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Book review

J.-M. Vergnaud and I.-D. Rosca, Assessing Bioavailability of Drug Delivery Systems—Mathematical Modeling (2005, CRC Press, Boca Raton, FL) € 74.99, ISBN 0-8493-3044-0, 248 pp

The author's book tries to address many facets of biopharmaceutics from a rather abstract perspective but not without mentioning a number of real-life examples. The book begins with a general introduction and definitions. Some of them are familiar to the non-novice, and some are fairly idiosyncratic. In view of recent developments, a discussion of the structure of biological membranes and their role in the absorption of drugs, which does not address active transport mechanisms, misses an important aspect of current research. Besides, the evidence for some basic definitions is not quite as clear-cut as it appears at first sight. When the authors state categorically that the absorption of drug from the digestive tract is a first order process, readers who have analysed absorption profiles may feel a bit uneasy. The first-order approximation is sufficient for some practical purposes, but in general, the effects of gastric emptying, peristaltic movement, the variations of pH and the permeability of the intestinal lining and their consequences for the rate of absorption cannot be overlooked.

Some definitions indicate that little care has been spent to clarify the conditions under which the mathematical models discussed are valid, even if the underlying simplifying assumptions are accepted. For example, in a section entitled 'Absorption of the drug in the blood', the equation $C_t = C_\infty[1 - \exp(-k_a t)]$ (Eq. (1.4)) is claimed to describe the increase of drug concentration in blood after first-order absorption, where the concentration of free drug not bound to plasma proteins is the quotient of the 'amount of drug in the dosage form initially in the GI' and the 'apparent volume of distribution, or apparent volume of blood': $C_\infty = M_{in}/V_p$ (Eq. (1.5)). These definitions obviously refer to closed systems, and tend to obscure rather than clarify the matter.

In Chapter 2, plasma level profiles after single and repeated i.v. bolus administration and after constant rate infusion are discussed and the concept of the 'master curve' is introduced. It is generated by expressing the concentration at any time as a fraction of the asymptotic value C_∞ and its time-dependency in terms of a dimensionless time-parameter Θ, which amounts to fractions and multiples of the elimination half-life. This yields some insight into plasma level profiles observed after infusion when the infusion rate is increased or decreased in a stepwise manner at an earlier or later time. However, the relationship between the fraction of the steady-state concentration level of any drug for which the one compartment body model holds and the infusion time expressed in terms of elimination half-lives is a standard topic in textbooks of pharmacokinetics, so that not much is gained.

Next, oral dosage forms with immediate release are covered, i.e. the Bateman function and its superpositions after repeated administration of equal doses at constant intervals. This is followed by a chapter on kinetics of drug release from oral sustained dosage forms, where models for the liberation of drugs from polymer matrices containing plasticisers and the influence of geometry of the matrix and swelling of the polymers on release profiles are discussed at length before the authors proceed to erosion-controlled dosage forms. Neither multiparticulate nor osmotic sustained release dosage forms, which play a prominent role in current practice, have attracted their attention. A bibliography of in vitro–in vivo correlations with only 24 references, none of them addressing explicitly the biopharmaceutical classification system, and the most recent dating from 1993 completes the first half of the book. The second half is devoted to 'Plasma drug level with oral diffusion-controlled dosage forms', 'Plasma levels with erosion-controlled dosage forms', 'Effect of the patient's noncompliance', 'Drug transfer to various tissues' and 'Transdermal therapeutic systems'.

As a whole, this book appears neither suitable as an introduction nor does it give an overview of the state of the art or even blaze the trail for new approaches. In some chapters, it adds new perspectives on topics, which deviate from the standard treatment in textbooks. It does, however, give an overview of the theoretical and experimental work of its senior author and as such it is representative of a certain style of pharmacokinetics during a time, which has become history.

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