

THE DETERMINATION OF GAS TRANSIT TIME DISTRIBUTION
FUNCTION IN LUNGS USING RADIOACTIVE TRACER $^{81}\text{Kr}^m$

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The kinetics of biologically inert radioactive tracer $^{81}\text{Kr}^m$ gas in lungs allow the regional lung ventilation studies [1]. Specifically one can consider the distribution of transit time of gas which is transported through lungs. The existence of such distribution is the consequence of the fact that total amount of gas inhaled in one breath-in is not completely expired in the next breath-out, but after several breath-outs.

To obtain gas transit time distribution (GTTD) function we connected the results of compartmental method with stochastic analysis which is based on the equation:

$$I_o(t) = \int_0^t f(t-t') I_i(t') dt'$$

$I_i(t)$ ($I_o(t)$) is the number of tracer atoms per unit of time which flow in (out) given lung region, $f(t)$ is GTTD function. Using simple mathematical lung ventilation model (compartmental method) [2] we obtained $I_i(t)$ and $I_o(t)$ and performed deconvolution of the above equation. $f(t)$ is found to be linear combination of exponential functions. We found that mean transit time $\bar{t} = \int_0^{\infty} t f(t) dt$ is reciprocal value of specific ventilation.

The numerical determination of GTTD function and \bar{t} is performed using regional $^{81}\text{Kr}^m$ dynamic study on normal subjects.

- [1] J. NOSIL, Ž. BAJZER, Š. SPAVENTI, Nucl. Med. 16 (1977) 13 and refs. cited therein
[2] Ž. BAJZER, J. NOSIL, Phys. Med. Biol. 22 (1977) 975.