

9th Yazd International Congress and Student Award on Reproductive Medicine with 4th Congress of Reproductive Genetics

Key Lectures

K-27

The effect of supporting the one carbon cycle on in vitro and in vivo fertilization outcomes

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One-carbon cycle (1-CC) is comprised of a series of metabolic pathways that can be categorized into folate and methionine cycles, transsulfuration pathway and recently formaldehyde cycle. These metabolic pathways are central to various important cellular functions that provide one-carbon units for essential biosynthetic reactions and for writing epigenetics marks. Folate is one of the most important promoters of 1-CC. It is well recognized that serious deficiency of folate during pregnancy is associated with adverse outcomes such as neural tube defects in the child. However, there is a growing concern about the potential adverse effects of high dose folate supplementation before and during pregnancy. Regarding this, there are few studies which report that excess folate consumption can cause developmental abnormalities and cognitive abnormalities in offsprings in mice. Moreover, two common inherited human mutations are the 677C > T and 1298A > C

mutations in the gene encoding methylenetetrahydrofolate reductase, which converts 5, 10-me-THF to 5-methyl-THF (m-THF, the active form of folate). These mutations may increase the un-metabolized form of folate and decrease m-THF which may explain to some extent why these mutations might be more prone to infertility and certain chronic illnesses. Therefore, monitoring of pregnant women for adequate dietary folate intake regarding the presence or absence of these mutations is required.

In addition, despite extensive improvements in assisted reproductive techniques (ARTs), the pre-implantation and post-implantation outcomes of ARTs have remained low. One of the main causes of these insufficiencies may be related to the in vitro manipulations and composition of the culture medium. Therefore, any changes that can bring these conditions closer to the in vivo situations can probably have a significant impact on ARTs. One of the important metabolic pathways during the process of folliculogenesis, oocyte maturation, and embryonic development is 1-CC. So, adding the substrates and cofactors of 1-CC may improve ARTs outcomes. In this presentation, first, we discuss the effect of folate deficiency and also the excessive dose of folate on fertility outcomes and then discuss the importance of various micronutrients involved in 1-CC during in vitro conditions.