

The first 7 days towards pregnancy

It is well known that many factors play a role in the successful insemination and establishing of pregnancy in dairy cows. A Japanese review article summarized the influences of the corpus luteum (CL), oviduct and uterus on embryo survival during the first 7 days after insemination. Luteinizing hormone (LH) has fundamental tasks in the process of ovulation and the subsequent development of a CL. The innate immune response also plays an essential part in this development by supporting angiogenesis and ovulation. At the end of the CL development, large and small luteal cells produce progesterone. In non-pregnant cows, the uterus produces $\text{PGF}_{2\alpha}$ between day 17 and 19, which leads to CL regression. In pregnant cows, the trophoblast produces Interferon τ (IFNT), which reduces the pulsatile release of $\text{PGF}_{2\alpha}$, thus preventing luteolysis. Low progesterone levels are associated with embryonic death and decreased conceptus development. P4 is also important for the maternal immune tolerance towards the embryo.

The 5 most important interconnected steps towards pregnancy are:

1. Sperm – uterus: When a sperm enters the uterus and gets contact to the endometrium, the maternal immune system reacts to the paternal DNA and a pro-inflammatory immune response occurs. Cytokines and prostaglandins as well as PMNs, are released in order to remove dead cells and pathogens.
2. Sperm – oviduct: Unlike the uterus, the oviduct suppresses the pro-inflammatory immune response and, thus, supports sperm survival to allow fertilization. Many oviductal processes have not been clarified yet.
3. Embryo – oviduct: On the way to the uterus, the embryo communicates with the oviduct by secreting bioactive molecules. This leads to a down-regulation of the complement system and antigen presentation, which prevents a maternal immune response and ensures the embryo survival.
4. Embryo – uterus: In the uterus, the embryo does not communicate with the endometrium by direct contact, but through the secretion of bioactive molecules. In addition, an anti-inflammatory immune response is triggered.
5. Systemic embryo-maternal crosstalk: Blood leukocytes detect the presence of an embryo in the uterus and upregulate the Th2 response. The recognition of the embryo is also stimulated by the INFT signal.

Our conclusion: The first days after insemination are critical for successful embryo development; even the slightest dysfunctions can lead to early embryonic loss. Therefore, the management of the postpartum period, including feeding, disease monitoring, breeding management, is crucial to optimally prepare the cow for these fine-tuned processes. (cz)

Source: Talukder et al. (2020), Theriogenology 150: 313-320.