ImmunoTools *special* Award 2014

Irina Levacheva, PostDoc

Philipps Universität Marburg, Institut für Pharmazeutische Technologie und Biopharmazie, Ketzerbach 63, D-35037 Marburg

Nanocarriers

The use of novel technique in nanocarrier development and production gives huge opportunities for improved drug delivery. With the establishment of liposomal formulation as a pivotal drug carrier, we capture wide segments of implicational market with a wide variety of drug groups. Widening of the substance spectrum loaded to liposomes to antioxidants, wins a new therapeutic perspective. Carnosin is already widely accepted in combinational therapy fighting against neuronal degeneration. Carnosin molecule presented in the **Figure 1.**

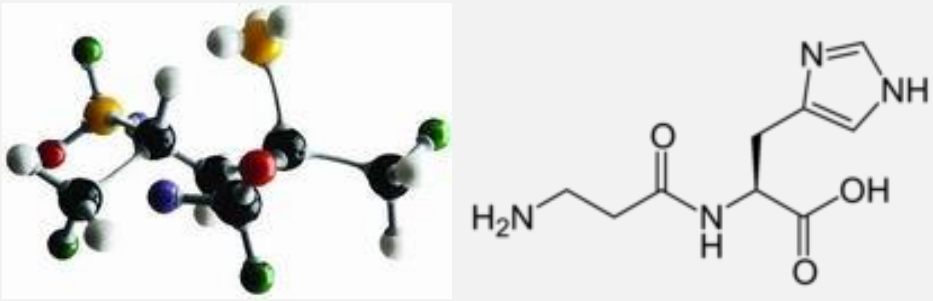

Fig.1. Carnosin molecule in steric and planar presentation.

Murine models as well as 3D cell culture constructs give clear support to a superior Carnosin activity towards conventional forms. These strong experimental results find reflection in the increased interest of medical experts. Currently liposomal Carnosin has no analogy on the market. It is perspective for application for a wide range of patients groups and, and has potential in flexible modification of its application routes. Even though the advantages of liposomal formulations are obvious, the implementation of these carriers is realized only for a very limited range of drugs. Despite of being the one of the largest markets in the modern medicine the abilities of existing medications are limited. Here we have two sources of consumers on the patient and physician side. Its ability to overcome the blood brain barrier is an extremely important characteristic of this formulation. The strategic step towards the further promotion of liposomal Carnosin will be the partnership development with

industry, academia, and medical organisations. Prior to stepping to the clinical investigation phase, the patent agreement settled and technology know how will be processed.

I have successfully developed a new unique technique allowing us to efficiently introduce Carnosine into nanocarrier – liposomes. I have conducted the physical characterisation of the liposomes (Fig.2) preclinical experimental phase different animal studies based on recognized models in this field. One standard model is the model of old nude mice at the average age of 4.5 months, with the life expectancy of 6 months, which is used especially for these neurodegenerative diseases. Our team have been able to show several benefits of the application of the liposomal formulation. 30 % better blood brain barrier penetration was found for the liposomal Carnosin form in comparison with the conventional drug formulation.

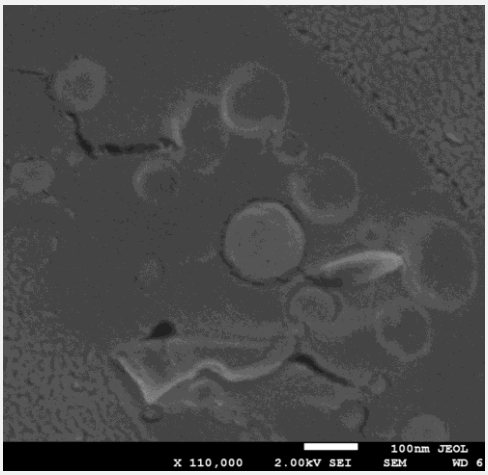

Fig.2. Image of Carnasin loaded liposomes, made by Cryo-fracture of liposomal suspension with Scanning Electron Microscopy bespattered with platinum layer.

The most advanced project in our portfolio is the targeted with antibodies liposomal formulations. We are expecting to get 30 % better blood brain barrier penetration in comparison with the conventional drug formulation. Witch would reflect the potential of the innovation in a market.

In order to proof the efficacy of our improved formulation and to investigate biological processes in the side of disease we would need to take into account many factors. Some of them well established the others are at the experimental phase. We would use TNF-α, naturally produced by activated cells of microglia, to cause the degeneration of neurons and apoptosis of neuronal tissue.

VEGF grows factor will be used to induce improved vessel growth at the side of damaged tissue. One of the factors that could follow the inflammation process and be a part of disease development connected to the cell aggregation will be investigated by human IL-8 ELISA-set for 96 wells and Annexin V, CD 20 and CD45 will be used to investigate the specific respond of B cells and general lymphocytes and their involvement with the degenerative inflammation processes. We are going to apply Neuregulin as a factor responsible for Schwann cell and oligodendrocyte differentiation. It is known that Oncostatin could play a role in inflammation and possibly CNS development. We would like to simulate the whole complexity associated with neurogenerative process and establish our new formulation as a promising therapeutic tool with the possibility to enter the market.