

Regulation of Mouse Uterine Aquaporin Expression in the Preimplantation Period and the Impact of Ovarian Superovulation

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Uterine fluid level in early pregnancy is a critical determinant of fertility and aquaporins (AQPs), selective bidirectional transporters that move water along a concentration gradient, are major regulators of water homeostasis. The expression of mouse uterine AQP genes and proteins in early pregnancy has been studied but these studies yielded inconsistent results. To better understand their roles in regulating luminal fluid levels in the preimplantation period, we conducted a multi-pronged analysis of uterine *Aqp*/AQP expression on the morning of D1 and D4 of pregnancy in ovarian superovulated and non-superovulated WT C57 Bl/6 mice. Expression was also determined in ovariectomized mice that received E2, P4 or E2 + P4 and in D4 pregnant RU486-treated mice. Our analyses revealed that in the non-superovulated females, *Aqp3*, *Aqp4*, *Aqp5* and *Aqp8* exhibit greater expression on D1 and are induced by E2 while *Aqp1* and *Aqp11* exhibit greater expression on D4 and are induced by P4. Interestingly, *Aqp9* is constitutively expressed. We also observed that P4 inhibits the E2-induced expression of *Aqp3* and *Aqp4* (with the negative effect on *Aqp3* being transient) while *Aqp1* and *Aqp11* are negatively regulated by E2. Superovulation increased *Aqp1*, *Aqp3*, *Aqp5* and *Aqp8* expression on D4 and triggered dramatic spatial changes in AQP expression in both D1 and D4 uteri. These aberrant changes in expression following superovulation likely reduce implantation success and might be managed by targeting E2 or P4 levels and actions in the uterus during *in vitro* fertilization and embryo transfer (IVF/ET).