

Blood Lactate Measurements and Analysis during Exercise: A Guide for Clinicians

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Abstract

Blood lactate concentration ($[La^-]_b$) is one of the most often measured parameters during clinical exercise testing as well as during performance testing of athletes. While an elevated $[La^-]_b$ may be indicative of ischemia or hypoxemia, it may also be a “normal” physiological response to exertion. In response to “all-out” maximal exertion lasting 30–120 seconds, peak $[La^-]_b$ values of ≈ 15 –25 mM may be observed 3–8 minutes postexercise. In response to progressive, incremental exercise, $[La^-]_b$ increases gradually at first and then more rapidly as the exercise becomes more intense. The work rate beyond which $[La^-]_b$ increases exponentially [the lactate threshold (LT)] is a better predictor of performance than VO_{2max} and is a better indicator of exercise intensity than heart rate; thus LT (and other valid methods of describing this curvilinear $[La^-]_b$ response with a single point) is useful in prescribing exercise intensities for most diseased and nondiseased patients alike. H^+ -monocarboxylate cotransporters provide the primary of three routes by which La^- transport proceeds across the sarcolemma and red blood cell membrane. At rest and during most exercise conditions, whole blood $[La^-]$ values are on average 70% of the corresponding plasma $[La^-]$ values; thus when analyzing $[La^-]_v$, care should be taken to both (1) validate the $[La^-]_b$ -measuring instrument with the criterion/reference enzymatic method and (2) interpret the results correctly based on what is being measured (plasma or whole blood). Overall, it is advantageous for clinicians to have a thorough understanding of $[La^-]_b$ responses, blood La^- transport and distribution, and $[La^-]_b$ analysis.

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Abbreviations: ($[La^-]_b$) blood lactate concentration, (LT) lactate threshold, ($(LT)_D_{max}$) method of determining LT, (MCT) H^+ -monocarboxylate cotransporter, (MLSS) maximal lactate steady state, (OBLA) onset of blood lactate accumulation, (RBC) red blood cell, (YSI) Yellow Springs Instruments, Inc.

Keywords: lactate analyzers, lactate threshold, maximal lactate, onset of blood lactate accumulation, plasma, whole blood

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