ABSTRACT

The aim of my thesis was to identify proteins involved in chemical communication and especially those that are involved in sexual signalling. Volatile chemical signals are transported with lipocalins in their beta-barrel structure to present their ligands to receptors or out of the body. Thus, I focused on the identification of these proteins in saliva and vaginal secretion of the house mouse using proteomic and transcriptomic approaches. Due to a cyclic manner of reproduction and its hormonal control, I have also focused on the role of estradiol on sperm phenotype in the laboratory mouse.

We have identified an elevated sexual dimorphism in several lipocalins (i.e. 10 out of 20) in the saliva proteome where they may play a role in sexual signalling (i.e. similar to their described roles in the mouse urine). Interestingly, vaginal secretion also contains lipocalins and they rise from proestrus to estrus and remain steady during metestrus. Such variation provides evidence that they serve sexual signalling, however, due to their elevated levels during metestrus it is most likely that their ligands function as signals and not the proteins themselves. On the level of sperm phenotype, we have provided evidence, that experimental concentrations of estradiol have differential effects on sperm. This is due to a differential activation of several signalling pathways via their receptors based on varying levels of estradiol.

To conclude, the regulation of reproduction and female sexual signalling are under the control of steroid hormones - namely estradiol and progesterone. In our study we provide evidence that the same female hormones are responsible for the variation in chemical signals and for the differences in fertilizing capacity of sperm.