THE ACTIVATION AND INACTIVATION OF LYSOSOMAL AND EXTRALYSOSOMAL COMPARTMENTS – A SIMPLE GENERAL MODEL

WOJCIECH A. TURSKI¹, JANUSZ ZASŁONKA², STEFAN SZRAM³ and MIROSŁAW MUSSUR²

¹Department of Neurology and Oromandibular Dysfunction, Medical University in Łódź, Pomorska 251, 92-213 Łódź, Poland, ²Department and Clinic of Cardiosurgery, Medical University in Łódź, Poland, ³Department of Jurisprudence Medicine, Medical University in Łódź, Poland

Many physiological and pathological processes involve the participation of lysosomal enzymes acting both within lysosomes and outside them (mostly in the extracellular compartment). There is an evident lack of a simple general model enabling the calculation of what is going on with any lysosomal enzyme both in the intra- and extralysosomal compartment (translation and processing, endo- and exocytosis, infiltration of cells rich in lysosomes during tissue growth affected with any drug, toxin, hormone or growth factor) We offer such a simple general model. Let us estimate the activity of any lysosomal enzyme: free (F), total (T), the latter after preincubation with Triton X-100, and bound (B) i.e. intralysosomal: B=T-F, in homogenates of tissue (sample) taken at two points, t₁ and t₂, e.g. t₁ before and t₂ after an operation. Then we calculate Aᵢ (in the lysosomes) and Aₑ (outside the lysosomes) being the indices of activation (if A>1) or inactivation (if A<1) with the formulae: Aᵢ = B₂/B₁ L and Aₑ = F₂/F₁ + (B₁ • Aᵢ) - B₂, where (1-L) means the percentage of lysosomes broken between t₁ and t₂. We present the meta-analysis of the experimental data of other authors and analyse our own data on the activity of cathepsin D and L from small fragments of the right atria of coronary patients collected during a coronary-aortal bypass graft operation. An intralysosomal activation and extralysosomal inactivation during the intraoperative (cardioplegic) ischemia might result from the elevated endocytosis of lysosomal enzyme(s) in the cardiomyocytes. Electron microscopy reveals that this is indeed the case.