

## Effects of sodium lactate infusion in two teenagers with Glucose Transporter 1 Deficiency Syndrome

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**Objective:** Glucose is the principal fuel for the brain. In Glucose Transporter 1 Deficiency Syndrome (GLUT1DS) the transport of glucose across the blood-brainbarrier is limited. Most individuals with GLUT1DS present with developmental problems, epilepsy, and (paroxysmal) movement disorders, and respond favorably to the ketogenic diet. Similar to ketones, lactate can be an alternative energy source for the brain. The aim of this study is to investigate whether intravenous lactate infusion can therapeutically be applied in children with GLUT1DS.

**Methods:** We performed a proof of principle study with two subjects with GLUT1DS who were not on a ketogenic diet. After an overnight fast, sodium lactate (600 mmol/l) was infused during 120 minutes, under video-EEG recording and monitoring of or serum lactate, glucose, electrolytes and pH. Furthermore, the EEGs were compared with pre-/postprandial EEGs of both subjects, obtained shortly before the study.

**Results:** Fasting EEGs of both subjects showed frequent bilateral, frontocentral poly-spike-and-wave complexes. In one subject no more epileptic discharges were seen postprandially and after the start of lactate infusion. The EEG of the other subject did not change, neither postprandially nor after lactate infusion. Serum pH, lactate and sodium changed temporary during the study, as expected.

**Interpretation:** This study suggests that sodium lactate infusion is safe in individuals with GLUT1DS, and may have potential therapeutic effects. Additional cellular abnormalities, beyond neuronal energy failure, may contribute to the underlying disease mechanisms of GLUT1DS and explain why not all individuals respond to the supplementation of alternative energy sources like ketones or lactate.