highlights studies the beneficial effect of mesenchymal stem cell (MSC) therapy for COVID-19. MSCs are known for their regenerative and immunomodulatory impact. Since COVID-19 is noted for cytokine storm and high inflammation in lungs, MSC seems to be a treatment option.
53	Mesenchymal Stem Cell Derived Exosomes: a Nano Platform for Therapeutics and Drug Delivery in Combating COVID-19	MSC	Pinky, Gupta, S., Krishnakumar, V., Sharma, Y., Dinda, A. K., & Mohanty, S. (2020). Mesenchymal Stem Cell Derived Exosomes: A Nano Platform for Therapeutics and Drug Delivery in Combating COVID-19. <i>Stem Cell Reviews and Reports</i> , 1–11. https://doi.org/10.1007/s12015-020-10002-z	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7357441/	7/13/2020	Stem Cell Reviews and Reports	This review briefly recapitulates the recent evidence and developments in understanding exosomes as a promising candidate for novel nano-intervention in the current pandemic scenario. Furthermore, this review will highlight and discuss mechanistic role of exosomes to combat severe lung pathological conditions.
54	Mesenchymal Stem Cells: A New Front Emerge in COVID19 Treatment	MSC	Raza, S. S., & Khan, M. A. (2020). Mesenchymal Stem Cells: A new front emerge in COVID19 treatment: Mesenchymal Stem Cells therapy for SARS-CoV2 viral infection. <i>Cytotherapy</i> , 0 (0). https://doi.org/10.1016/j.jcyt.2020.07.002	https://www.isct-cytotherapy.org/article/S1465-3249(20)30789-1/fulltext	7/15/2020	Cytotherapy	This article highlights results from preliminary clinical investigations of MSCs therapy for SARS-CoV-2 infected patients. The preliminary clinical data suggest that MSCs possess the capacity to lessen systemic inflammatory responses and protect against SARS-COV-2 virus-induced injury. Additional studies in a larger cohort of patients are needed to validate their potential efficacy.
55	The Rationale of Using Mesenchymal Stem Cells in Patients with COVID-19-Related Acute Respiratory Distress Syndrome: What to Expect	MSC	Can, A., & Coskun, H. (2020). The rationale of using mesenchymal stem cells in patients with COVID-19-related acute respiratory distress syndrome: What to expect. <i>Stem Cells Translational Medicine</i> . https://doi.org/10.1002/sctm.20-0164	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7404450/	7/21/2020	Stem Cells Translational Medicine	This review documents the rationale and possible outcomes of compassionate use of MSCs, particularly in patients with SARS-CoV-2 infections, toward proving or disproving the efficacy of this approach in the near future.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
56	Stem Cell Therapies for COVID-19: Strategy and Application	MSC	Darabi, R., & Li, Y. (2020). Stem cell therapies for COVID-19: Strategy and application. <i>Journal of Cellular Biochemistry</i> , 121 (12), 4696–4698. https://doi.org/10.1002/jcb.29816	https://onlinelibrary.wiley.com/doi/full/10.1002/jcb.29816	7/21/2020	Journal of Cellular Biochemistry	This article discusses the beneficial effects of MSC treatment for COVID-19 complications. So far, a limited clinical trial of MSCs indicated their safety and possible effectiveness to treat pneumonia. Except for pneumonia, other severe complications of the infection such as multi-organ failure and sepsis might also benefit from MSC treatment.
57	Treatment of COVID-19 Pneumonia: the Case for Placenta-Derived Cell Therapy	MSC	Berishvili, E., Kaiser, L., Cohen, M., Berney, T., Scholz, H., Floisand, Y., & Mattsson, J. (2020). Treatment of COVID-19 Pneumonia: The Case for Placenta-derived Cell Therapy. <i>Stem Cell Reviews and Reports</i> , 1–8. https://doi.org/10.1007/s12015-020-10004-x	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7372209/	7/21/2020	Stem Cell Reviews and Reports	This article reviews characteristics of placenta-derived MSCs that make attractive candidates for the treatment of COVID-19 pneumonia. In light of the existing clinical evidence for the innocuousness and efficiency of systemic administration of DSCs or AECs in similar conditions, the article advocates for the initiation of clinical trials using this strategy in the treatment of severe COVID-19 disease.
58	Mesenchymal Stem Cells: Current Clinical Progress in ARDS and COVID-19	MSC	Xiao, K., Hou, F., Huang, X., Li, B., Qian, Z. R., & Xie, L. (2020). Mesenchymal stem cells: Current clinical progress in ARDS and COVID-19. <i>Stem Cell Research & Therapy</i> , 11. https://doi.org/10.1186/s13287-020-01804-6	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7373844/	7/22/2020	Stem Cell Research and Therapy	This review focuses on clinical progress in the use of MSCs as a cell therapy for ARDS, which may have clinical implications during the coronavirus disease 2019 (COVID-19) pandemic. Limited clinical data have shown that systemic administration of MSCs can significantly alleviate lung injury in COVID-19 patients. Large-scale, long-term, multicenter trials are needed
59	The Promise of Mesenchymal Stem Cells Therapy for Acute Respiratory Distress Syndrome Caused by COVID-19	MSC	Gu, J., Zhao, Q., Han, Z., & Han, Z. (2020). The Promise of Mesenchymal stem cells therapy for acute Respiratory Distress Syndrome Caused by COVID-19. <i>Current Stem Cell Research & Therapy</i> . https://doi.org/10.2174/1574888X15999200729161539	https://pubmed.ncbi.nlm.nih.gov/32729428/	7/29/2020	Stem Cell Research and Therapy	This review discusses mesenchymal stem cell (MSC)-based treatment for ARDS caused by SARS-CoV-2. MSCs have the advantage of targeting numerous pathophysiological components of ARDS by secreting a series of cell factors, exerting anti-inflammatory, antioxidative, immunomodulatory, antiapoptotic, and proangiogenic effects, resulting in significant structural and functional recovery following ARDS in various preclinical models and pilot clinical studies.
60	Mesenchymal Stem Cells in COVID-19: A Journey from Bench to Bedside	MSC	Sahu, K. K., Siddiqui, A. D., & Cerny, J. (2020). Mesenchymal Stem Cells in COVID-19: A Journey from Bench to Bedside. <i>Laboratory Medicine</i> , Imaa049. https://doi.org/10.1093/labmed/Imaa049	https://academic.oup.com/labmed/article/doi/10.1093/labmed/Imaa049/5878411	7/30/2020	Laboratory Medicine	This review discusses the potential of MSCs as a therapeutic option for patients with COVID-19, based on the encouraging results from the preliminary data showing improved outcomes in the progression of COVID-19 disease. The patients belonging to this subset are most likely beyond the point where they could benefit from an antiviral therapy because most of their illness at this stage of disease is driven by inflammatory (over)response of the immune system.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
61	Immunomodulatory Effect of Mesenchymal Stem Cells and Mesenchymal Stem-Cell-Derived Exosomes for COVID-19 Treatment	MSC	Jayaramayya, K., Mahalaxmi, I., Subramaniam, M. D., Raj, N., Dayem, A. A., Lim, K. M., Kim, S. J., An, J. Y., Lee, Y., Choi, Y., Raj, A., Cho, S.-G., & Vellingiri, B. (2020). Immunomodulatory effect of mesenchymal stem cells and mesenchymal stem-cell-derived exosomes for COVID-19 treatment. <i>BMB Reports</i> , 53(8), 100-112.	https://pubmed.ncbi.nlm.nih.gov/32731913/	7/31/2020	BMB Reports	This review discusses the basics of the cytokine storm in COVID-19, MSCs and MSC-derived exosomes, and both ongoing and potential stem-cell-based clinical trials for COVID-19.
62	The Immune System as a Target for Therapy of SARS-CoV-2: A Systematic Review of the Current Immunotherapies for COVID-19	MSC	Mansourabadi, A. H., Sadeghalvad, M., Mohammadi-Motlagh, H. R., & Rezaei, N. (2020). The immune system as a target for therapy of SARS-CoV-2: A systematic review of the current immunotherapies for COVID-19. <i>Life sciences</i> , 258, 118185. https://doi.org/10.1016/j.lfs.2020.118185	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7395832/	8/1/2020	Life Sciences	This review aimed to describe the role of the immune system in response to COVID-19. This is also a systematic review to collate and describe all published reports of the using immunotherapies, including convalescent plasma therapy, monoclonal antibodies, cytokine therapy, mesenchymal stem cell therapy, and intravenous immunoglobulin and their important outcomes in COVID-19 patients.
