

2ND INTERNATIONAL CONFERENCE ON CELL SCIENCE AND REGENERATIVE MEDICINE



Hannah J. Stage, Heidrun Gehlen

Equine Clinic, Freie Universität Berlin, Germany

Mesenchymal Stem Cells and Their Extracellular Vesicles as a Future Treatment Strategy for Equine and Human Asthma? – A Literature Review

Abstract: Asthma is a chronic, inflammatory, non-infectious respiratory disease with high prevalence in humans and horses. Severe equine asthma (EA) exerts strong similarities to human asthma (HA). In both species, treatment success is not always successful and includes bronchodilators, mucolytics and corticosteroids, whereas the latter can cause systemic side effects, underlying the need for new treatment strategies. Multipotent mesenchymal stem cells (MSCs) mainly act through their extracellular vesicles (MSC-EVs) with promising antiinflammatory and immunomodulatory paracrine effects and could therefore be used as new treatment option for lung diseases. The study's aim was to compare the therapeutic effects of MSCs and MSC-EVs in EA and HA based on the 'One Medicine, one Health' approach.

The research question addressed whether asthmatic human patients could benefit from new treatment approaches of asthma affected horses and vice versa. An extensive literature search was carried out, including publications between 2010 and 2025. In EA and HA first clinical studies investigated the safety and clinical efficiency of MSCs, whereas, to the best of the author's knowledge, MSC-EVs have not yet been used in these patients clinically. In horses with severe EA a first study showed that intrabronchial applicated autologous adipose tissue-derived MSCs significantly improved long-term clinical symptoms after one year. In 2022, the first human asthmatic patient benefited significantly from intravenously applied allogenic umbilical cord-derived MSCs two and six months after treatment, as demonstrated by reduction in nebulizer usage. Further single clinical studies followed. In conclusion, the horse represents a suitable model for allergic neutrophilic HA. Further studies investigating the clinical efficiency of MSCs and especially their MSC-EVs will lead to better treatment options for both, humans and horses.

Keywords: asthma, equine, human, mesenchymal stem cells, extracellular vesicles, regenerative medicine

Biography: Dr. Hannah Julia Stage is a research assistant and veterinarian at the Equine Clinic of the Freie Universität of Berlin, Germany (Department of Equine Internal Medicine). In her thesis she focused on the characterisation and multilineage differentiation potential of mesenchymal stem cells derived from equine adipose tissue. Her special interest lies in stem cells and potential new treatment strategies, especially in equine internal medicine.



2ND INTERNATIONAL CONFERENCE ON CELL SCIENCE AND REGENERATIVE MEDICINE

References:

- § Adamić N, Prpar Mihevc S, Blagus R, Kramarić P, Krapež U, Majdić G, Viel L, Hoffman AM, Bienzle D, Vengust M. Effect of intrabronchial administration of autologous adipose-derived mesenchymal stem cells on severe equine asthma. *Stem Cell Res Ther.* 2022 Jan 21;13(1):23. doi: 10.1186/s13287-022-02704-7. PMID: 35063028; PMCID: PMC8777441.
- § Adamić N, Vengust M. Regenerative medicine in lung diseases: A systematic review. *Front Vet Sci.* 2023 Jan 17;10:1115708. doi: 10.3389/fvets.2023.1115708. PMID: 36733636; PMCID: PMC9887049.
- § Bullone M, Lavoie JP. The equine asthma model of airway remodeling: from a veterinary to a human perspective. *Cell Tissue Res.* 2020 May;380(2):223-236. doi: 10.1007/s00441-019-03117-4. Epub 2019 Nov 12. PMID: 31713728.
- § ClinicalTrials.gov, National Library of Medicine, NCBI National Center for Biotechnology Information, Bethesda, MD, USA, 2025, <https://clinicaltrials.gov> (last access on 26/02/2025 at 15:02 pm)
- § Couëtil, L.L., et al., Inflammatory Airway Disease of Horses--Revised Consensus Statement. *J Vet Intern Med*, 2016. 30(2): p. 503-15.
- § Leclerc M, Lavoie-Lamoureux A, Lavoie JP. Heaves, an asthma-like disease of horses. *Respirology.* 2011 Oct;16(7):1027-46. doi: 10.1111/j.1440-1843.2011.02033.x. PMID: 21824219.
- § Sharan, J., Barmada, A., Band, N., Liebman, E., & Prodromos, C. (2023). First report in a human of successful treatment of asthma with mesenchymal stem cells: a case report with review of literature. *Current Stem Cell Research & Therapy*, 18(7), 1026-1029.