

## Metabolic cross-talk of neurons and oligodendrocytes under fasting conditions



### Who are we?

The immuno-metabolism group (head: Prof. Karsten Hiller), located at the Braunschweig Integrated Centre of Systemsbiology (BRICS), investigates cellular and mitochondrial metabolism of immune cells during bacterial infection, cancer, metabolic complications and neuro-degeneration. The team has developed a strong expertise in stable-isotope assisted metabolomics and metabolic flux analysis both on a whole cell as well as on a mitochondrial sub-compartment level.

### Project background

Neuronal energy metabolism is critical for axonal transport processes and the maintenance of the axonal membrane potential (Vance et al., 2000). Transport of autophagosomes or organelles along the axon is very energy demanding in terms of ATP hydrolysis. Dysfunction of these processes have been linked to the development of neurodegenerative diseases and axon degeneration (De Vos et al., 2008). Fast axonal transport (FAT) has been shown to rely on vesicle coupled glycolytic enzymes to generate sufficient ATP from glucose or glycolytic intermediates. On the other hand, mitochondrial migration is fueled by mitochondrial ATP synthesis (Zala et al., 2013). However, in times of fasting and reduced glucose availability, neuronal cells appear also able to utilize ketone bodies, a process that makes them independent of glycolytic products, but which is mechanistically poorly understood (Morris, 2005).

### Thesis content

You will apply stable-isotope labeling in combination with mass spectrometry to determine metabolic fluxes under different experimental conditions and nutritional states (Hiller and Metallo, 2013). To better meet the metabolic environment in the brain, you will perform the experiments under defined hypoxic conditions. By employing this approach, we expect to gain further understanding of the role of axonal energy metabolism and the response of neurons to nutritional stress under disease conditions.

#### Methodology:

Cell culture, Gas chromatography-mass spectrometry (GC-MS), Stable isotope-assisted metabolomics, YSI, Seahorse, Hypoxia (low oxygen levels)

### Interested?

Please send your application via Email with your preferred starting date.

- Bachelor or Master
- English or German

Michelle-Amirah Khalil  
[m.khalil@tu-bs.de](mailto:m.khalil@tu-bs.de)

Prof. Dr. Karsten Hiller  
[karsten.hiller@tu-bs.de](mailto:karsten.hiller@tu-bs.de)