63	Stem Cells Therapy as a Possible Therapeutic Option in Treating COVID-19 Patients	MSC	Esquivel, D., Mishra, R., Soni, P., Seetharaman, R., Mahmood, A., & Srivastava, A. (2020). Stem Cells Therapy as a Possible Therapeutic Option in Treating COVID-19 Patients. <i>Stem Cell Reviews and Reports</i> , 1-9. https://doi.org/10.1007/s12015-020-10017-6	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7395577/	8/1/2020	Stem Cell Reviews and Reports	This review discusses the possible therapeutic uses of MSCs for treating COVID-19. Results from clinical trials are encouraging as patients treated with MSCs regain lung functions and have restored levels of cytokines and trophic factors, underscoring the fact that stem cell therapy can be, at least, a complementary therapy to alleviate sufferings in COVID-19 patients.
64	Stem Cell Therapy for COVID-19: Possibilities and Challenges	MSC	Choudhery, M. S., & Harris, D. T. (2020). Stem cell therapy for COVID-19: Possibilities and challenges. <i>Cell Biology International</i> , 44(11), 2182-2191. https://doi.org/10.1002/cbin.11440	https://onlinelibrary.wiley.com/doi/10.1002/cbin.11440	7-Aug-20	Cell Biology International	In this review, the possibilities of stem cell use in COVID-19 patients and relevant challenges in their use have been discussed. Several clinical trials have been registered using stem cells for COVID-19 treatment that aim to use different cell sources, dosage, and importantly diverse targeted patient groups.
65	Mesenchymal Stem Cells and Exosome Therapy for COVID-19: Current Status and Future Perspective	MSC	Gupta, A., Kashe, S., Gupta, M., Rodriguez, H. C., Gautam, S. S., & Kadam, S. (2020). Mesenchymal stem cells and exosome therapy for COVID-19: Current status and future perspective. <i>Human Cell</i> , 1-12. https://doi.org/10.1007/s13577-020-00407-w	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7418088/	8/11/2020	Human Cell	This review explores the therapeutic potential of both mesenchymal stem cells (MSCs) and MSC-derived exosomes in mitigating the COVID-19 induced cytokine storm as well as promoting the regeneration of alveolar tissue, attributed to the intrinsic cytokines and growth factor present in the MSC secretome.
66	Promising Impacts of Mesenchymal Stem Cell Therapy in Treatment of SARS-CoV-2 (COVID-19)	MSC	Khorshidi, M., Zarezadeh, M., Emami, M., Olang, B., & Moghaddam, O. M. (2020). Promising impacts of mesenchymal stem cell therapy in treatment of SARS-CoV-2 (COVID-19). <i>Heart & Lung: The Journal of Cardiovascular and Acute Care</i> , 49(6)	https://www.heartandlung.org/article/S0147-9563(20)30351-4/fulltext	8/19/2020	Heart & Lung	This article discusses whether mesenchymal stem cell (MSC) could be considered as an efficacious and safe treatment approach for COVID-19-induced pneumonia.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
67	Safety and Effectiveness of Intravascular Mesenchymal Stem Cells to Treat Organ Failure and Possible Application in COVID-19 Complications	MSC	Atluri, S., Manocha, V., Boddu, N., Bhati, S., Syed, Z., Diwan, S., & Manchikanti, L. (2020). Safety and Effectiveness of Intravascular Mesenchymal Stem Cells to Treat Organ Failure and Possible	https://www.painphysicianjournal.com/current/pdf?article=NzEwOQ%3D%3D&journal=129	8/23/2020	Pain Physician Journal	This article assesses the safety and efficacy of MSC therapy in organ failure commonly seen in seriously complicated COVID-19 patients by reviewing human randomized controlled trials (RCTs) and observational studies.
68	Overview of Stem Cell Therapy for Acute Respiratory Distress Syndrome with Focus on COVID 19	MSC	Kaye, R. J. (2020). Overview of Stem Cell Therapy for Acute Respiratory Distress Syndrome with Focus on. <i>Pain Physician</i> , 23, S421-S431.	https://www.painphysicianjournal.com/current/pdf?article=NzExMA%3D%3D&journal=129	8/23/2020	Pain Physician Journal	This review examines recent research studies in humans to determine whether mesenchymal stem cells (MSCs) may be used effectively and safely to target potentially deadly lung damage that may follow infection by COVID-19.
69	Immunomodulation and Regeneration Properties of Dental Pulp Stem Cells: A Potential Therapy to Treat Coronavirus Disease 2019	MSC	Zayed, M., & Iohara, K. (2020). Immunomodulation and Regeneration Properties of Dental Pulp Stem Cells: A Potential Therapy to Treat Coronavirus Disease 2019. <i>Cell Transplantation</i> , 29. https://doi.org/10.1177/0963689720952089	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7443577/	8/23/2020	Cell Transplantation	This review analyzes the potential use of dental pulp stem cells (DPSCs) and their significance in the development of a therapy for COVID-19. DPSCs are considered a potential source of MSCs for immunomodulation, tissue regeneration, and clinical application. Although some current clinical trials have treated COVID-19 patients with DPSCs, this therapy has not been approved.
70	Mesenchymal Stromal Cells as Potential Immunomodulatory Players in Severe Acute Respiratory Distress Syndrome Induced by SARS-CoV-2 Infection	MSC	Mallis, P., Michalopoulos, E., Chatzistamatiou, T., & Stavropoulos-Giokas, C. (2020). Mesenchymal stromal cells as potential immunomodulatory players in severe acute respiratory distress syndrome induced by SARS-CoV-2 infection. <i>World Journal of Stem Cells</i> , 12 (8), 731–751.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7477656/	8/26/2020	World Journal of Stem Cells	This article discusses how, taking into account the multifunctional properties of MSCs, the proposed stem-cell-based therapy may be proven significantly effective in critically-ill COVID-19 patients. The current therapeutic strategy may improve the patient's overall condition and in parallel may decrease the mortality rate of the current disease.
71	Mesenchymal Stromal Cells in Viral Infections: Implications for COVID-19	MSC	Rocha, J. L. M., de Oliveira, W. C. F., Noronha, N. C., dos Santos, N. C. D., Covas, D. T., Picanço-Castro, V., Swiech, K., & Malmegrim, K. C. R. (2020). Mesenchymal Stromal Cells in Viral Infections: Implications for COVID-19. <i>Stem Cell Reviews and Reports</i> . https://doi.org/10.1007/s12015-020-10032-7	https://link.springer.com/article/10.1007%2Fs12015-020-10032-7	9/7/2020	Stem Cell Reviews and Reports	This article critically discusses the rationale, advantages, and disadvantages of mesenchymal stem cell (MSC)-based therapies for viral infections and also specifically for COVID-19. The article also points out some directions for this field.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
72	COVID-19 and its Therapeutics: Special Emphasis on Mesenchymal Stem Cells Based Therapy	MSC	Verma, Y. K., Verma, R., Tyagi, N., Behl, A., Kumar, S., & Gangenahalli, G. U. (2020). COVID-19 and its Therapeutics: Special Emphasis on Mesenchymal Stem Cells Based Therapy. <i>Stem Cell Reviews and Reports</i> . https://doi.org/10.1007/s12015-020-10037-2	https://link.springer.com/article/10.1007%2Fs12015-020-10037-2	9/12/2020	Stem Cell Reviews and Reports	This review highlights the minute details of SARS-CoV-2 and its genomic organization. This compilation emphasizes Mesenchymal Stem Cells (MSCs) based therapy alone or in combination with other therapeutics as an attractive curative approach for COVID-19 pandemic.
73	The Role of Mesenchymal Stromal Cells in Immune Modulation of COVID-19: Focus on Cytokine Storm	MSC	Kavianpour, M., Saleh, M., & Verdi, J. (2020). The role of mesenchymal stromal cells in immune modulation of COVID-19: Focus on cytokine storm. <i>Stem Cell Research & Therapy</i> , 11 (1), 404. https://doi.org/10.1186/s13287-020-01849-7	https://stemcellres.biomedcentral.com/articles/10.1186/s13287-020-01849-7	9/18/2020	Stem Cell Research and Therapy	This review highlights the newest research findings regarding mesenchymal stem cell (MSC)-based immunomodulation in patients with COVID-19. MSCs can reduce the cytokine storm produced by coronavirus infection. In a number of studies, the administration of these cells has been beneficial for COVID-19 patients.
