Iron is a microelement involved in many crucial biological processes, among which erythropoiesis, a process which produces red blood cells, requires large amounts of iron incorporated into hemoglobin molecules. Therefore, it is not surprising that iron deficiency is one of the most common factors disturbing the course of erythropoiesis leading to iron deficiency anemia (IDA). Interestingly, this pathology occurs in suckling piglets of most contemporary domestic pig breeds. Critically low level of iron stores accumulated in the liver in the fetal life is considered a primary cause of neonatal IDA in pigs. Importantly, in mammals, after birth, iron released from hepatic cells, called hepatocytes, is a main source of this microelement to satisfy iron demand for erythropoiesis. During the neonatal period, an exogenous iron absorbed in the intestine from colostrum and milk represents a very small proportion in meeting iron needs of the organism. Interestingly, no cases of iron deficiency have been reported in the offspring of wild boar (*Sus scrofa*), remaining the most popular mammalian species living in wild, the ancestor of contemporary pig (*Sus scrofa domestica*) domesticated approximately 10 000 years ago. This suggests that the systemic processes ensure an appropriate balance between iron supply and demand. Wild boar piglets survive and develop correctly in their natural habitat without any iron supplements. By contrast, the obligatory use of parenteral iron supplementation in domestic piglets is current practice in the swine industry. Over the last century, pigs have been particularly intensively bred for a variety of productivity traits such as meat yield and fertility. This led to the creation of high-yielding pig breeds, characterized by more than 10 piglets in the litter, and thus strongly exceeding the number of piglets in the litter of wild boar (4-6 piglets per litter).

The aim of the project is to make a comparison of iron status and molecular basis of iron homeostasis between wild boar and Polish Landrace (a high reproductive performance breed) piglets. We will obtain regulated piglet number litters (4-6 piglet and standard > 10 piglet litters) through embryo transfer from the same superovulated donor female into closely related recipients. We plan to check whether the number of piglets in the litter may influence iron status and the regulation of iron metabolism in 1-day old piglets. Owing to this part of the project we will also get knowledge about molecular iron handling in piglets of wild boar, the most widely spread species from the *Suidae* family living in wild in Europe.

The next aim is to investigate how iron passes from the mother to the fetus across the placenta. Molecular mechanisms of trans-placental iron trafficking are least well understood aspect of iron metabolism in mammals. We will verify whether low efficiency of iron transport across the placenta of domestic pig female is responsible for deficient iron level in the liver of neonates. We hypothesize that in wild boar females molecular mechanisms of iron flux across the placenta are adequate to deliver sufficient amount of iron for few fetuses (and in consequence for few neonates). During relatively short period of intensive selection for reproductive traits, these mechanisms have not been adapted for growing requirements in the conditions of multi-fetal (10-12 fetuses) pregnancy. In our study we will use Next Generation Sequencing, a new technology of molecular biology allowing identification of genes potentially involved in iron transport across the placenta.

Finally, we will verify whether supplementation of Polish Landrace pregnant sows with heme iron (bovine hemoglobin) will contribute to the increase in hepatic iron stores in neonates. Although wild boars and domestic pigs are omnivores, their diet is mainly composed of plant matter (poor in heme iron). We hypothesize that genes related to heme turnover (including those involved in trans-placental heme transport) constitutively expressed and “not frequently used” under natural (wild boar)/standard (domestic pig) feeding conditions are triggered in response to high content of heme in the diet. If our concept works, this new procedure may replace routinely used intramuscular injection of iron to suckling piglets, a time- and labor-consuming procedure, which is stressful for these animals.