Meet GM-CSF

The great communicator

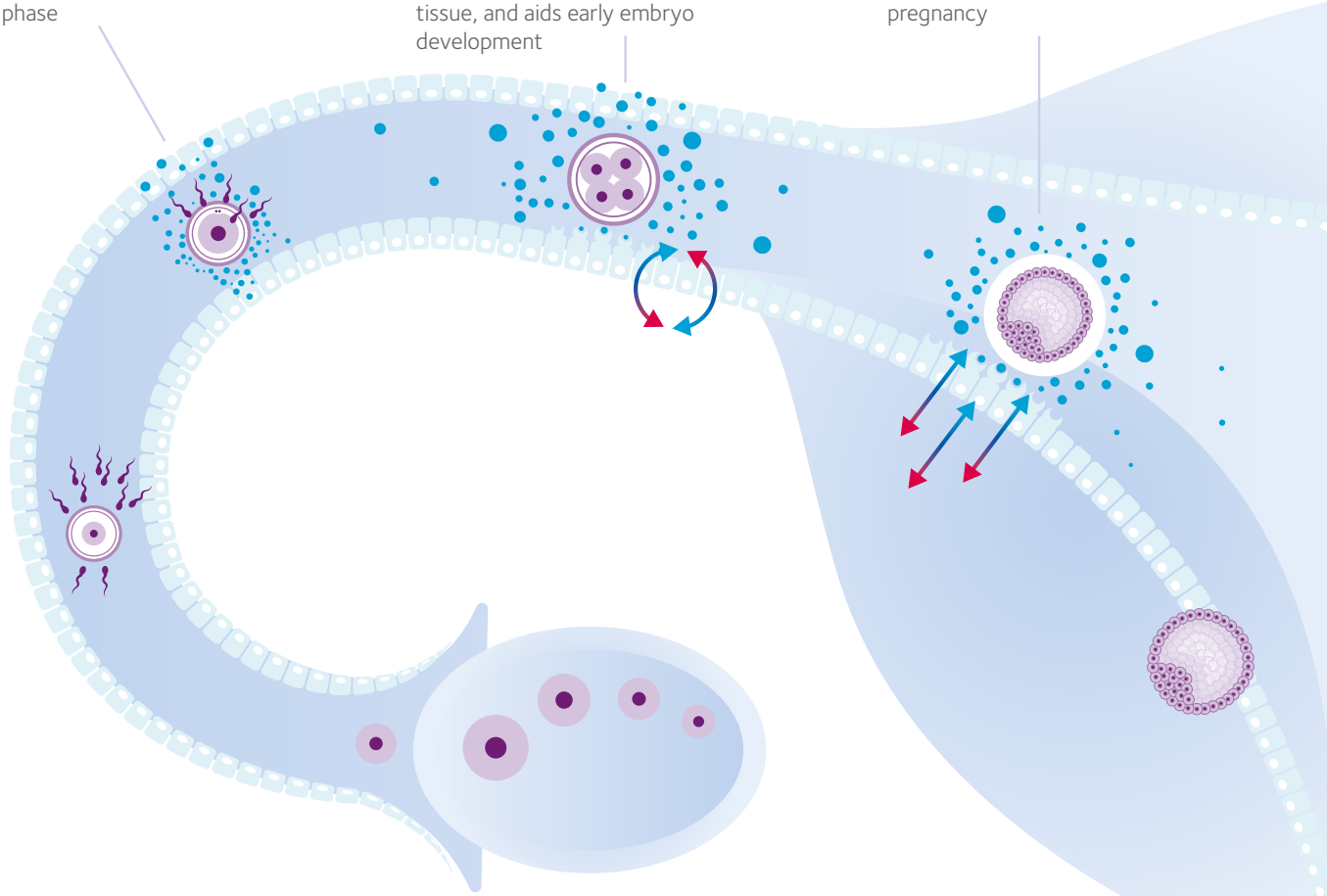
CooperSurgical®

The essential roles of Granulocyte-Macrophage Colony-Stimulating Factor (GM-CSF) in early embryonic development and successful implantation

1 Conception
GM-CSF is secreted into the fallopian tube and uterus during the mid-luteal phase

2 Development
GM-CSF mediates communication between embryo and maternal tissue, and aids early embryo development

3 Implantation
GM-CSF promotes chances of implantation success and ongoing pregnancy



1 Conception
After natural conception *in vivo*, decidual tissue within the endometrium secretes the GM-CSF cytokine during the mid-luteal phase, bathing the developing embryo.[1-4] This stimulates the conversion of circulating neutrophils to poly-morphonuclear myeloid-derived suppressor cells, which facilitate immune tolerance of the implanting foetal allograft.[5]

2 Development
Receptors for GM-CSF are expressed on the surface of the embryo from the zygote through to the implanting blastocyst stage and after implantation. GM-CSF is one of a family of pleiotropic cytokines that mediate communication between the embryo and maternal tissue. It is believed to be involved in the regulation of diverse reproductive functions, including gamete maturation, ovulation, embryogenesis, implantation, pregnancy, and parturition.[1,6] Additionally, it protects cells from constitutive death pathways mediated by p53-induced apoptosis.[7]

3 Implantation
The autocrine and paracrine signaling mediated by GM-CSF fine-tunes gene expression, protects embryos from cell stress, and promotes normal glucose uptake. This, in turn, enhances cell survival and facilitates on-time development and implantation.[1]

1. Robertson, S.A. (2018) GM-CSF in IVF Embryo Culture. *ART Scientific* Edition 4: 1-4. 2. Zhao, Y. & Chegini, N. (1994) Human fallopian tube expresses granulocyte-macrophage colony stimulating factor (GM-CSF) and GM-CSF alpha and beta receptors and contain immunoreactive GM-CSF protein. *J Clin Endocrinol Metab* 79: 662-665. 3. Giacomini, G., Tabibzadeh, S.S., Satyaswaroop, P.G. et al. (1995) Epithelial cells are the major source of biologically active granulocyte macrophage colony-stimulating factor in human endometrium. *Hum Reprod* 10: 3259-3263. 4. Chegini, N., Tang, X.M., Dou, Q. (1999) The expression, activity and regulation of granulocyte macrophage-colony stimulating factor in human endometrial epithelial and stromal cells. *Mol Hum Reprod* 5: 459-466. 5. Li, C., Chen, C., Kang, X. et al. (2020) Decidua-derived granulocyte macrophage-colony stimulating factor induces polymorphonuclear myeloid-derived suppressor cells from circulating CD15+ neutrophils. *Hum Reprod* 35: 2677-2691. 6. Ostanin, A.A., Aizikovich, B.I., Aizikovich, I.V. et al. (2007) Role of cytokines in the regulation of reproductive function. *Bull Exp Biol Med* 143: 75-79. 7. O'Neill, C., Li, Y., Jin, X.L. (2012) Survival signaling in the preimplantation embryo. *Theriogenology* 77: 773-784.

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