74	SARS-CoV-2 Infection of Pluripotent Stem Cell-derived Human Lung Alveolar Type 2 Cells Elicits a Rapid Epithelial-Intrinsic Inflammatory Response	iPSC	Huang, J., Hume, A. J., Abo, K. M., Werder, R. B., Villacorta-Martin, C., Alysandratos, K.-D., Beermann, M. L., Simone-Roach, C., Lindstrom-Vautrin, J., Olejnik, J., Suder, E. L., Bullitt, E., Hinds, A., Sharma, A., Bosmann, M., Wang, R., Hawkins, F., Burks, E. J., Saeed, M., ... Kotton, D. N. (2020). SARS-CoV-2 Infection of Pluripotent Stem Cell-Derived Human Lung Alveolar Type 2 Cells Elicits a Rapid Epithelial-Intrinsic Inflammatory Response. <i>Stem Cell Reports</i> , 15 (1), 1-12. https://doi.org/10.1016/j.stemcr.2020.08.007	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7500949/	9/18/2020	Cell Stem Cell	This article reveals the cell-intrinsic responses of a key lung target cell to infection, providing a platform for further drug development and facilitating a deeper understanding of COVID-19 pathogenesis.
75	The Use of Mesenchymal Stromal Cells in the Treatment of Coronavirus Disease 2019	MSC	Canham, M. A., Campbell, J. D. M., & Mountford, J. C. (2020). The use of mesenchymal stromal cells in the treatment of coronavirus disease 2019. <i>Journal of Translational Medicine</i> , 18 (1), 359. https://doi.org/10.1186/s12967-020-02532-4	https://translational-medicine.biomedcentral.com/articles/10.1186/s12967-020-02532-4	9/21/2020	Journal of Translational Medicine	This review discusses novel therapeutics for critically ill patients suffering from COVID-19-induced acute respiratory distress syndrome (ARDS). MSCs possess both regenerative and immunomodulatory properties, the latter of which can be harnessed to reduce the severity and longevity of ARDS in patients under intensive care due to SARS-CoV-2 infection.
76	Mesenchymal Stem Cell Therapies for COVID-19: Current Status and Mechanism of Action	MSC	Sadeghi, S., Soudi, S., Shafiee, A., & Hashemi, S. M. (2020). Mesenchymal stem cell therapies for COVID-19: Current status and mechanism of action. <i>Life Sciences</i> , 262, 118493. https://doi.org/10.1016/j.lfs.2020.118493	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7510562/	9/23/2020	Life Sciences	In the current article, the potential mechanisms by which MSCs contribute to the treatment of COVID-19 patients are highlighted. Current trials that evaluated the potential of MSC-based treatments for COVID-19 are also briefly reviewed.
77	Mesenchymal Stem Cell Research Progress for the Treatment of COVID-19	MSC	Yao, D., Ye, H., Huo, Z., Wu, L., & Wei, S. (2020). Mesenchymal stem cell research progress for the treatment of COVID-19. <i>Journal of International Medical Research</i> , 48 (9), 0300060520955063. https://doi.org/10.1177/0300060520955063	https://journals.sagepub.com/doi/10.1177/0300060520955063	9/24/2020	Journal of International Medicine Research	This review discusses the research progress related to using stem cells to treat patients with COVID-19. Mesenchymal stem cells (MSCs) are expected to reduce the risk of complications and death in patients because they have strong anti-inflammatory and immunomodulatory capabilities, which can improve the microenvironment, promote neovascularization, and enhance tissue repair capabilities.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
78	Perspectives on Mesenchymal Stem/Progenitor Cells and Their Derivates as Potential Therapies for Lung Damage Caused by COVID-19	MSC	Klimczak, A. (2020). Perspectives on mesenchymal stem/progenitor cells and their derivates as potential therapies for lung damage caused by COVID-19. <i>World Journal of Stem Cells</i> , 12 (9), 1013–1022. https://doi.org/10.4252/wjsc.v12.i9.1013	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7524694/	9/26/2020	World Journal of Stem Cells	This review discusses mesenchymal stem cells (MSCs) and/or their secretome as cell-based therapy for critically ill patients of COVID-19. MSCs secrete a variety of bioactive factors that can be applied for respiratory tract regeneration in COVID-19 patients thanks to their trophic, anti-inflammatory, immunomodulatory, anti-apoptotic, pro-regenerative, and proangiogenic properties.
79	Novel Insights into the Treatment of SARS-CoV-2 Infection: An Overview of Current Clinical Trials	MSC	Oroojalian, F., Haghbin, A., Baradaran, B., Hemmat, N., Shahbazi, M.-A., Baghi, H. B., Mokhtarzadeh, A., & Hamblin, M. R. (2020). Novel insights into the treatment of SARS-CoV-2 infection: An overview of current clinical trials. <i>International Journal of Biological Macromolecules</i> , 165, 18–43. https://doi.org/10.1016/j.ijbiomac.2020.09.20	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7521454/	9/28/2020	International Journal of Biological Macromolecules	This review provides an overview of the biological properties, functional mechanisms, and molecular components of SARS-CoV-2, along with investigational therapeutic and preventive approaches for this virus, including Mesenchymal stem cells and natural killer cells.
80	Stem Cell Based Therapy Option in COVID-19: Is It Really Promising?	MSC	Irmak, D. K., Darıcı, H., & Karaöz, E. (2020). Stem Cell Based Therapy Option in COVID-19: Is It Really Promising? <i>Aging and Disease</i> , 11 (5), 1174–1191. https://doi.org/10.14336/AD.2020.0608	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7505270/	10/1/2020	Aging and Disease	This paper intends to analyze the current clinical trials on stem cell treatment of novel virus, searching and reviewing the available information and the International Clinical Trials Registry Platform (ICTRP) of World Health Organization (WHO). The paper concludes that the stem cell treatment of COVID-19 is found promising with pilot studies' results, but still in the early development phase. There is an urgent need for large-scale investigations to confirm and validate the safety and efficacy profile of these therapies with reliable scientific
81	The Immune System as a Target for Therapy of SARS-CoV-2: A Systematic Review of the Current Immunotherapies for COVID-19	MSC	Mansourabadi, A. H., Sadeghalvad, M., Mohammadi-Motlagh, H.-R., & Rezaei, N. (2020). The immune system as a target for therapy of SARS-CoV-2: A systematic review of the current immunotherapies for COVID-19. <i>Life Sciences</i> , 258, 118185. https://doi.org/10.1016/j.lfs.2020.118185	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7395832/	10/1/2020	Life Science	This article aims to describe the role of the immune system in response to COVID-19. A systematic review is provided to collate and describe all published reports of immunotherapies, including convalescent plasma therapy, monoclonal antibodies, cytokine therapy, mesenchymal stem cell therapy, and intravenous immunoglobulin, and their important outcomes in COVID-19 patients.
82	Research Progress on Mesenchymal Stem Cells (MSCs), Adipose-Derived Mesenchymal Stem Cells (AD-MSCs), Drugs, and Vaccines in Inhibiting COVID-19 Disease	MSC	Gentile, P., Sterodimas, A., Pizzicannella, J., Calabrese, C., & Garcovich, S. (2020). Research progress on Mesenchymal Stem Cells (MSCs), Adipose-Derived Mesenchymal Stem Cells (AD-MSCs), Drugs, and Vaccines in Inhibiting COVID-19 Disease. <i>Aging and Disease</i> , 11 (5), 1191–1201.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7505274/	10/1/2020	Aging and Disease	In this literature review, the roles of regenerative strategies with MSCs, AD-MSCs, and adipocyte-secreted exosomal microRNAs (A-SE-miRs) as potential antiviral therapies are reported, comparing the results found with current research progress on drugs and vaccines in COVID-19 disease.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
83	Cell-Based Therapy for Severe COVID-19 Patients: Clinical Trials and Cost-Utility	MSC	Golchin, A. (2020). Cell-Based Therapy for Severe COVID-19 Patients: Clinical Trials and Cost-Utility. <i>Stem Cell Reviews and Reports</i> . https://doi.org/10.1007/s12015-020-10046-1	https://link.springer.com/article/10.1007%2Fs12015-020-10046-1	10/3/2020	Stem Cell Reviews and Reports	This summary describes cell-based clinical trials and the cost-utility aspects of cell therapy. Several clinical trials have been approved for starting phases 2 and 3 of their trials for treating COVID-19 patients with acute respiratory distress syndrome. Many believe that the high cost of cell-based therapy will decrease substantially. Hence, there are hopes that cellular therapy can be approved soon for the treatment of viral diseases such as COVID-19.
84	Umbilical Cord: an Allogenic Tissue for Potential Treatment of COVID-19	MSC	Rodriguez, H. C., Gupta, M., Cavazos-Escobar, E., El-Amin, S. F., & Gupta, A. (2020). Umbilical cord: An allogenic tissue for potential treatment of COVID-19. <i>Human Cell</i> , 1–13. https://doi.org/10.1007/s13577-020-00444-5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7544522/	10/9/2020	Human Cell	This article reviews the current evidences and explores the potential therapeutic use of allogenic UC and/or WJ-derived MSCs for the treatment of COVID-19. Although, preliminary preclinical and clinical studies indicate that their use is safe and potentially effective, more multi-center, randomized, controlled trials are needed to adequately assess the safety and efficacy of UC and/or WJ-derived MSCs for the treatment of COVID-19.
