Types of Metabolic Thresholds

As exercise intensity increases there is;

↑ catabolism of creatine phosphate

↑ catabolism of carbohydrate
(blood glucose, and to a greater extent muscle glycogen)

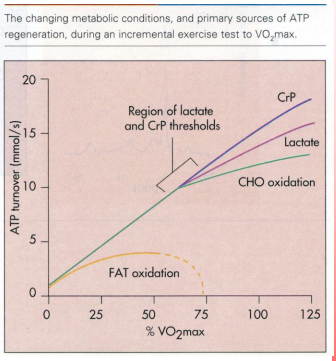
↓ catabolism of lipid

↓ muscle redox potential (NAD^+ / NADH)

↑ acidosis

↑ production of lactate

↑ recruitment of FT motor units



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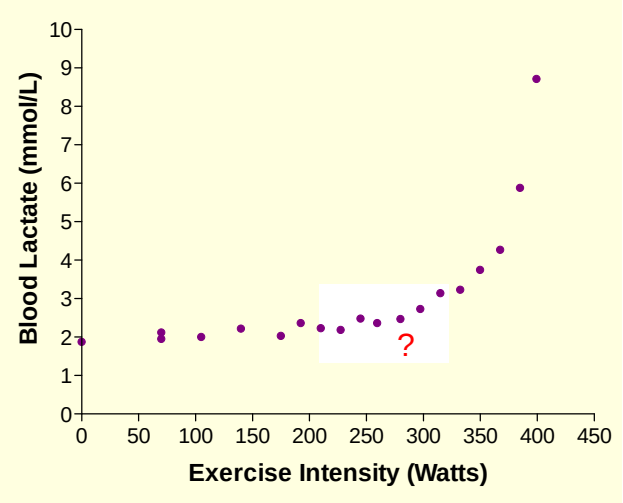
Lactate Threshold

Refers to the exercise intensity where there is an abrupt increase in either of muscle or blood lactate.

The intensity at the LT represents the maximal intensity at which steady state exercise can be maintained.



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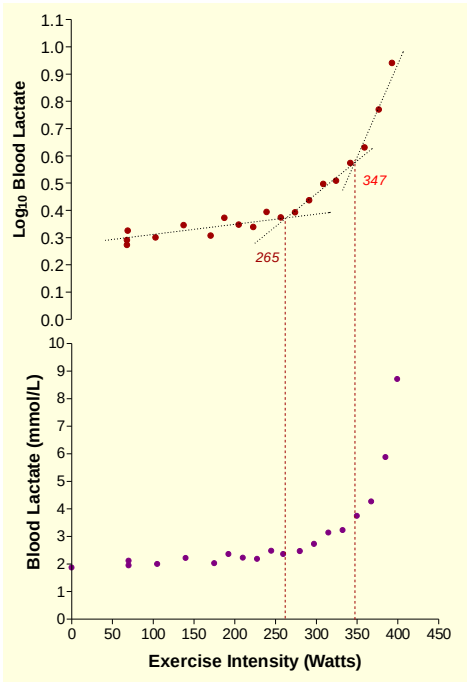
Converting data to a log form produces data that fit different linear functions below and above the threshold.



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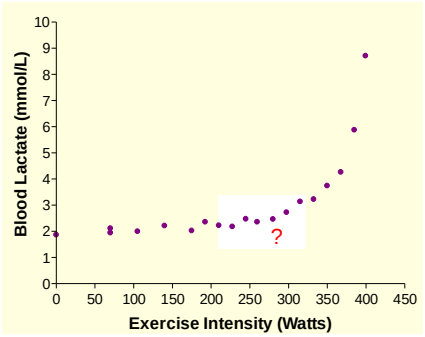

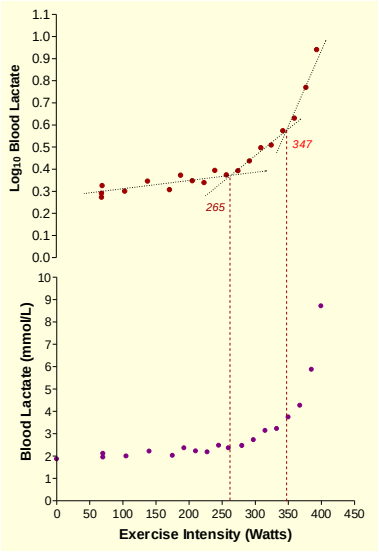

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What causes the LT?

