

Blood Alcohol: The Concentration-Time Curve and Retrospective Estimation of Level

MJ LEWIS

Home Office Forensic Science Laboratory, Washington Hall, Euxton, Chorley, Lancashire, United Kingdom PR7 6HJ

Abstract

Traditionally, retrospective estimates of blood alcohol concentration (BAC) have been made by assumption of a steady rate of elimination, some considerable variation in which has been reported. During recent years, in contradiction of Widmark's hypothesis, it has been confirmed that the metabolic rate of alcohol is not constant but varies, in a predictable way, with BAC. The present study considers this dichotomy and shows that the experimental evidence hitherto used in support of Widmark's hypothesis can, more satisfactorily, be interpreted on the basis of first-order absorption kinetics together with Michaelis-Menten elimination. It is thus demonstrated that a range of apparent linear rates, from as little as $120 \text{ mg l}^{-1} \text{ h}^{-1}$ to over $200 \text{ mg l}^{-1} \text{ h}^{-1}$, can be seen in a single subject. The implications for retrospective estimation of level are examined and a simple procedure is proposed to enable a more realistic assessment to be made than is given by the historical linear assumption. *Key Words:* Blood alcohol concentration; Retrospective estimation; Elimination; Enzyme kinetics.

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Introduction

During the early nineteen thirties, Widmark published his now-famous work on the absorption and elimination of alcohol [1, 2]. His precept that alcohol is eliminated at a constant rate (β_{60}) has since enjoyed continued and widespread acceptance. A glance at current reference works [3, 4] will confirm that there is a large, and widely-based, body of experimental evidence in support of Widmark's theory. It may therefore be considered that this fact amply justifies the application of the theory to the medico-legal problems encountered in this area. However, it should be appreciated that