85	Mesenchymal Stem Cell Immunomodulation and Regeneration Therapeutics as an Ameliorative Approach for COVID-19 Pandemics	MSC	Yadav, P., Vats, R., Bano, A., & Bhardwaj, R. (2020). Mesenchymal stem cell immunomodulation and regeneration therapeutics as an ameliorative approach for COVID-19 pandemics. <i>Life Sciences</i> , 263, 118588. https://doi.org/10.1016/j.lfs.2020.118588	https://www.sciencedirect.com/science/article/pii/S024320520313412?via%3Dihub	10/10/2020	Life Sciences	The current review summarizes and emphasizes how mesenchymal stem cells (MSCs) modulate the immune response, can repair the lungs from the impact of the virus, and various aspects of MSCs as a remedial source for COVID-19, to provide better insight for biomedical researchers and for those who are fascinated by stem cells as a therapeutic approach.
86	Potential Application of Mesenchymal Stem Cells and their Exosomes in Lung Injury: an Emerging Therapeutic Option for COVID-19 Patients	MSC	Al-Khawaga, S., & Abdelalim, E. M. (2020). Potential application of mesenchymal stem cells and their exosomes in lung injury: An emerging therapeutic option for COVID-19 patients. <i>Stem Cell Research & Therapy</i> , 11. https://doi.org/10.1186/s13287-020-01963-6	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7558244/	10/15/2020	Stem Cell Research and Therapy	This review sheds light on the mechanistic view of MSC therapeutic role based on preclinical and clinical studies on acute lung injury and ARDS; therefore, offering a unique correlation and applicability in COVID-19 patients. The review further highlights the challenges and opportunities in the use of MSC-based therapy.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
87	Therapeutic Modalities and Novel Approaches in Regenerative Medicine for COVID-19	MSC	Ramezankhani, R., Solhi, R., Memarnejadian, A., Nami, F., Hashemian, S. M. R., Tricot, T., Vosough, M., & Verfaillie, C. (2020). Therapeutic modalities and novel approaches in regenerative medicine for COVID-19. <i>International Journal of Antimicrobial Agents</i> , 56 (6), 106208. https://doi.org/10.1016/j.ijantimicag.2020.106208	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7582055/	10/23/2020	International Journal of Antimicrobial Agents	This article reviews the underlying mechanisms for the pathogenesis of severe acute respiratory syndrome coronavirus-2, and discusses available therapeutic candidates and advanced modalities that are being evaluated in in-vitro/in-vivo models and are of note in clinical trials.
88	Stem Cell Therapy for COVID-19, ARDS and Pulmonary Fibrosis	MSC	Li, Z., Niu, S., Guo, B., Gao, T., Wang, L., Wang, Y., Wang, L., Tan, Y., Wu, J., & Hao, J. (2020). Stem cell therapy for COVID-19, ARDS and pulmonary fibrosis. <i>Cell Proliferation</i> , 53 (12), e12939. https://doi.org/10.1111/cpr.12939	https://onlinelibrary.wiley.com/doi/10.1111/cpr.12939	10/24/2020	Cell Proliferation	This review systematically summarizes the pathogenic progression and potential mechanisms underlying stem cell therapy in COVID-19 and discusses registered COVID-19 clinical trials. Of all the stem cell therapies touted for COVID-19 treatment, mesenchymal stem cells (MSCs) or MSC-like derivatives have been the most promising in preclinical studies and clinical trials so far.
89	Insights into the Use of Mesenchymal Stem Cells in COVID-19 Mediated Acute Respiratory Failure	MSC	Durand, N., Mallea, J., & Zubair, A. C. (2020). Insights into the use of mesenchymal stem cells in COVID-19 mediated acute respiratory failure. <i>NPJ Regenerative medicine</i> , 5(1), 17.	https://pubmed.ncbi.nlm.nih.gov/33580031/	10/26/2020	NPJ Regenerative medicine	This review discusses key features of the current COVID-19 outbreak, and the rationale for MSC-based therapy in this setting, as well as the limitations associated with this therapeutic approach.
90	Mesenchymal Stem Cells as Living Anti-Inflammatory Therapy for COVID-19 Related Acute Respiratory Distress Syndrome	MSC	Lin, F., Ichim, T. E., Pingle, S., Jones, L. D., Kesari, S., & Ashili, S. (2020). Mesenchymal stem cells as living anti-inflammatory therapy for COVID-19 related acute respiratory distress syndrome. <i>World Journal of Stem Cells</i> , 12 (10), 1067–1079. https://doi.org/10.4252/wjsc.v12.i10.1067	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7596438/	10/26/2020	World Journal of Stem Cells	This review discusses the unique ability of mesenchymal stem cells (MSCs), to act as a “living anti-inflammatory”, which can “rebalance” the cytokine/immune responses to restore equilibrium. It also discusses current MSC trials and present different concepts for optimization of MSC therapy in patients with COVID-19 acute respiratory distress syndrome.
91	Race to Arsenal COVID-19 Therapeutics: Current Alarming Status and Future Directions	MSC	Dubey, A. K., Singh, A., Prakash, S., Kumar, M., & Singh, A. K. (2020). Race to arsenal COVID-19 therapeutics: Current alarming status and future directions. <i>Chemico-Biological Interactions</i> , 332, 109298.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC758316/	10/27/2020	Chemico-Biological Interactions	This review is consequently an endeavour to highlight the several aspects of COVID-19, with incorporation of important treatment strategies discovered to date and the effort towards future therapeutic directions.
92	Immunomodulatory-Based Therapy as a Potential Promising Treatment Strategy Against Severe COVID-19 Patients: A Systematic Review	MSC	Razmi, M., Hashemi, F., Gheytnachi, E., Dehghan Manshadi, M., Ghods, R., & Madjid, Z. (2020). Immunomodulatory-based therapy as a potential promising treatment strategy against severe COVID-19 patients: A systematic review. <i>International Immunopharmacology</i> , 88, 106942.	https://doi.org/10.1016/j.intimp.2020.106942	11/1/2020	International Immunopharmacology	This review indicates that immunomodulatory therapies are potentially effective for COVID-19 and provides comprehensive information for clinicians to fight this outbreak.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
93	Transplantation of Mesenchymal Stem Cells: A Potential Adjuvant Therapy for COVID-19	MSC	Zhu, Y., Geng, S., Li, Q., & Jiang, H. (2020). Transplantation of Mesenchymal Stem Cells: A Potential Adjuvant Therapy for COVID-19. <i>Frontiers in Bioengineering and Biotechnology</i> , 8.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7674275/	11/5/2020	Frontiers in Bioengineering and Biotechnology	This article aims to review the beneficial effects of mesenchymal stem cells (MSCs) in treating ALI/ARDS, which provides novel insight into the potential therapeutic strategies against COVID-19. MSCs are emerging as a promising adjuvant therapy for the attenuation of COVID-19 based on its
94	Stem Cell Therapy in Coronavirus Disease 2019: Current Evidence and Future Potential	MSC	Shetty, R., Murugeswari, P., Chakrabarty, K., Jayadev, C., Matalia, H., Ghosh, A., & Das, D. (2020). Stem cell therapy in coronavirus disease 2019: Current evidence and future potential. <i>Cytotherapy</i> . https://doi.org/10.1016/j.jcyt.2020.11.001	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7649634/	11/9/2020	Cytotherapy	This review explores the potential of mesenchymal stromal cells (MSCs) as cell therapy for ARDS. MSCs serve as a potential therapeutic candidate for combating the cytokine storm owing to their primordial cell lineage and multi-potent functions, such as immunomodulation and anti-inflammatory activity, and their ability to secrete various growth factors and soluble vesicles.
95	Mesenchymal Stem Cell (MSC)-Derived Exosomes as a Cell-Free Therapy for Patients Infected with COVID-19: Real Opportunities and Range of Promises	MSC	Rezakhani, L., Kelishadroki, A. F., Soleimanizadeh, A., & Rahmati, S. (2020). Mesenchymal stem cell (MSC)-derived exosomes as a cell-free therapy for patients Infected with COVID-19: Real opportunities and range of promises. <i>Chemistry and Physics of Lipids</i> .	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7658620/	11/12/2020	Chemistry and Physics of Lipids	In this review, the recent exosome-based clinical trials for the treatment of COVID-19 are presented. Potential therapy may include the following items: First, using mesenchymal stem cells secretome. Second, incorporating specific miRNAs and mRNAs into exosomes and last, using exosomes as carriers to deliver drugs.
