

SUMMARY

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The physiological role of the exocrine pancreas and the brain structure and function in studies on pig model

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Biomedical research proved that diets and life style understood as: food composition, food quality, eating behavior, and physical activity deeply effect health of population. New functional food compounds can ameliorate effects of malnutrition. Actually maldigestion, which is the main malnutrition component in modern society, with all its consequences is an effect of the lack of pancreatic enzymes.

In the present thesis, we aimed to investigate if the chronic abcence (developed by surgical procedure) of pancreatic enzymes in gut lumen of the pigs model can affect brain structure and function. The absence or low level of pancreatic enzymes is commonly described as exocrine pancreas insufficiency (EPI). EPI in newborns is physiological while in elderly is a sign of aging. In both cases replacement therapy with pancreatic or pancreatic-like enzymes of microbial origin is applied to the patients.

The main aim of the studies was to prove and highlight effects of the presence of active pancreatic or pancreatic-like enzymes on brain morphology and function measured as behaviour activity.

The potential application of pig models mimicking EPI conditions to explore brain development and function in infants and individuals with chronic malfunction of the exocrine pancreas, such as patients with cystic fibrosis, patients after oncology surgery and elderly (Al-Kaade, 2013; Caramia et al., 1972; Goncharova et al., 2014) were tested. It was proved that EPI pig model is a sensitive tool which allows to test the presence of enzymes in the gut on the neurological status of the animal. Thus, model can serve as promissing sensitive tool for

understanding mechanisms underlying pancreatitis-related neurological alternations and their correction.

Interestingly, new born pig model is characterised by total absence of immunoglobulines G (IgG) in the blood and allow us to prove necessity of their absorption in first 36 hours after birth, not only to ensure resistency but also allowing proper development of the brain. *Nota bene* - in first hours after birth even scanty amount of pancreatic enzymes are totally blocked by cocktail of endogenous and colostral inhibitors. Thus, that type of pancreatic insufficiency caused by enzyme inhibition exclude IgG digestion in first hours after pig birth and allow for intact IgG absorption. In the paper presented below it was proven that the latest is *condition sine qua* not for brain development. It is worth point out that only thanks that specific physiological features of transferring IgG from mother to the ofsprings in ungulates allows us to see that phenomenon of immuno-dependency of brain development. In that case temporal “pancretic insufficiency“ allows proper brain development.

We have demonstrated that pig EPI model can be used for testing new nutritional and therapeutical strategies for individuals with physiological or chronic malfunction of the exocrine pancreas in order to protect them from brain retardation related to lack of the pancreatic enzymes.

Moreover, studies show *per se* that for pig nutrition low amount of dietary fat and/or impaired fat digestion can alternated behaviour.

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