

It has been shown that iron and folate are of great importance for women of reproductive age. It is very important that potential mothers have the appropriate levels of these nutrients in order to ensure healthy pregnancy and good fetal development. However, in many developed countries, including Poland, it has been shown that young women have inadequate intakes of iron and folate. Low levels of these micronutrients have also been observed in the daily food rations of pregnant women—a situation which is associated with an increased risk of anemia in the mother and neural tube defects in the fetus. For this reason, it is recommended that young women who are trying to conceive use folic acid and iron supplements. However, nothing is known about the bioavailability of these nutrients, so it is unclear what percentage of the dose will be absorbed and utilized by the body when both are taken. The bioavailability of nutrients and their metabolism in various cells depends on the interactions between the nutrients, and on the transporting factors in the gut and other tissues. Since cosupplementation of folate and iron is recommended, we should aim to increase our understanding of their interactions.

The aim of this project is to determine whether the simultaneous use of iron and folic acid affect their bioavailabilities, and whether their bioavailabilities also depend on the individual (genetic) variability of young women.

This research requires invasive studies that involve collecting tissues and blood. For this reason, two studies are planned: an animal experiment and a study involving young women of reproductive age.

In the animal experiment, tissues and blood will be collected. Blood samples will be taken in the human study.

In the first stage of the animal experiment (28 days), iron and folic acid deficiencies will be induced in rats through dietary deficiency in these micronutrients. In the second stage of the experiment, the rats will be fed a diet with an increased content of iron and folic acid. At 2, 10, and 21 days, some of the rats will be euthanized and their tissues and blood collected for analysis. There will also be a control group at every stage of the study; this group will be fed a standard diet (containing optimal level of nutrients).

The parameters of iron and folic acid status will be measured in the blood and tissue samples. The factors responsible for the transport of iron and folic acid (mRNA and protein) will be analyzed in small intestine and liver tissue.

The human study will be carried out in a population of women aged 18-35 years. In the screening study it is expected to recruit at least 100 women with iron and folic acid deficiency. Women with diagnosed deficiency will use iron and folic acid supplements for 3 months. Women without deficiency will be the control group and they will not receive any supplements. At baseline, and then once a month, blood samples will be collected from the women and used to assess the parameters of iron and folic acid status. The collected material will also be used to analyze variation (polymorphism) in genes that encode iron and folic acid transport proteins.

The use of different study periods in the animal experiment (2, 10, and 21 days of supplementation) and in the human study (1, 2, and 3 months of supplementation) is because we want to observe the short-term and long-term effects of the interactions between the micronutrients.

The results of this project may be useful for formulating precise recommendations for women of reproductive age.