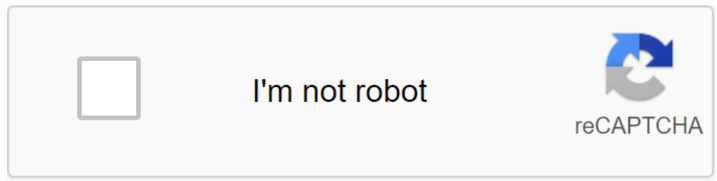

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Area under the curve definition

Last update 4:50:12 PM AnalyseIt.Public 4.0.7607.25433 Production EU Remote database In the field of pharmacokinetics, the area under the curve (AUC) is the definitive integral of a curve describing the variation of a drug concentration in blood plasma as a function of time. In practice, the concentration of medicinal products is measured at certain discrete times and the trapeze rule is used to estimate AUC. Interpretation and usability of AUC values AUC (from zero to infinity) represent the total drug exposure over time. AUC is a useful measure when trying to determine whether two formulations of the same dose (e.g. one capsule and one tablet) result in equal amounts of tissue or plasma exposure. Another use is in the therapeutic drug monitoring of drugs with a narrow therapeutic index. For example, gentamicin is an antibiotic that can be nephrotoxic (kidney harmful) and ototoxic (hearing damage); Measurement of gentamicin by concentrations in a patient's plasma and calculation of AUC is used to control the dosage of this drug. AUC becomes useful for knowing the average concentration over a time interval, AUC/t. AUC is also referenced when talking about elimination. The amount is eliminated by the body (mass) = clearance (volume/time) * AUC (mass *time /volume). AUC and bioavailability In pharmacokinetics, bioavailability generally refers to the fraction of drugs that are absorbed systemically and are thus available to produce a biological effect. This is often measured by quantifying auc. To determine the respective AUCs, serum concentration vs. time plots are usually collected with C-14 labelled drugs and AMS (accelerated mass spectrometry). [1] Bioavailability can be measured in terms of absolute bioavailability or relative bioavailability. Absolute bioavailability Absolute bioavailability refers to the bioavailability of medicinal products when administered via a non-intravenous (non-IV) dosage form (i.e. oral tablet, suppositories, subcutaneous, etc.) compared to the bioavailability of the same drug administered intravenously (IV). This is done by comparing the AUC of the non-intravenous dosage form with the AUC for the drug administered intravenously. This fraction is normalized by multiplying by each dosage form and dose. [2] F a b s = (A U C n o n − I V A U C I V) × (D o s e I V o s e n n n n − I V) {\displaystyle F_{abs}=\left({\frac {AUC_{non-IV }}{AUC_{IV}}}\right)\times \left({\frac {Dose_{IV}}{Dose_{non-IV}}}\right)} Relative bioavailability Relative bioavailability compares bioavailability between two different dosage forms. Again, the relative AUCs are used to make this comparison and relative doses are used to normalize the calculation. (A U C d o s a g e A A U C d o s a g e B) × (D o s e B D o s e A) {\displaystyle \right)\times \left({\frac {Dose_{B}}{Dose_{A}}}\ \right)} See also Cmax (Pharmacology) Cmean Area Under Curve of receiver's operating characteristics References ^ Lappin, Graham; Rowland, Malcolm; Garner, R Colin (2006). [1] The use of isotopes in the determination of absolute bioavailability of drugs in humans. Expert opinion on drug metabolism & toxicology 2 (3): 419-27. ^ Srinivasan, V. Srini (2001). [2] Bioavailability of nutrients: A practical approach to In Vitro Demonstration of the availability of nutrients in Multivitamin-Mineral combination products. Journal of Nutrition 131 (4 Suppl): 1349S–1350S. Taken from Jump to main content Jump to table of contents Reference entryDOI: A common use of the term area under the curve (AUC) can be found in pharmacokinetic literature. It represents the area below the plasma concentration curve, also known as the plasma concentration time profile. It is of interest to know the area under the curve, i.e. AUC is a measure of total systemic exposure to the drug. AUC is one of several important pharmacokinetic terms used to describe and quantify aspects of the plasma concentration-time profile of an administered drug (and/or its metabolites, which may or may not be pharmacologically active themselves). These include: Cmax: The maximum concentration or maximum system exposure Tmax: The time of maximum concentration or maximum systemic exposure t1/2 or half-life: The time required to reduce the plasma concentration to half of its initial value Integral... This is a preview of subscription content, sign in to control access. Dhillon, S., & Kostrzewski, A. (Eds.). (2006). Clinical Pharmacokinetics. London: Pharmaceutical Press.Google ScholarMulder, G. J., & Powers, W. J. (Eds.). (2006). Drug Toxicology. London: Pharmaceutical Press.Google Scholar© Springer Science+Business Media, New York 2013J. Rick TurnerEmail author1. Cardiovascular SafetyQuintilesDurhamUSA The area under the plasma physician concentration-time curve (AUC) reflects the actual body exposure to the drug after administration of a dose of the drug and expressed in mg*h/L. This area under the curve depends on the degree of elimination of the drug from the body and the dose administered. The total amount of drugs eliminated by the body can be assessed by adding up or integrating the amounts eliminated in each time interval, from time zero (time for administration of the drug) to infinite time. This total quantity corresponds to the fraction of the dose administered and which reaches the systemic circulation. The AUC is directly proportional to the dose when the medicine follows linear kinetics. AUC is inversely proportional to the clearance of the drug. That is, the higher the clearance, the less time spends the drug in the systemic circulation and the faster the decrease in plasma drug concentration. Therefore, in such situations, the body exposure to the drug and the area during the concentration-time curve is less. $$AUC = {color{cyan}{AUC0}-\color{cyan}2 + {color{pink}{AUC2}-\color{pink}4+\color{purple}{AUC4}-color{purple}{6}+\\color{yellow}{AUC6}-{color{yellow}{8}+{color{green}{AUC}{AUC 8}-\color{green}{10}+\color{HotPink}{AUC10}-\color{HotPink}{12}+\\color{RoyalBlue}{AUC last}-\color{RoyalBlue}{infinity}$$ Clinical implications During clinical trials, the patient's plasma drug concentration time profile can be drawn by measuring plasma concentration at multiple times. AUC can then be appreciated. Knowing the bioavailability and dose, clearance of the drug can be calculated by dividing the dose absorbed by the AUC. The clearance that is calculated is relatively independent on the shape of the concentration-time profile. This method provides costly information about the pharmacokinetic behavior of a drug on trial. It can also be used to study a change in the clearance of a drug in specific clinical conditions, such as disease or concomitant drug authorization. Related Terms Apparent Clearance (CL'): In some pharmacokinetic trials, bioavailability of the studied drug is not known. The apparent clearance, resulting from the dose divided by AUC, reflects the drug's clearance which does not take into account the drug's bioavailability. Relative bioavailability Assessment $$AUC = {F*D \over CL}$$ After an iv bolus injection, AUC can be calculated by the following equation: $$AUC = C(0) \over \lambda} $$ Trapezoidal rule: It consists in dividing the plasma concentration time profile into multiple trapetsoides and calculating the AUC by adding the area of these trapetsoides. AUC = Area under concentration time curve F = bioavailability D = dose CL = clearance C(0) = extrapolated plasma concentration at time 0 λ = elimination rate constant = CL/Vd CL/Vd