Metabolic Dysregulation following Traumatic Brain Injury in *Drosophila melanogaster*
TBI pathophysiology

Primary Injury
- Mechanical Disruption
- Vascular Damage
- Acute Cell Death

Secondary Injury
- Metabolic Dysfunction
- Inflammation
- Oxidative Stress

Ultimate Outcomes
- Memory Loss
- Emotional lability
- Seizures

Factors:
- Age
- Environment
- Genetic make-up

Mechanical Disruption

Vascular Damage
Fly model of TBI

Immediately before TBI

Immediately after TBI
Post-TBI diet influences outcomes

Diet

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AMPK is a major regulator of metabolic homeostasis

- **Pharmacological**: Metformin
- **Energy Deficiency**: AMP, ADP, NAD⁺, Exercise
- **Inflammation**: NfkB
- **Oxidative Stress**: Nrf2, p53
- **Autophagy**: mTOR
- **Glucose uptake/utilization**: FOXO, p53
- **Protein Kinases**: LKB1, CaMKKB
- **Phosphatases**: PP2A, PP2Ca
Loss of neuronal AMPK-α worsens acute and chronic TBI outcomes