

CEIPEX VUVEL/VRI TOPIC 01

	GL leader	Martin Anger, DVM, PhD
1	CEIPEX RESEARCH TOPIC LEVEL2	Molecular Veterinary Medicine: Reproduction
2	RESEARCH GROUP	Mammalian Reproduction
3	TOPICS/FOCUS	Advanced Proteomic Approaches in Mammalian Oocytes and Early Embryos
4	SUMMARY	The transition from a fully grown oocyte to a developmentally competent blastocyst represents one of the most complex cellular transformations during mammalian development. Within a short period, the oocyte must complete meiosis, undergo fertilisation, reorganise the maternal and paternal genomes, activate the embryonic genome and initiate the first embryonic cell divisions. A characteristic feature of this period is a significant dependence on maternally accumulated molecules, as transcription becomes silenced during the final stages of oocyte growth, while maternal transcripts are subsequently selectively translated and progressively degraded. Transcriptomic analysis itself is therefore unable to fully capture the functional condition of the oocyte and early embryo. Proteomics represents a key tool for directly characterising the protein composition and its dynamic changes during this developmental period. Its combination with micromanipulation techniques makes it possible to go beyond the analysis of whole oocytes and embryos and focus on physically isolated subcellular structures. This approach enables characterization of their specific proteomes, track protein reorganisation between individual developmental stages, and subsequent functional validation of identified molecular mechanisms. In our research, we use two mammalian models – the mouse and cattle – which enable us to study both conserved and species-specific mechanisms regulating chromatin organisation, the cell cycle and chromosome segregation. Errors in oocyte maturation, fertilisation and the first embryonic divisions can contribute substantially to reduced reproductive success. Understanding the mechanisms responsible for these errors may provide important insights into the origins of chromosomal abnormalities and early embryonic developmental failure, with relevance to both human assisted reproduction and reproductive efficiency in livestock species.
5	RG WEBPAGE/CONTACT	https://www.vri.cz/en/departments/genetics-and-reproductive-biotechnologies/