The increasing socio-economical impacts of cardiovascular diseases have determined the scientific community to deeply investigate the mechanisms which stand behind this pathology. Myocardial infarction represent an acute event in cardiovascular diseases, being the last stage of this disease and the most dramatic by considering its high consequences. Up to now it is known that many factors related to our habits (e.g. dyslipidemia, hypertension, diabetes, obesity, smoking, diet, physical activity, alcohol consumption and psychosocial stress) are directly linked with the evolution of these events, which came in addition to the non-modifiable risk factors like male gender and increasing age. In this regards, it has been demonstrated that from the above mentioned factors, the changes in our dietary structure have the most important impact to the incidence of mortality due to myocardial infarction and have shown an increasing trend over the years. Moreover, altered lipid metabolism resulted from diet reach in fatty acids as well as endogenous fatty acid metabolism were identify as involved in heart injury associated with infarcted myocardium. Cardiomyocytes are heart's cells most affected in infarcted myocardium and whose metabolism shifts to the excessive use of fatty acids to glucose consumption. Although it is well established that blocking off fatty acid consumption in infarcted myocardium, leads to lipid accumulation in affected heart.

Stearoyl-CoA desaturase (SCD) is a key enzyme implicated in synthesis of monounsaturated fatty acids. Recent studies shown that SCD1 is involved in regulation of cardiac metabolism and function. It has been shown that SCD1 deletion is a viable approach for decreasing FA uptake and oxidation in the heart, thereby aiding in the prevention and treatment of lipotoxic cardiomyopathy.

Another important process associated to infarcted myocardium is represented by the formation of the new blood vessels – angiogenesis, which contributes to the increase of oxygen availability for affected heart. Therefore, we propose to investigate the role of SCD in the angiogenesis process. To realize that aim we have designed different experimental tools. Firstly, we will use in vitro specific models which mimics in vivo condition of infarcted heart. We will use two cell types – cardiomyocytes and entothelial cells, the last representing the main cells which form our blood vessels. Then, we will grow these cells to investigate their cross-talk in hypoxic condition to mimic infarcted myocardium. Moreover, we will inhibit SCD activity in cardiomyocytes before interaction. After 10 hours of hypoxia cross-talk, we will evaluate the lipid contents in interacted cells as well as secreted from cells factors, especially pro-angiogenic factor. Another important experiment will be designed also to point out the implication of SCD in angiogenesis using a method whereby we will obtain a similar structure like blood vessels, i.e. capillary tubes. Briefly, with conditioned medium from interacted cells we will test the capacity of endothelial cells to form new tubes. Also, because we want to validate in vitro results we will use in vivo models represented by mice deficient ind SCD1 and SCD4. From this mice we will isolate blood cells which represent our proper cells, reserve which help our body to restore the altered organ function in some pathologies, i.e. progenitor cells. Our interest is to isolate endothelial progenitor cells (EPC) from SCD deficient mice and then to incorporate these cells in a special gel matrix analysis follow by transplantation into subcutaneous place in mice. After 7 days we will excise the inserted structure and analyze the infiltrating cells. To expand our understanding on how hypoxia regulate angiogenic process involving SCD finally we propose to investigate a SCD isoform identify only in heart – SCD4. For this we plan to screen the most important part of this gene. In this region, namely promoter, exist a regulatory structure which is recognized also by nuclear regulatory transcription factors. We will try to discover in SCD4 promoter a specific regulatory regions in which transcription factors induced by hypoxia may be bind. Therefore, we will clone and characterize SCD4 promoter region in hypoxic condition. Moreover, for this we will try to identify a specific region in which the transcription factors induced by hypoxia could regulate the expression of this gene. In this context, we hope that functional manipulation of SCD4 expression in hypoxic cardiomyocytes would constitute an essential option to regulate angiogenesis after myocardial infarction. Our results may contribute to extend the knowledge in the field of myocardial metabolism to maintain proper heart function or to restore heart function after pathological events.