- ↑ Production of lactate
- Removal of lactate does not match production
- ↑ Fast twitch motor unit recruitment
  (biases metabolism toward glycolysis)
- Imbalance between glycolysis and mitochondrial respiration
- Ischemia
- Muscle hypoxia
- ↓ Redox potential (NAD^+ / NADH)

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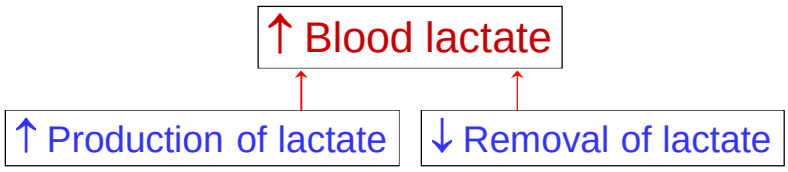
Flow Diagram of ↑ Blood Lactate



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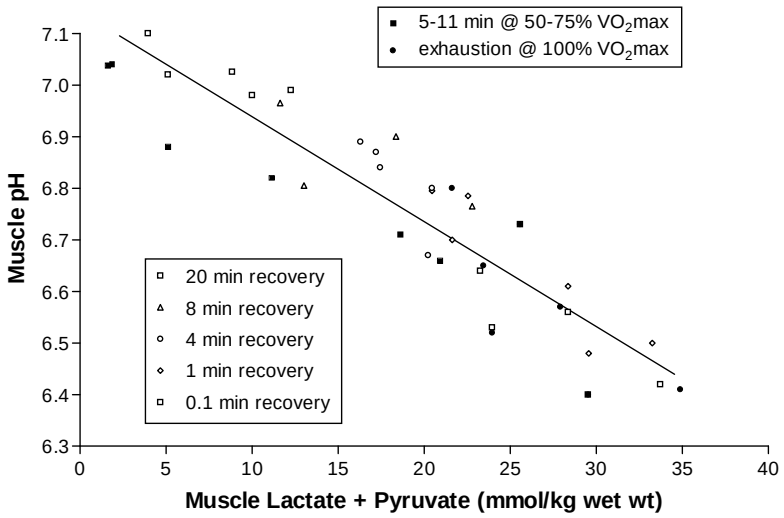
Sahlin K et al. Pflugers Arch 367:143-149, 1976.



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Other Lactate Threshold Terminology

Anaerobic threshold - first used in 1964 and based on increased blood lactate being associated with hypoxia. Now known to be an oversimplification, and should not be used.

Onset of blood lactate accumulation (OBLA) - the maximal steady state blood lactate concentration, which can vary between 3 to 7 mmol/L.

Research has shown that there is considerable similarity in each of the exercise intensities obtained from the different lactate threshold methodologies.

Remember that the limitation to exercise above the LT is not the increased blood and muscle lactate but the associated increase in acidosis and other markers of muscle fatigue.

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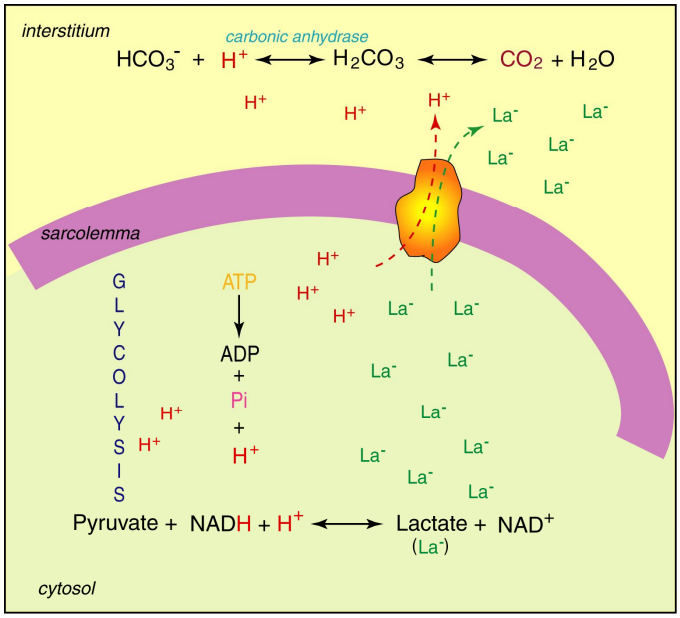
Muscle Lactate and Proton Efflux



