ALACTATE TRAINING: Does it Really Exist?

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Terminology

- Synonymous terms
  - Alactic
  - Alactate
  - Anaerobic-alactic

Stored Energy: High-Energy Phosphates

- ATP stored in small amounts until needed
- Breakdown of ATP to release energy
  - ATP + water + ATPase → ADP + P_i + energy
  - ADP: lower-energy compound, less useful
- Synthesis of ATP from by-products
  - ADP + P_i + energy → ATP (via phosphorylation)
  - Can occur in absence or presence of O_2
Bioenergetics: Basic Energy Systems

- ATP storage limited
- Body must constantly synthesize new ATP
- Three ATP synthesis pathways
  - ATP-PCr system (anaerobic metabolism)
  - Glycolytic system (anaerobic metabolism)
  - Oxidative system (aerobic metabolism)

ATP-PCr System

- Anaerobic, substrate-level metabolism
- ATP yield: 1 mol ATP/1 mol PCr
- Duration: 3 to 15 s
- Because ATP stores are very limited, this pathway is used to reassemble ATP

ATP-PCr System

- Phosphocreatine (PCr): ATP recycling
  - PCr + creatine kinase $\rightarrow$ Cr + P, + energy
  - PCr energy cannot be used for cellular work
  - PCr energy can be used to reassemble ATP
- Replenishes ATP stores during rest
- Recycles ATP during exercise until used up (~3-15 s maximal exercise)
Control of ATP-PCr System: Creatine Kinase (CK)

- PCr breakdown catalyzed by CK
- CK controls rate of ATP production
  - Negative feedback system
  - When ATP levels \( \downarrow \) (ADP \( \uparrow \)), CK activity \( \uparrow \)
  - When ATP levels \( \uparrow \), CK activity \( \downarrow \)
Review of the Literature


Key Points

- Research evidence suggests that ATP-PCr and Glycolysis are activated instantaneously at the onset of maximal activity
- Significant levels of lactic acid are produced in under 10 sec of supramaximal exercise
- More research needs to be conducted investigating lactic acid production with so-called “alactate” exercise
- Concept of “alactate” work may need to be reconsidered or possibly redefined
Practical Application

- Volunteers needed
- Supramaximal exercise bouts
  - <10 sec maximal effort
- YSI Sport 1500 Blood Lactate Analyzer
- Blood lactate samples
  - Pre-exercise
  - Immediate post
  - Post-exercise (1, 3, 5 min)

QUESTIONS

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