The main objective of this project is to study (on the laboratory mouse model) the role of kidneys in haem detoxification and iron reabsorption during neonatal jaundice. Neonatal jaundice is a physiological process caused by decay of foetal erythrocytes. It's present in around 40% of term and 100% of preterm babies and sometimes it takes the form of pathological condition. In foetal organism number of erythrocytes is much larger than in postnatal period (around 7 million cells per $1mm^3$) and haemoglobin content in blood is 30% higher than in adults. Moreover, foetal haemoglobin have higher affinity to oxygen than adult haemoglobin. Oxygen conditions change drastically after birth and excess of erythrocytes disintegrates. This process begins on the second day after birth and ends in 10^{th} day of age. In short period of time are generated large amounts of unconjugated bilirubin – product of haem decay. In hepatocytes unconjugated bilirubin is transformed to conjugated, water-soluble form and excreted to the bile. In new-born babies, especially preterm ones, liver is physiologically immature and enzymatic system responsible for bilirubin transformation is not completely formed. Therefore, excess of free bilirubin circulates in the body, infiltrates to the skin and mucosa, giving them characteristic, yellow colour. Accumulation of unconjugated bilirubin is highly toxic, because this compound can diffuse through blood-brain barrier and cause damage of brain structures, especially the basal nuclei. Thus, the proper course of neonatal jaundice is limited by efficient functioning of the liver. The main goal of the proposed project is to understand the role of kidneys in iron metabolism in early, postnatal period of life.

My research on role of kidneys in haem detoxification and iron recirculation includes analysis of gene expression, in this process information from DNA is read and rewritten for RNA and next translated for proteins. Proteins will be analysed using immunofluorescence method which allow for detection of their intracellular localisation. I will analyse genes and proteins involved in iron metabolism such as: membrane transporters - DMT1, HCP1, FLVCR, HRG1, HO-1 - enzyme responsible for haem degradation and ferroportin (FPN) – cellular iron exporter. I also plan to investigate the expression of hepcidin – hormone responsible for controlling systemic iron metabolism.

Results of preliminary study indicated that kidneys of new-born mice show significantly elevated expression of haem oxygenase 1 (HO-1) - an enzyme involved in the breakdown of haem, as well as the protein expression of ferroportin (FPN), which is responsible for iron export from the cell. These observations indicate on the involvement of the kidneys in the detoxification process of haem and its significant contribution to the iron recycling in neonates. In mammals, regulation of iron bioavailability is particularly important during early postnatal life, because it is a period of intense process of erythropoiesis (process of red blood cell production) and the fast growth of the organism. The results obtained in the planned project will give us a better understanding of the processes taking place in the organisms of new-born babies during neonatal jaundice. This is particularly important, because severe neonatal jaundice and bilirubin accumulation in the brain may have dangerous neurotoxic consequences in terms of damage to brain structure, resulting in neurological conditions such as epilepsy or deafness.