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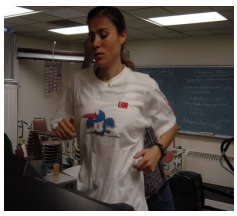
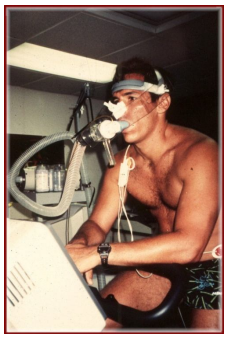
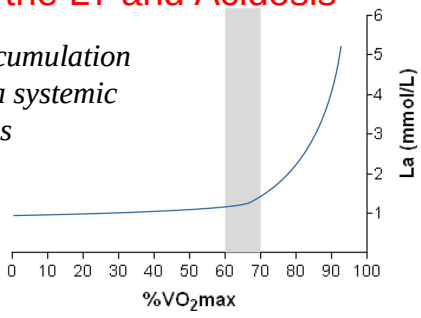
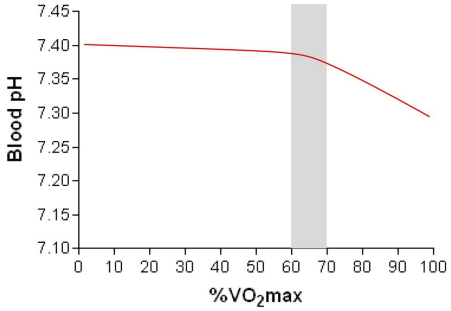
Blood Lactate Accumulation, the LT and Acidosis





Blood lactate accumulation coincides with a systemic acidosis





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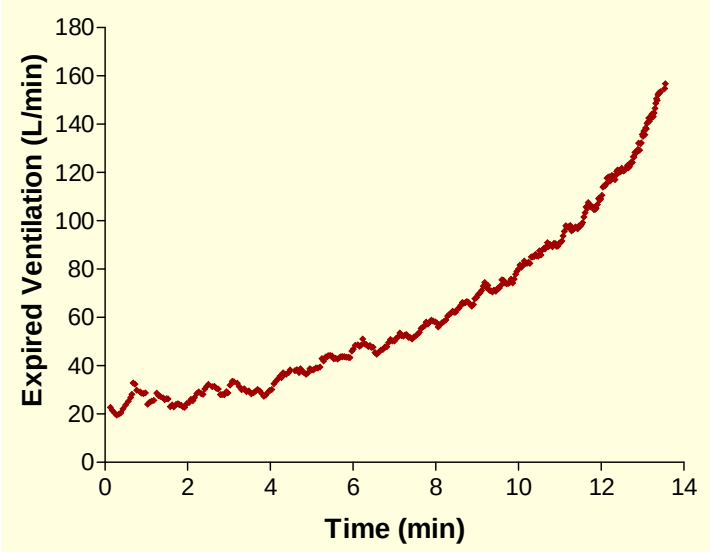
Gas Exchange Indices of The Metabolic Threshold



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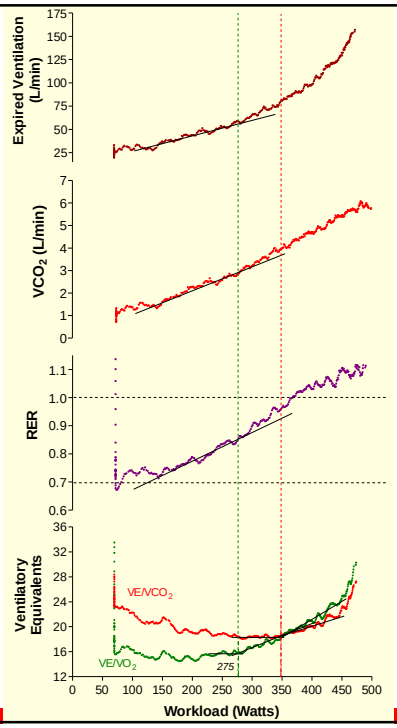

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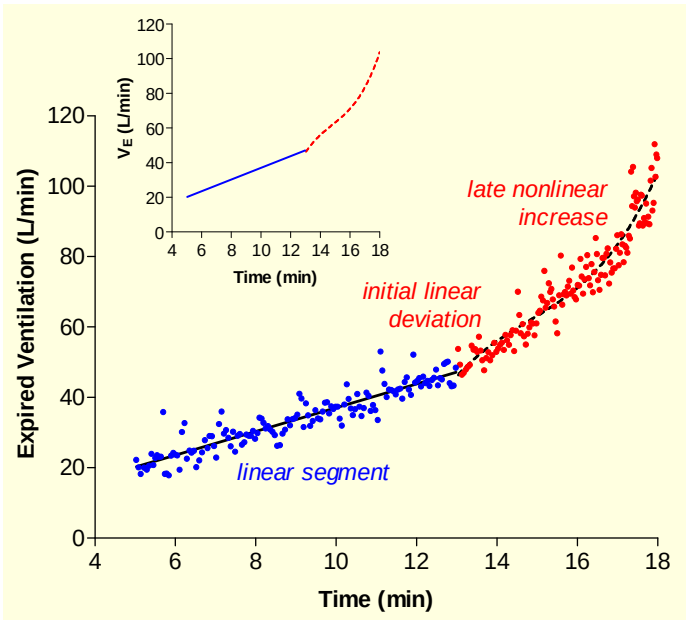