96	COVID-19 Therapy with Mesenchymal Stromal Cells (MSC) and Convalescent Plasma Must Consider Exosome Involvement: Do the Exosomes in Convalescent Plasma Antagonize the Weak Immune Antibodies?	MSC	Askenase, P. W. (2020). COVID-19 therapy with mesenchymal stromal cells (MSC) and convalescent plasma must consider exosome involvement: Do the exosomes in convalescent plasma antagonize the weak immune antibodies? <i>Journal of Extracellular Vesicles</i> , 10 (1), e12004.	https://onlinelibrary.wiley.com/doi/full/10.1002/jev2.12004	11/14/2020	Journal of Extracellular Vesicles	This article discusses exosome extracellular vesicles as a biologic therapy for COVID-19. It is recommended to treat the profound clinical cytokine storm and severe pneumonia in COVID-19 patients with mesenchymal stromal cell-released exosomes rather than MSCs.
97	Mesenchymal Stem Cells (MSCs) as a Potential Therapeutic Strategy in COVID-19 Patients: Literature Research	MSC	Coelho, A., Alvites, R. D., Branquinho, M. V., Guerreiro, S. G., & Mauricio, A. C. (2020). Mesenchymal Stem Cells (MSCs) as a Potential Therapeutic Strategy in COVID-19 Patients: Literature Research. <i>Frontiers in Cell and Developmental Biology</i> , 8. https://doi.org/10.3389/fcell.2020.602647	https://www.frontiersin.org/articles/10.3389/fcell.2020.602647/full	11/19/2020	Frontiers in Cell and Developmental Biology	This study analyzes the MSCs, their origin, differentiation, therapeutic potential, making a bridge with the COVID-19 disease and its characteristics, as a potential therapeutic strategy, and also reports recent studies where these cell-based therapies were used for the treatment of COVID-19 patients.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
98	Therapeutic Potential of Mesenchymal Stem Cells and Their Secretome in the Treatment of SARS-CoV-2-Induced Acute Respiratory Distress Syndrome	MSC	Harrell, C. R., Jovicic, B. P., Djonov, V., & Volarevic, V. (2020). Therapeutic Potential of Mesenchymal Stem Cells and Their Secretome in the Treatment of SARS-CoV-2-Induced Acute Respiratory Distress Syndrome. <i>Analytical Cellular Pathology; Hindawi</i> . https://doi.org/10.1155/2020/1939768	https://www.hindawi.com/journals/acp/2020/1939768/	11/20/2020	Analytical Cellular Pathology	This review article describes molecular mechanisms that are responsible for MSC-based modulation of immune cells, which play a pathogenic role in the development of SARS-CoV-2-induced ARDS. It also provides a brief outline of already conducted and ongoing clinical studies regarding the therapeutic potential of MSCs and their secretome in the therapy of COVID-19-related ARDS.
99	Fostering Mesenchymal Stem Cell Therapy to Halt Cytokine Storm in COVID-19	MSC	Jeyaraman, M., John, A., Koshy, S., Ranjan, R., Anudeep, T. C., Jain, R., Swati, K., Jha, N. K., Sharma, A., Kesari, K. K., Prakash, A., Nand, P., Jha, S. K., & Reddy, P. H. (2021). Fostering mesenchymal stem cell therapy to halt cytokine storm in COVID-19. <i>Biochimica et Biophysica Acta. Molecular Basis of Disease</i> , 1867 (2), 166014. https://doi.org/10.1016/j.bbadis.2020.166014	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7680525/	11/22/2020	Biochimica et Biophysica Acta	This article revolves around the usage of novel MSCs therapy for combating COVID-19. With the available evidence of immunomodulatory and immune-privilege actions, mesenchymal stem cells (MSCs) can repair, regenerate and remodulate the native homeostasis of pulmonary parenchyma with improved pulmonary compliance.
100	The Role of Mesenchymal Stem/Stromal Cells in the Acute Clinical Setting	MSC	Premier, C., Schulman, I. H., & Jackson, J. S. (2020). The role of mesenchymal stem/stromal cells in the acute clinical setting. <i>The American Journal of Emergency Medicine</i> . https://doi.org/10.1016/j.ajem.2020.11.035	https://pubmed.ncbi.nlm.nih.gov/33279332/	11/24/2020	American Journal of Emergency Medicine	This article reviews the current state of MSC-based therapeutics and further explores the untapped potential role to treat various acute, life-threatening injuries in the ED and ICU.
101	Controlling Cytokine Storm Is Vital in COVID-19	MSC	Tang, L., Yin, Z., Hu, Y., & Mei, H. (2020). Controlling Cytokine Storm Is Vital in COVID-19. <i>Frontiers in Immunology</i> , 11. https://doi.org/10.3389/fimmu.2020.570993	https://www.frontiersin.org/articles/10.3389/fimmu.2020.570993/full	11/30/2020	Frontiers in Immunology	This review will summarize advances in the research of cytokine storms induced by COVID-19, as well as potential intervention strategies to control cytokine storms.
102	The Role of Mesenchymal Stem Cells in COVID-19 Treatment	MSC	Yıldız Gülhan P. (2020). The role of mesenchymal stem cells in COVID-19 treatment. COVID-19 tedavisinde mezenkimal kök hücrelerin rolü. <i>Tuberkuloz ve toraks</i> , 68 (4), 430–436.	https://pubmed.ncbi.nlm.nih.gov/33448740/	12/1/2020	Tüberküloz ve Toraks	The aim of this article is to discuss the potential effect of MSCs types in COVID-19 infection without definite treatment.
103	Emerging Cellular and Pharmacologic Therapies for Acute Respiratory Distress Syndrome	MSC	Gonzalez, H., Horie, S., & Laffey, J. G. (2020). Emerging cellular and pharmacologic therapies for acute respiratory distress syndrome. <i>Current Opinion in Critical Care</i> . https://doi.org/10.1097/MCC.0000000000000000	https://pubmed.ncbi.nlm.nih.gov/33278121/	12/3/2020	Current Opinion in Critical Care	This article discusses promising cellular and pharmacological therapies for ARDS, including Mesenchymal Stem Cell therapy, which can modulate the immune response, reduce epithelial injury, target endothelial and vascular dysfunction, have anticoagulant effects, and enhance ARDS resolution.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
104	The Role of MSC Therapy in Attenuating the Damaging Effects of the Cytokine Storm Induced by COVID-19 on the Heart and Cardiovascular System	MSC	Ellison-Hughes, G. M., Colley, L., O'Brien, K. A., Roberts, K. A., Agbaedeng, T. A., & Ross, M. D. (2020). The Role of MSC Therapy in Attenuating the Damaging Effects of the Cytokine Storm Induced by COVID-19 on the Heart and Cardiovascular System. <i>Frontiers in cardiovascular medicine</i> , 7, 602183.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7756089/	12/9/2020	Frontiers in Cardiovascular Medicine	This review discusses the mechanistic underpinnings of the cytokine storm on the cardiovascular system and how MSCs potentially attenuate the damage caused by the cytokine storm induced by COVID-19. The review also addresses how MSC transplantation could alleviate the long-term complications seen in some COVID-19 patients, such as improving tissue repair and regeneration.
105	Mesenchymal Stromal Cells to Fight SARS-CoV-2: Taking Advantage of a Pleiotropic Therapy	MSC	Barros, I., Silva, A., de Almeida, L. P., & Miranda, C. O. (2020). Mesenchymal stromal cells to fight SARS-CoV-2: Taking advantage of a pleiotropic therapy. <i>Cytokine & growth factor reviews</i> , S1359-6101(20)30239-2. Advance online	https://pubmed.ncbi.nlm.nih.gov/33397585/	12/15/2020	Cytokine & Growth Factor Reviews	This review provides a reasoned discussion of the possible use of Mesenchymal Stromal Cells (MSC) or their products as a treatment in SARS-CoV-2-infected patients. The main benefits and concerns of using this cellular therapy, guided by preclinical and clinical data obtained from similar pathologies will be reviewed.
106	Human Mesenchymal Stem Cells: The Present Alternative for High-Incidence Diseases, Even SARS-Cov-2	MSC	Juárez-Navarro, K. J., Padilla-Camberos, E., Díaz, N. F., Miranda-Altamirano, A., & Díaz-Martínez, N. E. (2020). Human Mesenchymal Stem Cells: The Present Alternative for High-Incidence Diseases, Even SARS-Cov-2. <i>Stem cells international</i> , 2020, 8892189.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7769649/	12/18/2020	Stem Cells International	This work summarizes a general overview of MSCs and their therapeutic mechanisms, as well as some of the novel clinical trial protocols and their results, comparing between the number of registries, countries, and search portals.
