



Placental Immunology in Eutherian Mammals

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Editorial

The acquisition of maternal tolerance to the allogeneic foetus is a major focus of immunologists' thoughts on the immune system during pregnancy. This viewpoint is undoubtedly oversimplified because it ignores the physical reality that the maternal interaction with the placenta, rather than the baby, holds the key to our understanding of pregnancy's "immunological conundrum." The intermingling of placental and maternal cells in the uterine wall should be a special focus, as here is where direct tissue contact occurs during placentation.

A great deal of misunderstanding has resulted from a failure to distinguish between the local uterine immune response to the placenta and the systemic immune response to foetal cells (which generally transfer to the mother during birth). The sequence of anatomical and physiological processes that occur during placentation must be understood in order to comprehend maternal uterine immune responses to the placenta. Herein lies the difficulty: each species has developed its own method, resulting in a wide range of placentation types in mammals.

The amount of placental trophoblast cell invasion into the uterus is one of the most noticeable variations. This can vary from little invasion (as in epitheliochorial placentation) to substantial invasion (as in haemochorial placentation), in which trophoblast cells penetrate uterine blood vessels and come into direct contact with maternal blood. Humans, like many laboratory animals such as mice, rats, guinea pigs, and rabbits, have haemochorial placentas, but the human placenta is extremely invasive. The maternal reaction that each placental type elicits

must also be considered when comparing different placental methods. There is also a lot of variety here. The uterine mucosa is converted into a highly specialised tissue known as the decidua during haemochorial placentation (a process referred to as decidualization). In animals with non-invasive epithelio chorial placentae, this does not happen.

Decidualization in primates is directly related to the degree of invasion, thus those species with the most invasive placentae show the most pronounced decidual alteration. The inflow of a unique lymphocyte population of maternal uterine natural killer cells is a prominent characteristic of the decidua. Natural killer cells are becoming more prominent in the uterine immune response to invasive types of placentation, while their exact involvement is yet unknown. The trophoblast cells are the cells that define the border between the mother and the foetus.

These cells come from the blastocyst's outer layer and feature a number of peculiar traits that immunologists prefer to overlook. Because trophoblast cells are not constrained by the same developmental restrictions as the rest of the embryo, they express paternal and maternal genes in a distinct way. The production of MHC and MHC-like genes by trophoblast cells, which might represent possible ligands for immunological receptors on uterine Natural Killer cells, lymphocytes, and myelomonocytic cells, is of particular interest to immunologists. Human trophoblast cells have been widely researched, and they express a unique and interesting array of HLA class I molecules, whose activities may hold the secret to a successful temporary cohabitation of two persons.

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