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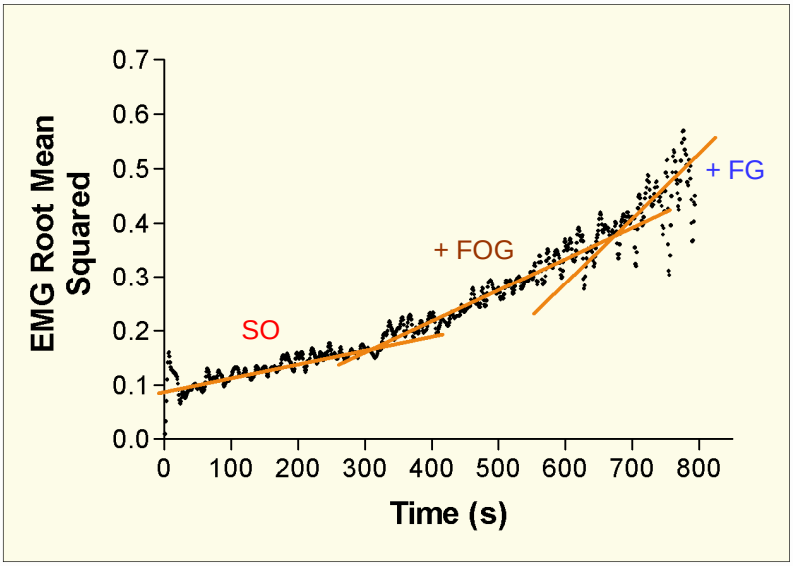
EMG Threshold



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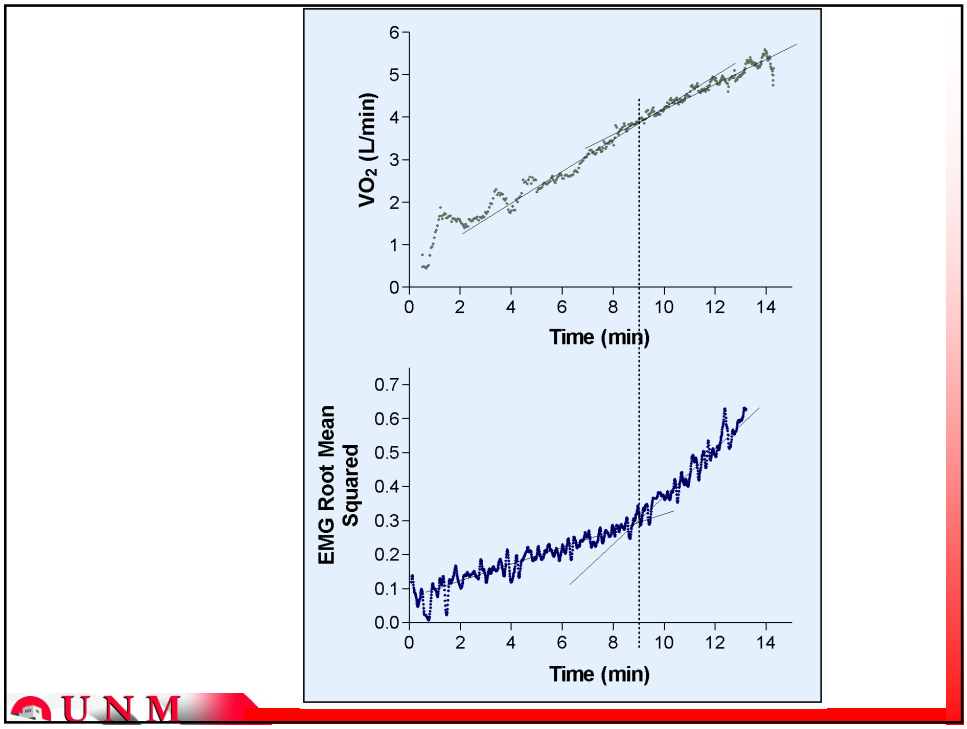
VO_2 (L/min)
Time (min)
EMG Root Mean Squared
Time (min)
UNM