

Modelling cancer – tame a monster.

In our experiments we tried to contribute to improvement of colon cancer modelling which we believe is a powerful and desired tool for successful research.

Diseases can be monitored in many various ways taking into consideration diverse levels on which we could explore all the nooks of medical condition. Modelling illnesses is like making ship models, we can take a look around and see how things work together theoretically. *In vitro* studies refer to those lead outside of a living organism. Thanks to this method, one can focus on cellular level of considered questions. *In vivo* studies on the other hand, which are lead in living organisms can give a bigger picture of explored problem. That gives an opportunity to place point of interest in anatomical context of the whole organism. The combination of these two techniques becomes a very potent device to mimic disease and explore its deepest secrets.

Colon cancer is the third most common cancer type occurring in the World, classified on the fourth position as a cause of death. Ulcerative colitis and Cohn's disease are chronic inflammatory bowel diseases (IBD) posing a significant problem in Western World, with increasing prevalence in newly industrialised countries. Those patients are at high-risk group for inflammation associated colon cancer (CAC) development. All above-mentioned brings up quite obvious conclusion of great need for improvement of colorectal cancer research. In our study, we explored well-known CAC model in a way that has not been done before. Inflammation associated tumours were induced to grow in the colons of laboratory mice. The idea was to monitor their development in a new for this model way - in particular by means of fluorescence imaging. Encouraged by the hope for success, we applied two potentially adequate fluorescent probes in this experiment. Achievement of the assumed goal would give us an easy, applicable way for tumour development monitoring, reducing laboratory animal use and minimising expenses of research. Unfortunately, the probes failed and even though one of them bound to the tumours and gave distinguishable signal it was not strong enough to be notified from the living animal, as assumed in the ambition of this operation. Fortunately, *in vivo* imaging is a highly developing method. That gives a hope for optimising this technique for imaging previously mentioned colon cancer model in the future.

Undaunted with no positive result from *in vivo* imaging we faced the challenge of *in vitro* attempt of colon knowledge improvement. This time we aimed to grow intestinal cells *ex vivo* – out of the living organism. Colon – the last part of large intestine, consists of crypts. They are invaginations covering colon epithelium. On the bottom of each, there are stem cells – able to divide indefinitely and change into any kind of a cell. They make intestines most often renewed surface in our organisms but also take part in cancer development. We succeeded with isolating those crypts and making them grow *in vitro* under special conditions. Described, amazing stem cells enabled generation of 3D multicellular structures that imitate epithelium of the colon. That opens up loads of new opportunities in exploring physiological and pathological conditions of the colon.

The combination of animal models alongside with *ex vivo* crypts growing is a great opportunity to explore truth behind colon physiology. We hope that this will bring us closer to understanding grounds of such a threatening disease as colon cancer. By this exploration we hope to find suitable cure or improve the prevention of colon cancer in IBD patients. When it comes to fluorescent imaging we strongly believe, it will soon develop into sophisticated method, applicable for any disease model. Whereas our non-positive results make the knowledge of that field broader and corresponds to our conviction that publishing negative results as same important as positive ones.