107	Efficacy and Safety of Mesenchymal Stem Cells for the Treatment of Patients Infected with COVID-19: a Systematic Review and Meta-Analysis Protocol	MSC	Chen, Y., Zhang, Q., Peng, W., Liu, D., You, Y., Liu, X., Tang, S., & Zhang, T. (2020). Efficacy and safety of mesenchymal stem cells for the treatment of patients infected with COVID-19: a systematic review and meta-analysis protocol. <i>BMJ open</i> , 10 (12), e042085. https://doi.org/10.1136/bmjopen-2020-042085 .	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7756871/	12/18/2020	BMJ Open	This protocol is proposed for a systematic review and meta-analysis that aims to evaluate the efficacy and safety of mesenchymal stem cell (MSC) therapy on patients with COVID-19. MSC therapy may be a promising therapeutic approach that reduces the high mortality in critical cases.
108	Current Status and Future Prospects of Perinatal Stem Cells	MSC	Torre, P. de la, & Flores, A. I. (2021). Current Status and Future Prospects of Perinatal Stem Cells. <i>Genes</i> , 12 (1), 6. https://doi.org/10.3390/genes12010006	https://www.mdpi.com/2073-4425/12/1/6/html	12/23/2020	Genes	This review gives an overview of clinical applications of perinatal derived stem cells, with a special emphasis on the clinical trials being carried out to treat COVID19 pneumonia. Furthermore, the use of new technologies and the future directions of this rapidly progressing field of perinatal cells and regenerative medicine are discussed.
109	Coronavirus Disease 2019: A Tissue Engineering and Regenerative Medicine Perspective	MSC	Shafiee, A., Moradi, L., Lim, M., & Brown, J. (2021). Coronavirus disease 2019: A tissue engineering and regenerative medicine perspective. <i>STEM CELLS Translational Medicine</i> , 10 (1), 27–38. https://doi.org/10.1002/sctm.20-0197	https://stemcellsjournalsonline.wiley.com/doi/10.1002/sctm.20-0197	1/1/2021	Stem Cells Translational Medicine	In this review the impacts of the COVID-19 pandemic in the present and future of tissue engineering and regenerative medicine research and products are briefly presented. Recent clinical trials and the therapeutic benefits of MSCs in coronavirus-induced ARDS are also critically reviewed.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
110	Overview of Current Adipose-Derived Stem Cell (ADSCs) Processing Involved in Therapeutic Advancements: Flow Chart and Regulation Updates Before and After COVID-19	MSC	Mazini, L., Ezzoubi, M., & Malka, G. (2021). Overview of current adipose-derived stem cell (ADSCs) processing involved in therapeutic advancements: flow chart and regulation updates before and after COVID-19. <i>Stem cell research & therapy</i> , 12 (1), 1. https://doi.org/10.1186/s13287-020-02006-w	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7781178/	1/4/2021	Stem Cell Research and Therapy	The aim of this work is to highlight the major guidelines and differences in ADSC processing meeting the current good manufacturing practices (cGMP) and the cellular therapy-related policies. Having the advantages of being in higher quantities and easy to access, ADSCs might be a promising tool in combatting COVID-19-induced pneumonia and be a part of future treatment options.
111	Combating COVID-19 With Mesenchymal Stem/Stromal Cell Therapy: Promise and Challenges	MSC	Wang, S. H., Shetty, A. K., Jin, K., & Chunhua Zhao, R. (2021). Combating COVID-19 With Mesenchymal Stem/Stromal Cell Therapy: Promise and Challenges. <i>Frontiers in cell and developmental biology</i> , 8, 627414.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC781676/	1/5/2021	Frontiers in Cell and Developmental Biology	This review discusses the current use of mesenchymal stem cells to combat COVID-19 and its challenges.
112	Pharmacological Insight into Potential Therapeutic Agents for the Deadly Covid-19 Pandemic	MSC	Bhandari, R., Khanna, G., & Kuhad, A. (2021). Pharmacological insight into potential therapeutic agents for the deadly Covid-19 pandemic. <i>European Journal of Pharmacology</i> , 890, 173643. https://doi.org/10.1016/j.ejphar.2020.173643	https://www.sciencedirect.com/science/article/abs/pii/S0014299920307354	1/5/2021	European Journal of Pharmacology	This review discusses the epidemiology, pathogenesis, the tale of origin, and transmission of COVID-19 or Sars-Cov2 virus and gives evidence of potential therapeutic agents that can be explored to cast away this pandemic.
113	Proposed Mechanisms of Targeting COVID-19 by Delivering Mesenchymal Stem Cells and Their Exosomes to Damaged Organs	MSC	Jamshidi, E., Babajani, A., Soltani, P., & Niknejad, H. (2021). Proposed Mechanisms of Targeting COVID-19 by Delivering Mesenchymal Stem Cells and Their Exosomes to Damaged Organs. <i>Stem cell reviews and reports</i> , 1–17. Advance online publication. https://doi.org/10.1007/s12015-020-00000-0	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7799400/	1/11/2021	Stem Cell Reviews and Reports	This review focuses on the proposed therapeutic mechanisms and delivery routes of MSCs and their exosomes to the damaged organs. It also discusses the possible application of primed and genetically modified MSCs as a promising drug delivery system in COVID-19.
114	Regenerative Medicine Approaches in COVID -19 Pneumonia	MSC	Asghar zad, S., Alizadeh, A., & Arab, S. (2021). Regenerative Medicine Approaches in COVID -19 Pneumonia. <i>Current stem cell research & therapy</i> , 10.2174/1574888X16999210112205826. Advance online publication. https://doi.org/10.2174/1574888X16999210112205826	https://pubmed.ncbi.nlm.nih.gov/33438550/	1/12/2021	Current Stem Cell Research and Therapy	This article considers regenerative medicine (RM) approaches to cure COVID-19 pneumonia based on what RM has so far used to treat lung diseases, injuries, or pneumonia induced by other pathogens. These approaches include stem and progenitor cell transplantation, stem cell-derived exosomes, and microRNAs therapy.
115	Stem Cell Therapy in COVID-19: Pooled Evidence from SARS-CoV-2, SARS-CoV, MERS-CoV and ARDS: A Systematic Review	MSC	Mahendiratta, S., Bansal, S., Sarma, P., Kumar, H., Choudhary, G., Kumar, S., Prakash, A., Sehgal, R., & Medhi, B. (2021). Stem cell therapy in COVID-19: Pooled evidence from SARS-CoV-2, SARS-CoV, MERS-CoV and ARDS: A systematic review. <i>Biomedicine & pharmacotherapy</i> = <i>Biomedecine & pharmacotherapie</i> , 137, 111300. Advance online publication. https://doi.org/10.1016/j.biopha.2021.111300	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7843034/	1/28/2021	Biomedicine & pharmacotherapy	This systematic review has been framed by pooling the available data of the use of stem cells in SARS-CoV-2, SARS-CoV, MERS-CoV and ARDS.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
116	Stem Cell Therapy Potency in Personalizing Severe COVID-19 Treatment	MSC	Basiri, A., Mansouri, F., Azari, A., Ranjbarvan, P., Zarein, F., Heidari, A., & Golchin, A. (2021). Stem Cell Therapy Potency in Personalizing Severe COVID-19 Treatment. <i>Stem cell reviews and reports</i> , 1–21. Advance online publication.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7842180/	1/28/2021	Stem Cell Reviews and Reports	Prompted by the uncertainties in the area of COVID-19 therapies, this study reviewed the published papers and concepts to gather and provide useful information to clinicians and researchers interested in personalized medicine and cell-based therapy. One novel aspect of this study focuses on the potential application of personalized medicine in treating
117	Placenta-Derived Mesenchymal Stem Cells (P-MSCs) for COVID-19 Pneumonia - A Regenerative Dogma	MSC	Siddesh, S. E., Gowda, D. M., Jain, R., Gulati, A., Patil, G. S., Anudeep, T. C., Jeyaraman, N., Muthu, S., & Jeyaraman, M. (2021). Placenta-derived mesenchymal stem cells (P-MSCs) for COVID-19 pneumonia-a regenerative dogma. <i>Stem cell investigation</i> , 8, 3.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7937692/	2/3/2021	Stem Cell Investigation	This article provides an insight into dealing COVID-19 pandemic with P-MSCs as cell-based therapy embracing immunomodulatory and immune-privileged potentials and future prospects. Advocating prospective randomized controlled clinical trials ethically will concretely supplement for its efficacy and safety concerns.
118	The Use of Mesenchymal Stem Cells in the Process of Treatment and Tissue Regeneration Sfter Recovery in Patients with Covid-19	MSC	Saburi, E., Abazari, M., Hasannia, H., Nassiri Mansour, R., Eshaghi-Gorji, R., Gheibi, M., Rahmati, M., & Ehsan Enderami, S. (2021). The use of mesenchymal stem cells in the process of treatment and tissue regeneration after recovery in patients with Covid-19. <i>Gene</i> , 777, 145471. Advance online publication.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7860931/	2/4/2021	Gene	This review discusses the beginning of numerous clinical trials in the use of mesenchymal stem cells and the fact that it is necessary to set a practical guideline that specifies items such as cell origin, number of cells, frequency of injection, injection site, etc.
