Abstract

A series of dynamic epigenetic changes need to happen to rebuild the gamete's genome after fertilization and to secure the totipotency of the zygote. The processes can be observed in both parental pronuclei, although the machinery providing the epigenetic dynamics probably lies in the maternal oocyte, more specifically in the germinal vesicle (GV).

GV can be divided into two fractions: a soluble and an insoluble fraction. The probable ability of the soluble fraction is remodelling the sperm head and the paternal pronucleus formation, while the insoluble fraction could be involved in reprogramming of the paternal genome and ensuring the developmental competence.

This thesis was focused on one of the epigenetic regulations which was DNA methylation and its rapid loss after fertilization. Putative mechanisms, which can occur there are the oxidation of methylated bases and their subsequent repair and replacement through the base excision repair (BER). This thesis tested a hypothesis that a protein lamin A/C, found in the insoluble fraction of the GV, is a possible candidate participating in the active demethylation through BER.

To examine the role of lamin A/C in BER, it was required to prepare such GV oocytes, which would contain both the soluble part of GV and protein lamin A / C. The selective enucleation was used to obtain cytoplasts containing the soluble GV fraction. These cytoplasts were then fertilised *in vitro* and the epigenetic status of the formed pronuclei was analysed by bisulfite sequencing to examine the methylation status of specific sequences.

This thesis did not confirm the hypothesis that lamin A/C participates in the DNA demethylation after fertilization. However, the role of the insoluble GV fraction has not been excluded. These results together provide an insight into DNA methylation reprogramming after fertilization and suggest its systemic complexity and it should be the subject of further studies.

Key words: active demethylation, germinal vesicle, lamin A/C, base excision repair (BER)