

Abstract:
Physiology in Metabolic Disorders:
Overcoming Exercise-, Surgery- and Sepsis-Induced Stress on Glycaemia

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The overall aim of this Habilitation is to highlight the importance of glycaemia and stressors (exercise, surgery, sepsis) in people with different metabolic disorders. To achieve in people with type 1 diabetes a good glycaemic control it is important to improve both HbA_{1c} levels and functional capacity. To minimise diabetic complications, acute glycaemia needs to be targeted in conjunction with physical exercise. Once patients can safely perform exercise, the full range of beneficial effects can be transferred into more stable euglycaemia over a longer term. Utilising different types of exercise in combination with the latest technology facilitate euglycaemia. Additionally, novel technologies face the potential to improve glycaemia in intensive care unit patients after major cardiac surgery and in patients with severe sepsis.

Therefore, the specific aims of this Habilitation were:

- I. To examine the **relationship of glycaemic control to functional capacity** obtained during cardio-pulmonary exercise testing in individuals with type 1 diabetes
- II. To investigate if **standardised bolus insulin dose reductions**, dependent on specified exercise intensities, are successful to avoid hypoglycaemia during and after exercise in people with type 1 diabetes
- III. To investigate the **responses of blood and interstitial glucose** (with the associated risk of hypoglycaemia) during and after high-intensity interval exercise compared to moderate-intensity continuous exercise in people with type 1 diabetes
- IV. To analyse the **accuracy of a continuous glucose monitoring system** in comparison to blood glucose measures during different types of exercises in people with type 1 diabetes
- V. To investigate **the accuracy of continuous subcutaneous glucose monitoring by means of microdialysis** in two different critically ill patient populations (surgical

patients after major cardiac surgery and medical patients with severe sepsis) and to investigate whether the prolongation of the run-in period improves the signal quality