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Human liver mitochondria and microsomes: Ultrastructure and functional properties in relation to molecular composition and fluidity

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A synopsis of studies on subcellular fractions of human liver (HL) will be presented. The HL mitochondria, purified inner and outer membranes and microsomes were isolated by differential centrifugation. The purity of fractions was evaluated by electron microscopy and marker enzymes. Studies of molecular composition, fluidity of membranes and functional properties revealed peculiarities in comparison with the corresponding fractions in rat liver (RL); human membranes contain twice as much lipid, with differences in regard with the essential fatty acids: more linoleic acid and less arachidonic acid. Such a pattern of distribution of fatty acids in liver subcellular membranes has not been reported for any other species. Although the unsaturation of lipids is lower in HL than in the RL membranes a higher fluidity of human membranes was inferred from spin label studies, probably due to a lesser immobilization of lipids by proteins. Human membrane proteins contain a higher amount of hydrophobic aminoacids and a lower amount of polar aminoacids, hence the hydrophobicity of membranes is higher than in the rat. The peculiar composition of membranes confer to HL mitochondria a higher fragility compared to that of RL mitochondria, while some enzymic activities posses interesting peculiarities: the ATPase, β -hydroxybutyrate dehydrogenase and adeninnucleotide translocator are stimulated by albumin, while cytochrome oxidase exhibit a specificity towards the oxidation of human cytochrome c. There were important changes in the ultrastructure, oxygen uptake, oxidative phosphorylation, enzymic activities and membrane fluidity of mithochondria isolated from the liver of patients with non-alcoholic fatty liver, prolonged jaundice, cirrhosis.

Biography

Gheorghe Benga, MD, PhD (Univ. Medicine and Pharmacy - UMP), MSc ("Babes-Bolyai" University), completed his Postdoctoral studies in Sheffield and London. He is a Senior Physician (Clinical Laboratory, Medical Genetics), Doctor honoris Causa (6 universities), member, The Romanian Academy and Academy of Medical Scences. He founded the Department of Cell and Molecular Biology (CMB) of UMP, the Laboratory of Genetic Explorations (LEG), Cluj County Clinical Emergency Hospital. He is now Director of LEG, Professor of CMB ("Vasile Goldis" Western University of Arad) and Honorary Associate (University of Sydney). He was Visiting Professor, invited plenary lecturer or speaker in many international congresses, universities in Europe, USA, Canada, Japan, Australia. He has published more than 200 papers in reputed journals (including Nature) and is serving as an editorial board member of reputed journals.

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