

Abstract

One of the basic characteristics of living systems is a sexual reproduction, when the germ cells, sperm and egg, fuse. The key process in the germ cells development is meiosis.

During meiotic division, several dramatic changes happen in the nucleus and different errors might appear, which may then result in various chromosomal aberrations and nondisjunctions leading to genetic diseases and infertility. The causes of infertility are very diverse, but many of them obviously come from the meiotic errors. One of the most critical parts for the successful meiotic progress is a prophase I, where the homologous chromosomes are paired by the protein structure of the synaptonemal complex (SC) and subsequent genetic recombinations by crossing-over accurate.

Vinculin (VCL) is a cytoplasmic actin binding protein in the focal adhesions and adherent junctions and VCL acts as their essential regulator. Recently, this protein was also found in the nucleus of germ cells of certain organisms. However, the nuclear functions of vinculin have not been described yet.

This diploma thesis focuses on the study of chromosomal dynamics in the gametogenesis of our mouse model, regarding the involvement of the nuclear vinculin in these processes. Our aim was to localize VCL in the nucleus of embryonic prophase oocytes using fluorescence microscopy. Next aim was to create VCL a conditional knock-out mouse (VCL cKO) and observe subsequent changes in the reproduction of these VCL cKO mice depending on the decreased expression of vinculin in the ovaries. We also compared morphological changes of the VCL depleted ovaries with the ovaries of the control mice.

According to our results, VCL localizes to the nucleus of embryonic prophase oocytes and its expression is dramatically reduced in the VCL cKO mice. These mice also showed an increased number of underdeveloped embryos, frequent abortions and reduced number of newborns, suggesting that VCL has an significant effect on the mouse female fertility.

Keywords: vinculin, meiosis, prophase I, gametogenesis, ovaries, mouse