



Immunology of the maternal-fetal interface

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Literature review current through: **Sep 2023**.

This topic last updated: **May 30, 2023**.

INTRODUCTION

In pregnant females, local adaptation of the maternal immune system allows for successful coexistence between the mother and the semi-allograft that is the fetus/placenta expressing both maternal (self) and paternal (nonself) genes [1-4]. Cytotoxic adaptive immune responses are diminished, bypassed, or even abrogated, while regulatory adaptive immunity is enhanced [5,6]. By contrast, innate (natural) immunity remains intact, serving two purposes: one, to continue to provide host defense against infection, and two, to interact with fetal tissues to promote successful placentation and pregnancy [4,7-10].

An introduction to the immunology of pregnancy and the maternal-fetal interface is presented in this topic review. Basic immunologic concepts are reviewed separately. (See "[An overview of the innate immune system](#)" and "[The adaptive cellular immune response: T cells and cytokines](#)".)

IMMUNE DEFENSE MECHANISMS OF THE PLACENTA AND EXTRAPLACENTAL MEMBRANES

The placenta and fetal membranes are directly exposed to maternal blood and tissues. Thus, unique features of the cells that comprise this interface must underlie the remarkable ability of the genetically distinct fetal tissue to inhabit the maternal host.

Many immunologists studying reproduction agree that maternal immunity is not solely antagonistic to trophoblast tissue [11,12]. Indeed, a maternal immune presence in the decidua is essential for successful implantation [4]. Evidence of the opposite hypothesis (ie, that trophoblasts have offensive mechanisms for actively killing maternal lymphocytes) is

lacking. It is clear, however, that the placenta is normally protected from the killing functions of maternal cells through a number of immune-protective mechanisms [13].

Trophoblast cells — Trophoblast cells are the specific placental cell layer that protects the embryo from those components of the maternal immune system dedicated to destroying foreign tissues. The inner cell mass and resultant embryo are secluded and protected beneath a layer of trophoblastic cells throughout pregnancy (figure 1).

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