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Actions of Insulin in *Caenorhabditis elegans*
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Increase of lifespan is an emerging goal of diabetes treatment, since at least in humans with diabetes it became evident that simply lowering glucose concentrations is often not sufficient to normalize life expectancy. The availability of an *in vivo* model of life expectancy might open new opportunities to study cellular defence.

This study focused on *C. elegans* which is genetically and functionally one of the best characterized organisms. *C. elegans* possesses an insulin receptor ("dauer activating factor", daf-2) which is highly homologous to the human insulin receptor. Daf-2 controls an insulin-like signalling pathway, being similar to human insulin signalling, which controls metabolism, growth and longevity. Several *C. elegans* insulin-like molecules and human insulin bind to DAF-2. Daf-2 and ins-genes are expressed in the neuronal system.

Aim of this thesis was to gain a better understanding of glucose effects on cellular and mitochondria function, and to evaluate the protective action of normal human insulin and the insulin analogue insulin aspart in *C. elegans* under high glucose conditions. Our data show that the excess of a certain glucose level leads to metabolic changes including AGE-formation and AGE-modification of mitochondria with induction of oxidative stress, cellular and in particular neuronal damage and finally a reduction of life span. These glucose-induced changes could partly reverted by using normal human insulin (Actrapid®) or insulin aspart (NovoRapid®) suggesting a neuronal preserving and life prolonging effect when used under hyperglycaemic conditions.