Effective, physical and biological half-life

During radioactive transformation, the number of active atoms of a radioactive nuclide is constantly decreasing, the decay time can be expressed using three quantities:

- physical half-life
- biological half-life
- effective half-life

Physical half-life

The physical half-life (Tf) characterizes the rate of radioactive transformation of a nucleus. This is the time in which half of the atoms of a given radioactive nuclide are transformed. Time is the dimension of a given quantity (time units - minutes, seconds, hours, days, years - are chosen according to the given isotope). The values of a given type of half-life are considerably different for individual radionuclides. Using the Tf value, we can make a graph of its decay curve.

The physical half-life is defined as: $T_f = \ln(2)/\lambda = 0{,}693../\lambda$

λ = conversion constant, is characteristic for each radioactive nucleus, the values are given in the tables

$\ln(2)$ = the value of the logarithm

Biological half-life

The biological half-life (Tb) is the time during which half of the amount of a given radionuclide is eliminated from the body.

Effective half-life

We define the *effective half-life (Tef)* as the time during which the total activity of the radionuclide that has been introduced into the body decreases. Due to radioactive transformation and biological excretion, it will drop by half. Under real conditions, it is always shorter than the physical half-time.

The effective half-life is defined as: $1/T_{ef} = 1/T_f + 1/T_b$

Links

Sources

- BENEŠ, Jiří, et al. *Základy lékařské biofyziky.* 3. vydání. Praha : Karolinum, 2011. 200 s. ISBN 978-80-246-2034-3.

- NAVRÁTIL, Leoš a Jozef ROSINA, et al. *Medicínská biofyzika.* 1. vydání. Praha : Grada, 2005. 524 s. ISBN 80-247-1152-4.