Kidney is the most often transplanted organ. Transplantation increases expectancy and quality of life in patients suffering from end-stage renal disease and renal dialysis. In recent years, the possibility to recover organs from the donors after cardiac death (DCD) became legally available in Poland, which results in an increase of donors numbers and consequently the condition of transplanted organs worsened. Although kidney transplantation has evolved greatly over the past few decades, the fact remains that in the process of removing a kidney from a donor, flushing and cooling it, then rapidly rewarming it once its blood vessels are connected in the recipient, there is a damage that occurs to the kidney that translates the loss of its function and loss of years of dialysis-free living for these patients. We hypothesize that MMPs, enzymes from the family of metalloproteinases, are involved in a significant amount of the injury that occurs to the transplant kidney. Hence, the addition of pharmacological agents (as MMPs inhibitors) during the procedure of preservation and cooling might reduce the damages of the kidneys Also we hypothesize, that ROS significantly contribute to the rewarming injury that occurs to the transplant kidney once its blood vessels are connected in the recipient (reoxygenation). We speculate that the inhibition of ROS production can prevent kidney from injury during transplantation. There are other useful proteins in the perfusate, valuable both as markers of injury and as potential targets of pharmacological intervention.

Our goal is to identify pharmacologic interventions that can be helpful in protecting the kidney from the injury that occurs during preservation and ultimately can increase the numbers of acceptable donor kidneys available for transplantation. The last step of these interventions will be monitoring of kidney ischemia and reperfusion injuries, by changes in biochemical markers of kidney damages in perfusates (*in vitro*) and *via* proteomics approach, then ultimately *in vivo* by performing a rat kidney transplantation. If the MMPs or ROS inhibitors will improve the isolated kidney conditions as they have been shown to help the heart, this should allow for better functioning of the transplant kidneys that last for more years. Furthermore, this should help increase the number of patients that can be transplanted as it can allow for the use of kidneys, for example, after prolonged the time of storage the isolated kidney.