119	A Role for Extracellular Vesicles in SARS-CoV-2 Therapeutics and Prevention	MSC	Machhi, J., Shahjin, F., Das, S., Patel, M., Abdelmoaty, M. M., Cohen, J. D., Singh, P. A., Baldi, A., Bajwa, N., Kumar, R., Vora, L. K., Patel, T. A., Oleynikov, M. D., Soni, D., Yeapuri, P., Mukadam, I., Chakraborty, R., Saksena, C. G., Herskovitz, J., Hasan, M., ... Kevadiya, B. D. (2021). A Role for Extracellular Vesicles in SARS-CoV-2 Therapeutics and Prevention. <i>Journal of neuroimmune pharmacology : the official journal of the Society on NeuroImmune Pharmacology</i> , 1–19. Advance online	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7862527/	2/5/2021	Journal of neuroimmune pharmacology	In this review, efforts to use EVs to contain SARS CoV-2 and affect the current viral pandemic are discussed. An emphasis is made on mesenchymal stem cell derived EVs' as a vaccine candidate delivery system.
120	Therapeutic Potential of Mesenchymal Stem Cells and Their Products in Lung Diseases- Intravenous Administration versus Inhalation	MSC	Fröhlich E. (2021). Therapeutic Potential of Mesenchymal Stem Cells and Their Products in Lung Diseases-Intravenous Administration versus Inhalation. <i>Pharmaceutics</i> , 13 (2), 232.	https://www.mdpi.com/1999-4923/13/2/232/htm	2/7/2021	Pharmaceutics	This review describes mode of action and use of MSCs and MSC-derived products in the treatment of lung diseases including the respective advantages and limitations of the products.
121	Is There an Effect of Fetal Mesenchymal Stem Cells in the Mother–Fetus Dyad in COVID-19 Pregnancies and Vertical Transmission?	MSC	Samara, A., & Herlenius, E. (2021). Is There an Effect of Fetal Mesenchymal Stem Cells in the Mother-Fetus Dyad in COVID-19 Pregnancies and Vertical Transmission?. <i>Frontiers in physiology</i> , 11, 624625. https://doi.org/10.3389/fphys.2020.624625	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7928412/	2/11/2021	Frontiers in Physiology	COVID-19 pregnancies come forth as a paradigm to be further and more comprehensively approached, to understand both the mechanism and action of circulating stem cells in immunoprotection and hypoxia in microcirculation.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
122	Medical Progress: Stem Cells as a New Therapeutic Strategy for COVID-19	MSC	Musial, C., & Gorska-Ponikowska, M. (2021). Medical progress: Stem cells as a new therapeutic strategy for COVID-19. <i>Stem cell research</i> , 52, 102239. Advance online publication. https://doi.org/10.1016/j.scr.2021.102239	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7877901/	2/11/2021	Stem Cell Research	The presented review provides not only new knowledge in the field of molecular mechanisms of pro-regenerative action of stem cells, but also have the potential to open up new prospects of action to improve lung tissue regeneration in COVID-19 patients. In addition, this review is about clinical trials using MSCs with a complete status, as well as the latest discoveries in molecular biology, a platform model of pluripotent stem cells in the SARS-CoV-2 study on 3D animal models and nanoconjugates based on stem cells.
123	Challenges and Advances in Clinical Applications of Mesenchymal Stromal Cells	MSC	Zhou, T., Yuan, Z., Weng, J., Pei, D., Du, X., He, C., & Lai, P. (2021). Challenges and advances in clinical applications of mesenchymal stromal cells. <i>Journal of hematology & oncology</i> , 14(1), 24.	https://jhoonline.biomedcentral.com/articles/10.1186/s13045-021-01037-x	2/12/2021	Journal of hematology & oncology	This review, discusses the major challenges of MSC therapies in clinical application, the factors impacting the diversity of MSCs, the potential approaches that modify MSC products with the highest therapeutic potential, and finally the usage of MSCs for COVID-19 pandemic disease.
124	Mesenchymal Stromal Cell Immunomodulation: In Pursuit of Controlling COVID-19 Related Cytokine Storm	MSC	Song, N., Wakimoto, H., Rossignoli, F., Bhare, D., Ciccocioppo, R., Chen, K. S., Khalsa, J. K., Mastrolia, I., Samarelli, A. V., Dominici, M., & Shah, K. (2021). Mesenchymal stromal cell immunomodulation: In pursuit of controlling COVID-19 related cytokine storm. <i>Stem cells (Dayton, Ohio)</i> , 10.1002/stem.3354.	https://pubmed.ncbi.nlm.nih.gov/33586320/	2/14/2021	Stem Cells	This review presents an overview and perspectives of the SARS-CoV-2 induced inflammatory dysfunction and the potential of MSC immunomodulation for the prevention and treatment of COVID-19 related pulmonary disease.
125	Mesenchymal Stromal Cell-Derived Extracellular Vesicles in Lung Diseases: Current Status and Perspectives	MSC	Abreu, S. C., Lopes-Pacheco, M., Weiss, D. J., & Rocco, P. (2021). Mesenchymal Stromal Cell-Derived Extracellular Vesicles in Lung Diseases: Current Status and Perspectives. <i>Frontiers in cell and developmental biology</i> , 9, 600711. https://doi.org/10.3389/fcell.2021.600711	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7917181/	2/15/2021	Frontiers in cell and developmental biology	This review summarizes the main features of EVs and the current understanding of the mechanisms of action of MSC-derived EVs in several lung diseases including coronavirus disease 2019 (COVID-19).
126	Host-Directed Therapies for COVID-19	MSC	Maeurer, M., Ramalho, R., Wang, F. S., & Zumla, A. (2021). Host-directed therapies for COVID-19. <i>Current opinion in pulmonary medicine</i> , 10.1097/MCP.0000000000000769. Advance online publication.	https://pubmed.ncbi.nlm.nih.gov/33629969/	2/23/2021	Current opinion in pulmonary medicine	Severe acute respiratory syndrome coronavirus-2-induced hyperinflammation is a major cause of death or end-organ dysfunction in COVID-19 patients. This paper reviews adjunct host-directed therapies (HDTs) for COVID-19 management.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
127	Mesenchymal Stem Cell-Derived Extracellular Vesicles: Promising Treatment for COVID-19 Pandemic	MSC	Azapira, N., Pourjafar, S., Habibi, A., Tayebi, L., Keshkar, S., & Kaviani, M. (2021). Mesenchymal Stem Cell-Derived Extracellular Vesicles: Promising Treatment for COVID-19 Pandemic. <i>Experimental and clinical transplantation : official journal of the Middle East Society for Organ Transplantation</i> , 10.6002/ect.2020.0296. Advance online publication.	http://www.ectrx.org/detail/epub/1/1/1/0/1020/0	2/23/2021	Experimental and clinical transplantation	This review suggests the consideration of mesenchymal stromal cell-derived extracellular vesicles as a new, safe, and effective therapeutic approach in the treatment of COVID-19 pneumonia.
128	Efficacy of Mesenchymal Stromal Cells and Cellular Products in Improvement of Symptoms for Covid-19 and Similar Lung Diseases	MSC	Banimohamad-Shotorbani, B., Farajpour, H., Sefat, F., Khosroshahi, S. A., Shafaei, H., & Heidari Keshel, S. (2021). Efficacy of Mesenchymal Stromal Cells and Cellular Products in Improvement of Symptoms for Covid-19 and Similar Lung Diseases. <i>Biotechnology and bioengineering</i> , 10.1002/bit.27729. Advance online	https://pubmed.ncbi.nlm.nih.gov/33629351/	2/25/2021	Biotechnology and bioengineering	This paper reviews in-vivo and clinical studies which have been used different sources of mesenchymal stromal cell, secreted extracellular vesicles, and secretome to improve and treat symptoms of COVID-19 and similar lung diseases.
129	Targeting Mesenchymal Stem Cell Therapy for Severe Pneumonia Patients	MSC	Lam, G., Zhou, Y., Wang, J. X., & Tsui, Y. P. (2021). Targeting mesenchymal stem cell therapy for severe pneumonia patients. <i>World journal of stem cells</i> , 13(2), 139–154. https://doi.org/10.4252/wjsc.v13.i2.139	https://www.wjnet.com/1948-0210/full/v13/i2/139.htm	2/26/2021	World Journal of Stem Cells	This article reviews the therapeutic potential and amplifiable merits of mesenchymal stem cells (MSCs) established over the past decade and summarize pioneering clinical progress of MSC-based strategies to treat lung diseases considering the current demands of the pandemic and future prospects.
