Evaluation of Enzyme Activities Measured with Different Instruments

by

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The measurement of the ACTIVITY of an enzyme (i.e., AST, ALT, ALP, LD, Amylase, GGT, CK) differs considerably when compared to the measurement of the CONCENTRATION of an analyte (glucose, calcium, creatinine, total protein etc). The measurement of analyte concentrations can be easily standardized between different analyzers with the use of appropriate calibrator solutions. Thus, the concentration of an analyte measured with one manufacturer's instrument can be easily made to match the concentration of the same analyte measured using another manufacturer's instrument.

Enzyme activities are determined by measuring the amount of product that is formed when an enzyme acts upon a specific substrate. The speed that the enzyme acts upon a substrate and converts it to a product is affected by several factors. The factors that influence the speed that an enzyme can work on a substrate include the specific substrate that is used in the reagent, the concentration of the substrate, the pH of the reagent containing the substrate, and the presence or absence of certain compounds in the reagent that modulate the rate that an enzyme can work.

Instrument manufacturers frequently differ in the particular substrate and substrate concentration used in their reagents for measuring enzyme activity. These differences in reagent composition can result in different instruments measuring very different enzyme activities, even from the same patient specimen. An example of the magnitude of the differences that can be observed between different methods used to measure enzyme activity is shown in the following Table derived from the College of American Pathologists Proficiency survey data[1].

Instrument	ALT[a]	AST	CK	ALP
Beckman LX20	208	140	168	283
Dade-Behring	230	155	123	308
Vitros 950	242	168	151	239

[a]Enzyme activities in U/L

The above table illustrates the fact that measured enzyme activities can vary considerably between methods designed to measure the same enzyme. These differences do not mean that one method for measuring enzyme activity is more accurate than another. Rather, these differences in measured enzyme activity reflect the use of different substrates or different reaction conditions. It is also important to understand that due to the differences in enzyme activity measured using different analytical systems, reference intervals, as well as quality control ranges, applicable to one method may not be applicable to another. Thus, it is important that reference intervals and quality control ranges be established that are specific to each instrument.

References:

1. Participant Summary Report CN3-B. College of American Pathologists. Northfield, IL. 2005.