Fetal cells which help cure the mother, even after birth

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During pregnancy, the fetus releases cells which cross the placenta, survive and integrate into the bone marrow of the mother. Recent results suggest that these fetal cells can help the healing of wounds in the mother, even after birth.

MOTHER-CHILD EXCHANGE

In eutherian (with placentas) animals, the **mother's blood** communicates directly with the fetal circulation to provide oxygen and nutrients essential for its development. This intimate mother-child communication is not, however, uniquely unidirectional: throughout pregnancy, some cells derived from the fetus reach the maternal circulation and can implant within the body of the mother, particularly within the bone marrow where they can remain in a latent state for several decades. This phenomenon, called microchimerism, means that the mothers possess a reservoir of stem cells, undifferentiated, and which are well tolerated by the immune system because they express a mixture of proteins at their surface, half from each parent.

REPLACING DAMAGED CELLS

One of the most important characteristics of stem cells is that they are quite versatile and can form a panoply of different cells. This seems to be true for microchimeric fetal cells, as several studies have shown that these cells can be recruited to different organs where they transform into specialized cells (neurons, hepatocytes and enterocytes) capable of replacing those which have been damaged.

This phenomenon is particularly apparent in the repair of skin wounds following an injury. To replace the cells which have been destroyed, the stem cells present in the deeper layers of the skin divide and migrate towards the lesion in order to form new, healthy tissue which will plug the breach. This process requires, however, the formation of a new branch of blood vessels by angiogenesis in order to supply these new cells with oxygen and the nutrients necessary for their function. And this is where the fetal cells come into play: the group of Professor Selim Aractingi in Paris has shown that fetal cells are present within the mother's wounds, both before and after delivery, and that these cells possess the ability to form blood vessels which contribute to the repair of the wound.

MOBILIZING THE FETAL CELLS

Work from the same team, recently published in the prestigious journal *Nature Communications*, allows us to better understand the mechanisms involved and could permit us to use this property of fetal stem cells for therapeutic purposes[1]. By specifically isolating the fetal cells involved in wound healing, the researchers discovered that these cells possessed the characteristic of expressing high quantities of a receptor called Ccr2 at their surface. They also observed that the activation of this receptor by a protein (Ccl2) greatly improved wound healing in women who were pregnant or who had given birth, indicating that it is the recruitment of fetal cells which was responsible for this process. According to the authors, the injection of Ccl2 to mobilize the fetal cells could open a way for a new approach for treating chronic skin wounds, such as those associated with diabetes, for example.

The mother-child relation is thus not as unidirectional as might have been thought. It exists more as a form of commensalism, in which the fetus contributes to the reservoir of the mother's stem cells in exchange for nourishment. Who says children are selfish?

(1) Castela M et al. Ccl2/Ccr2 signalling recruits a distinct fetal microchimeric population that rescues delayed maternal wound healing. Nat. Commun. 2017;8:156463.

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