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PII: S0361-9230(17)30638-X
DOI: https://doi.org/10.1016/j.brainresbull.2017.12.010
Reference: BRB 9346

To appear in: *Brain Research Bulletin*

Received date: 2-11-2017
Revised date: 9-12-2017
Accepted date: 15-12-2017

Please cite this article as: Bor Luen Tang, Brain activity-induced neuronal glucose uptake/glycolysis: Is the lactate shuttle not required?, Brain Research Bulletin https://doi.org/10.1016/j.brainresbull.2017.12.010

# Brain activity-induced neuronal glucose uptake/glycolysis: Is the lactate shuttle not required?

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## Highlights

- Evidence for and against the prevalent ANLS hypothesis is briefly reviewed.
- Recent findings of neuronal glucose uptake and metabolic changes are highlighted.
- The implications of these findings on the ANLS hypothesis are further discussed.

## Abstract

The astrocyte-neuron lactate shuttle (ANLS) hypothesis posits that during neuronal activation, astrocytic glycolysis consumes glucose and generates lactate, with the latter then imported by neurons as a preferred fuel. The hypothesis has been controversial, with multiple theoretical postulates for and against, and with empirical evidence that were either supportive or otherwise. Recent findings using direct *in vivo* imaging of lactate and glucose uptake as well as associated metabolic changes in neurons have now placed important constraints on the hypothesis. Here, I review these recent findings and discuss their implications on neuronal energetics.

Keywords: astrocyte-neuron lactate shuttle (ANLS); lactate; glycolysis, energetic metabolism; *in vivo* imaging.

## Introduction

Understanding neuronal energetics under physiological and pathological conditions has been a subject of intense investigation. It is widely known that persistent glucose and oxygen supplies are critical for neuronal function and survival. Under normal metabolic resting states, brain