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Albumin-derived perfluorocarbon-based artificial oxygen carriers: Assessment of microcirculation and physiological functions in a model of massive hemodilution in the rat

Alexandra Scheer, Anna Wrobeln, Michael Kirsch and **Katja B. Ferenz**
University of Duisburg-Essen, Germany

Statement of the Problem: Although „Patient Blood Management"-programs are implemented in many hospitals1, availability of approved artificial oxygen carriers are missing for clinical use both in Europe and USA2. Therefore albumin-derived perfluorocarbon-based nanocapsules (nanocapsules) were explored as a novel artificial oxygen carrier3,4.

Methodology & Theoretical Orientation: To investigate an essential supply of oxygen, we studied our nanocapsules in a model of massive normovolemic hemodilution (NH) followed by an *in vivo* fluorescence microscopy analysis (IVM) to assess the microcirculation5. NH of 16 healthy wistar rats was performed stepwise below the critical hematocrit of a rat (10%) with nanocapsules and without ones (control), respectively. During NH systemic parameters (e.g. heart rate, mean arterial pressure (MAP), respiration, pH, pO2, lactate) were continuously monitored. At the end of NH rats were further observed up to 100 min and an IVM of the right leteral liver lobe was performed. Vessel diameters of sinusoids, post sinusoidal venules and the number of perfused sinusoidal vessels (%) were determined5.

Findings: As expected, nanocapsule-diluted animals showed a higher pO2 and sO2 during the observation period while pCO2 was somewhat lower. At the beginning of the dilution period the nanocapsule-diluted animals showed a higher MAP. The pH and base excess were not affected by hemodilution. Interestingly, the microcirculation was also not affected significantly in the nanocapsules diluted animals.

Conclusion & Significance: The results illustrate that the microcirculation was not affected in both groups. Likewise, the parameters essential for survival (e.g. pO2, pCO2) were improved in the nanocapsule-diluted animals. Based on the encouraging results, the nanocapsules will be examined in further clinically relevant settings.

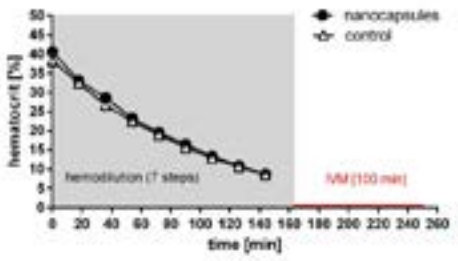

Figure: Validity of NH: During all seven dilution steps nanocapsules and control-group show equal hematocrit values.

Biography

Alexandra Scheer completed her Master's degree in Medical Biology in 2015. Since October 2015, she has been working on her doctoral thesis at the Institute of Physiological Chemistry at the University Hospital Essen in the working group of Dr. Katja B. Ferenz. Within the scope of this work she is involved in the development and characterization of artificial oxygen carriers.

alexandra.scheer@uk-essen.de