130	The Praise of Uncertainty: A Systematic Living Review to Evaluate the Efficacy and Safety of Drug Treatments for Patients with Covid-19	MSC	Cruciani, F., Amato, L., De Crescenzo, F., Mitrova, Z., Saule, R., Vecchi, S., & Davoli, M. (2021). L'elogio dell'incertezza: una revisione sistematica living per valutare l'efficacia e la sicurezza dei trattamenti farmacologici per pazienti affetti da covid-19 [The praise of uncertainty: a systematic living review to evaluate the efficacy and safety of drug treatments for patients with covid-19]. <i>Recenti progressi in medicina</i> ,	https://www.recentiprogressi.it/archivio/3565/articoli/35458/	3/1/2021	Recenti progressi in medicina	This review aimed to synthesize and evaluate the quality of evidence of efficacy and safety for the treatment.
131	Stem Cells and COVID-19: Are the Human Amniotic Cells a New Hope for Therapies Against the SARS-CoV-2 Virus?	MSC	Riedel, R. N., Pérez-Pérez, A., Sánchez-Margalet, V., Varone, C. L., & Maymó, J. L. (2021). Stem cells and COVID-19: are the human amniotic cells a new hope for therapies against the SARS-CoV-2 virus?. <i>Stem cell research & therapy</i> , 12(1), 155. https://doi.org/10.1186/s13287-021-02216-w	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7919997/	3/1/2021	Stem Cell Research and Therapy	This paper reviews the existing data about the stem cells use for COVID-19 treatment, including the ongoing clinical trials.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
132	Mesenchymal Stromal Cell-Based Therapy: A Promising Approach for Severe COVID-19	MSC	Xiong, J., Chen, L., Zhang, L., Bao, L., & Shi, Y. (2021). Mesenchymal Stromal Cell-Based Therapy: A Promising Approach for Severe COVID-19. <i>Cell transplantation</i> , 30, 963689721995455. https://doi.org/10.1177/0963689721995455	https://pubmed.ncbi.nlm.nih.gov/33650894/	3/2/2021	Cell Transplantation	This review summarizes the basic characteristics and mechanisms of COVID-19 and MSCs, outlined some preclinical and clinical studies of MSCs or MSC-EVs for respiratory virus infection such as influenza virus and SARS-CoV-2, shed light on the common problems that we should overcome to translate MSC therapy into clinical application, and discussed some safe issues related to the use of MSCs.
133	Mesenchymal Stem Cell Alongside Exosomes as a Novel Cell-Based Therapy for COVID-19: A Review Study	MSC	Dauletova, M., Hafsan, H., Mahhengam, N., Zekiy, A. O., Ahmadi, M., & Siahmansouri, H. (2021). Mesenchymal stem cell alongside exosomes as a novel cell-based therapy for COVID-19: A review study. <i>Clinical immunology (Orlando, Fla.)</i> , 108712. Advance online publication. https://doi.org/10.1016/j.clim.2021.108712	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7935675/	3/6/2021	Clinical Immunology	This review study discusses the characteristics and benefits of MSCs therapy as well as MSC-secreted exosome therapy in treatment of COVID-19 patients.
134	Potency of Mesenchymal Stem Cell and Its Secretome in Treating COVID-19	MSC	Chouw, A., Milanda, T., Sartika, C. R., Kirana, M. N., Halim, D., & Faried, A. (2021). Potency of Mesenchymal Stem Cell and Its Secretome in Treating COVID-19. <i>Regenerative engineering and translational medicine</i> , 1–12. Advance online publication. https://doi.org/10.1007/s40883-021-00202-5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7945610/	3/10/2021	Regenerative Engineering and Translational Medicine	This review focuses on the potency of mesenchymal stem cells (MSCs) and MSC-derived secretome for treating COVID-19 patients.
135	Mesenchymal Stem Cells: Biological Characteristics and Application in Disease Therapy	MSC	Lou, S., Duan, Y., Nie, H., Cui, X., Du, J., & Yao, Y. (2021). Mesenchymal stem cells: Biological characteristics and application in disease therapy. <i>Biochimie</i> , S0300-9084(21)00073-0. Advance online publication.	https://pubmed.ncbi.nlm.nih.gov/33711361/	3/10/2021	Biochimica et Biophysica Acta	This review describes the biological characteristics of MSCs and discuss the research advances of MSCs in regenerative medicine, immunomodulation, oncology, and COVID-19, to fully understand the range of diseases in which MSC therapy may be beneficial.
136	Efficacy of the Current Investigational Drugs for the Treatment of COVID-19: A Scoping Review	MSC	Wadaa-Allah, A., Emhamed, M. S., Sadeq, M. A., Ben Hadj Dahman, N., Ullah, I., Farrag, N. S., & Negida, A. (2021). Efficacy of the current investigational drugs for the treatment of COVID-19: a scoping review. <i>Annals of medicine</i> , 53 (1), 318–334. https://doi.org/10.1080/07853890.2021.1875	https://www.tandfonline.com/doi/full/10.1080/07853890.2021.1875500	3/12/2021	Annals of Medicine	There are thousands of studies published on the available treatments for COVID-19 virus in the past year. This review synthesizes and summarizes the evidence from published studies on the safety and efficacy of experimental treatments of COVID-19.
137	Research Progress of Mesenchymal Stem Cell Therapy for Severe COVID-19	MSC	Cai, Q., Yin, F., Hao, L., & Jiang, W. H. (2021). Research Progress of Mesenchymal Stem Cell Therapy for Severe COVID-19. <i>Stem cells and development</i> , 10.1089/scd.2020.0198. Advance online publication.	https://www.liebertpub.com/doi/10.1089/scd.2020.0198?url_ver=Z39.88-2003&rft_id=ori:rid:crossref.org&rft_dat=cr_pub%20%20pubmed	3/15/2021	Stem Cells and Development	This article will review the possible mechanisms of MSCs in the treatment of severe COVID-19.

#	Article Name	Cell Type	Citation	Article Link	Date	Journal Name	Summary
138	Mesenchymal Stem/Stromal Cells as a Valuable Source for the Treatment of Immune-Mediated Disorders	MSC	Markov, A., Thangavelu, L., Aravindhan, S., Zekiy, A. O., Jarahian, M., Chartrand, M. S., Pathak, Y., Marofi, F., Shamlou, S., & Hassanzadeh, A. (2021). Mesenchymal stem/stromal cells as a valuable source for the treatment of immune-mediated disorders. <i>Stem cell research & therapy</i> , 12(1), 100. https://doi.org/10.1186/s13287-021-02265-1	https://stemcellres.biomedcentral.com/articles/10.1186/s13287-021-02265-1	3/18/2021	Stem Cell Research and Therapy	This paper discussed the therapeutic applications of MSC secretome and its biomedical aspects related to immune-mediated conditions.
139	Immunoregulatory Therapy Strategies that Target Cytokine Storms in Patients with COVID-19	MSC	Wang, X., He, Z., & Zhao, X. (2021). Immunoregulatory therapy strategies that target cytokine storms in patients with COVID-19 (Review). <i>Experimental and therapeutic medicine</i> , 21 (4), 319. https://doi.org/10.3892/etm.2021.9750	https://www.spandidos-publications.com/10.3892/etm.2021.9750	4/1/2021	Experimental and Therapeutic Medicine	In this review, cytokine storms caused by SARS-CoV-2 infections are evaluated and discussed, and advances in immunoregulatory therapy strategies for patients with COVID-19 are reviewed.
140	Are Mesenchymal Stem Cells and Derived Extracellular Vesicles Valuable to Halt the COVID-19 Inflammatory Cascade? Current Evidence and Future Perspectives	MSC	Mongiù-Tortajada, M., Bayes-Genis, A., Rosell, A., & Roura, S. (2020). Are mesenchymal stem cells and derived extracellular vesicles valuable to halt the COVID-19 inflammatory cascade? Current evidence and future perspectives. <i>Thorax</i> , 76(2), 196–200. Advance online publication.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7815888/	12/15/2021	Thorax	This review discusses the management of potential inflammatory complications of COVID-19 by using appropriate immunosuppressive and immunomodulatory drugs.

Pubmed:

Advanced search settings, added words in quotation marks to search terms in title. Titles always
"cell therapy" AND "covid"
"MSCs" AND "covid"
"mesenchymal" AND "covid"
"stem cell" AND "covid"
"T cell" AND "covid"
"natural killer" AND "covid"
"hematopoietic" AND "covid"
"progenitor" AND "covid"
"induced pluripotent stem cell" AND "covid"
Any field: "stem cell" AND "covid"

Search Terms Used on Google:

Mesoblast covid stem cell
Cell therapy covid

Scopus:

"covid"