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Glutathione in parenteral nutrition prevents both the oxidative stress and hypo alveolarization in lungs of newborn Guinea pigs

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Introduction: Peroxides contaminating parenteral nutrition (PN) are associated with oxidation of redox potential of glutathione in blood of preterm newborns (<30 weeks gestation) and in lungs of animal model of neonatal PN. These oxidized redox and peroxides are associated to bronchopulmonaria dysplasia in preterm newborns and induce loss of alveoli by apoptosis in animals. Glutathione detoxifies peroxides and normalises redox potential. However, glutathione is low in preterm newborns. Glutathione is derived from liver where methionine is transformed in cysteine of which availability limits the glutathione synthesis. Peroxides from PN inhibit the methionine adenosyltransferase, the first enzyme leading to cysteine. Thus, premature infants have a limited capacity to detoxify peroxides.

Hypothesis: Addition of glutathione in PN compensates for the low hepatic capacity to supply glutathione, and consequently preserves the lung integrity.

Method: At 3 days of life, guinea pigs (N=55) received PN enriched with glutathione (0, 75, 200, 270, 440, 600, 650, 1065 nmol GSSG/d/kg). After 4 days, lungs were determined for GSH, GSSG, redox potential and alveoli (number of intercepts between a line (1 mm) and histological structures).

Results: The results of the study were as follows: redox: doses 0-270 = -209±1; doses 440-1065 = -217±2; $p<0.01$; control (without manipulation): -216±2 mV. GSH: 0-270 = 29±1; 440-1065 = 30±1; control = 36±1 nmol/mg prot. GSSG: 0-270 = 0.82±0.08; 440-1065 = 0.38±0.04; $p<0.01$; control = 0.49±0.07 nmol/mg prot. Alveoli: 0-200 = 26±1; 270-1065 = 30±1; $p<0.01$; control = 33±2 count/mm.

Discussion: Addition of glutathione in PN allows detoxification of peroxides (lower GSSG), preventing oxidation of redox and loss of alveoli. A clinical study is expected to start soon.

Biography

Jean-Claude Lavoie is Associated Professor in departments of Nutrition and Paediatrics of Université de Montréal where he has completed his PhD in 1998. He has published more than 90 papers in reputed scientific journals. His research works are funded primarily by the Canadian Institutes of Health Research. His research interest focuses on the impact of parenteral nutrition components on redox homeostasis in preterm infants in relation to chronic lung diseases such as bronchopulmonary dysplasia, energy metabolism and epigenetic modulator of chronic diseases observed in adults.

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