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FUNCTIONALITY OF PERFLUORODECALIN-BASED ARTIFICIAL OXYGEN CARRIERS: IMPACT ON THE WHOLE ORGANISM AND ON CELLULAR LEVEL

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At present, despite long lasting efforts, a harmless, effective artificial oxygen carrier is missing for clinical use both in Europe and USA. To bypass this bottleneck albumin-derived perfluorocarbon-based nanocapsules (nanocapsules) were designed as a novel artificial oxygen carrier. Nanocapsules do not contain any chemical emulsifier and can be synthesized in different size ranges (Ø 100-1500 nm). Physical assessment of size, oxygen transport capacity and repeated loading and unloading of respiratory gases was already performed and *in vitro* functionality was successfully proven using a flow-controlled Langendorff heart. Functionality *in vivo* was shown using a normovolemic hemodilution model. Up to 95% of the blood (final hematocrit of ~5%) was exchanged stepwise against plasma-like medium with nanocapsules (treatment) or without nanocapsules (control) in order to dilute below the critical hematocrit of a rat (~10%). Rats were monitored throughout the experiment (e.g. heart rate, mean arterial pressure (MAP), body core temperature and blood gas analysis). Furthermore rat kidneys were assessed for expression of erythropoietin using RNA scope technique to track effects of oxygen shortage on cellular level. Compared to control group all animals of the treatment group survived longer, showed a significant higher MAP and presented a continuous physiological temperature. Importantly, within the observation period erythropoietin mRNA was detected only in control animals. In conclusion nanocapsules provide enough oxygen to supply an organism when erythrocytes are not sufficiently present anymore, whereas plasma-like medium fails in the absence of any oxygen carrier. These positive results are confirmed on cellular level with the oxygen-dependent presence of erythropoietin.

Biography

Katja Bettina Ferenz has completed her PhD in Pharmaceutical Chemistry from Westfaelische-Wilhelms-University Muenster in Germany. From 2011 to 2018, she led her own research group development of artificial oxygen carriers at University Hospital Essen, Institute of Physiological Chemistry, Germany. Since February 2018, she continues her research on artificial blood and organ regeneration as Assistant Professor at University Hospital Essen, Institute of Physiology. Since 2017, she is a member of the editorial boards for the *Journal of Nanochemistry and Nanotechnology and Journal of Nanoscience and Nanomedicine*. Her research interests are artificial oxygen carriers, regeneration of tissue/organs, micro- and nanoparticles, nanomedicine, perfluorocarbons, drug delivery and biomaterials.

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