Laboratory for beta-cell biology

The long-term research interest of Laboratory for beta-cell biology is focussed on the understanding of molecular mechanisms that are involved in the development of beta-cell dysfunction and type 2 diabetes pathogenesis. Our research aims primarily at the effect of nutrients (particularly saturated and unsaturated fatty acids) and persistent organochlorine pollutants (particularly DDT and DDE) on function and viability of pancreatic beta-cells. We are also interested in the role of hypoxia as a potential predisposing factor for the development of beta-cell dysfunction.

Research in Laboratory for beta-cell biology

The long-term research interest of Laboratory for beta-cell biology aims at the understanding of molecular mechanisms by which various factors of environment contribute to pancreatic beta-cell dysfunction and pathogenesis of type 2 diabetes. In our recent projects, we are especially interested in the effect of (1) fatty acids, (2) persistent organochlorine pollutants and (3) hypoxia on function and viability of pancreatic beta-cells.

1. Increased level of fatty acids in the blood is considered as one of the main causes of pancreatic ?-cell dysfunction and consequent ?-cell death in type 2 diabetes. As we also demonstrated in our laboratory, increased level of saturated fatty acid species (e.g., palmitate, stearate) leads to beta-cell apoptosis, in contrast to unsaturated fatty acid species (e.g., palmitoleate, oleate) which are significantly less toxic and are even able to inhibit pro-apoptotic effects of saturated fatty acids. Molecular mechanisms of these effects, despite their great therapeutic potential in many fields of medicine, are not clear yet.

   Employing human pancreatic beta-cell line NES2Y, we have characterized stearate-induced apoptosis in respect to the involvement of various caspases and kinases activation, mitochondrial apoptotic pathway activation and ER stress induction. We found that all pro-apoptotic effects of stearate we found so far are inhibited by oleate co-application. In our current research, we aim to reveal the point of anti-apoptotic intervention of unsaturated fatty acids into pro-apoptotic signaling exerted by saturated fatty acids.
2. Persistent organochlorine pollutant, e.g., DDT and DDE, despite the prohibition of their usage in our country for many years, are still present in the environment and inevitably accumulate in our bodies via the food chain. Employing proteomic and other methods, we have revealed several effects of DDT and DDE on beta-cell function and insulin secretion. Our current research is aimed at elucidation of the molecular mechanisms of these effects with a specific interest focused on a role of vitamin D-binding protein.
3. Hypoxia often accompanies type 2 diabetes due to high coincidence of sleep apnea. Therefore, we are also interested in the effect of hypoxic conditions on beta-cell viability, including its impact on pro- and anti-apoptotic potential of saturated and unsaturated fatty acids.

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