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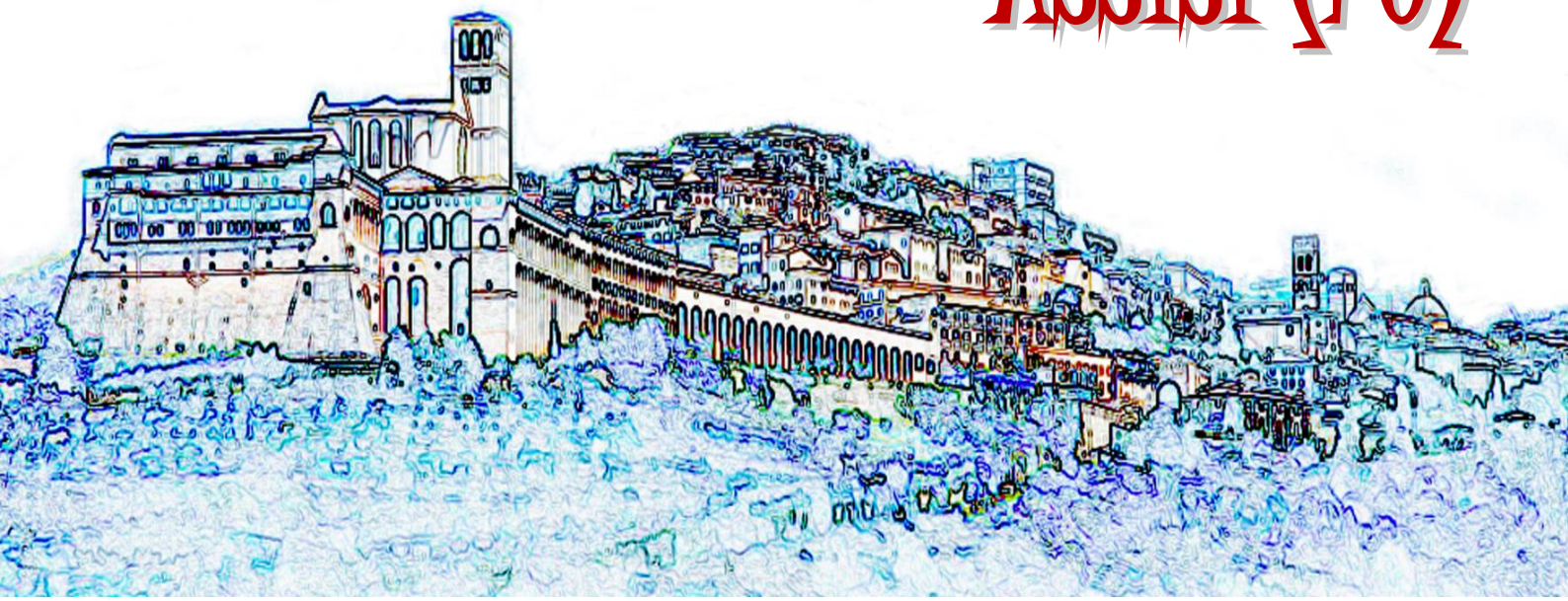
Gruppo Italiano Staminali Mesenchimali

Palazzo del Monte Frumentario

Assisi (PG)



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MSCS IN VETERINARY MEDICINE: WHY AND HOW DO THEY WORK?

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Abstract

The effective management of domestic animals, for their owners, requires sophisticated new treatments and preventive strategies. MSCs are the most promising candidates for tissue engineering and regenerative medicine. BM is the common source of MSCs for clinical applications in veterinary medicine. Alternatively, AT is used; it is ubiquitously available and has several advantages compared to BM. In fact, it is easily accessible in large quantities with minimal invasive harvesting procedures and yields a high amount of MSCs. However, for both sources, an invasive procedure is required and a large variability in cell yield related to the donor was demonstrated. Furthermore, they have limited potential in terms of in vitro proliferation capability and do not appear to noticeably improve long-term functionality compared to MSCs derived from extra-fetal tissues. Foetal adnexa represent a MSCs source readily available and easily procured, without invasive procedures. MSCs from foetal adnexa are defined as an intermediate between embryonic (ESCs) and adult SCs, due to the preservation of some characteristics typical of the primitive native layers. Among foetal adnexal tissues, the major sources of MSCs are: umbilical cord blood, amniotic fluid, amniotic membrane, Wharton's Jelly. Both in human and domestic animals, MSCs from these sources may be useful for immediate use or in later stages of life, after cryopreservation in cell banks.

As previously reported in human, also in domestic animals, MSCs are a population of multipotent cells that meet the following criteria: plastic adherence when maintained in standard culture conditions; differentiation toward different cell types in vitro; expression of CD105, CD73, CD90, lack of CD45, CD14, CD11b, CD79a, CD19, major histocompatibility complex surface molecules. Usually, clinical treatments with MSCs are based on their transplantation but only a small percentage of them engraft successfully. The ability of equine adult MSCs, IFN-gamma and TNG-alpha stimulated, to secrete numerous soluble mediators, implicated in the inhibition of T-cell proliferation, was demonstrated. Moreover, the presence of active genes specific for anti-inflammatory and angiogenic factors was recently observed in non-stimulated cells derived from equine amniotic membrane and Wharton's jelly. In addition, recent findings indicate that EVs are released in culture medium from domestic animals MSCs, derived from both adult tissues and fetal adnexa. In a preliminary study in vitro, the possible use of EVs in equine endometrial and tendon pathologies was evaluated. Furthermore, because of their capacity to encapsulate both hydrophilic and lipophilic molecules and to deliver them, EVs from MSCs have been considered as drug delivery systems, and a preliminary study was conducted on canine MSCs. As reported in the literature, MSCs from different sources have different characteristics that may drive their therapeutic use. These could be noteworthy for domestic animals as well as for other mammalian species, including humans.