**HIGH SERUM LIPID PEROXIDES AND THEIR SIGNIFICANCE IN
PATIENTS WITH LIVER DEFICIENCY**

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ABSTRACT

Various significant levels of lipid peroxides were observed in patients with different liver diseases. The increased values of lipid peroxides might be correlated with the modifications in pathological way of bilirubin, glutamate, pyruvate-transaminase, glutathione, triglycerides and chemiluminescence.

This correlation was observed in the acute hepatic insufficiency such as acute viral hepatitis, hepatic coma, ethylic cyrrhosis. The increase of lipid peroxides in the serum of these patients is related to tissue destructions, cellular membrane lysis and subsequent release of polyunsaturated fatty acids. The determination of lipid peroxides in liver deficiency might indicate an irreversible liver damage and the failure of the antioxidant systems to exert protective role.

RESUMO

Níveis elevados de peróxidos de lipídeos foram observados em pacientes com doenças hepáticas. Os teores altos de peróxidos de lipídeos poderiam ser correlacionados com mudanças patológicas da bilirubina, glutamato, piruvato transaminase, triglicerídeos e quimiluminescência.

Esta correlação foi observada em casos de insuficiência hepática aguda, incluindo hepatite viral, coma hepático e cirrose. O aumento de peróxidos de lipídeos no soro está relacionado com destruição de tecidos, lise da membrana celular e liberação de ácidos graxos poliinsaturados. Teores altos de peróxidos de lipídeos podem indicar dano hepático irreversível e falha dos sistemas antioxidantes.

KEYWORDS: Lipid peroxidation, Liver deficiency, Chemiluminescence, Oxidative stress.

INTRODUCTION

Formation of peroxides, especially of the lipid ones is a consequence of oxygen activation of the interconversion of the natural defence systems¹⁻⁸.

In biological environments, the most favourable substrate of peroxidation is constituted by polyunsaturated fatty acids, important components of cell and subcell membranes.

The continuous formation of lipid peroxides (LP) under normal and pathological conditions has been unanimously accepted¹⁻⁸.

The liver seems to be the key organ in oxidative stress. The term "oxidative stress" has been applied to situation when an imbalance arises between the prooxidant and antioxidant equilibrium in favour of the former⁴. A large part of LP are formed in the liver. Likewise, most concentrations of enzymatic and non-enzymatic antioxidants are to be found in the liver^{2, 5, 6, 8}.

Peroxidation involves direct reaction of active forms of oxygen with formation of free intermediary radicals and semistable peroxides. The most efficient catalysts are the ions of transition metals, haemoproteins, cold, stress, drugs, etc.

Once formed, LP are decomposed leading to the formation of carbonyl compounds. Of these, the most widespread is malondialdehyde (MDA), the determination of which has long constituted the only evidence of LP production in biological systems¹ (Fig.1).

Figure 1. Mechanism of Lipid Peroxides Production

Peroxidation of lipids, at least in the liver, might be a physiological phenomenon, controlled by protective systems, which within certain limits, will not lead to polyunsaturated fatty acids loss.

Through a complex process, LP appear in large concentrations in all liver diseases.

As in all stages of peroxidation, electronically excited species are formed, generating chemiluminescence (CL), CL associated to peroxidation has also been studied. A characteristic of CL is that in most reactions involved in this phenomenon, intermediates are reactive species of oxygen, especially singlet oxygen, $^1\text{O}_2$ ^{4, 5, 8, 9 - 12}.

MATERIALS AND METHODS

The biochemical determination has been performed according to standard methods^{13,14} for bilirubin (BR), glutamate : pyruvate-transaminase (GPT), glutathione (GSH) and triglycerides (TG). Lipid peroxides (PL) have been measured according to Satoh's method¹⁵ and chemiluminescence (CL) by using the H_2O_2 - haemoglobin - luminol system ¹⁰.

RESULTS AND DISCUSSION

The results are shown in Table 1 and Figure 2.

Lipid peroxides concentration in plasma becomes statistically increased in severe forms of hepatic insufficiency, varying with bilirubin and GPT levels. On the other hand, GSH concentrations decreases.

Unsignificant increase of lipid peroxides in mild forms of hepatic insufficiency proves the great capacity of resistance and adaptation of the defence systems.

A correlation between the biochemical parameters and the degree of lysis of the hepatic cell and the functionality of the defence systems, has also been noticed.

Thus, triglycerides represent the substrate of peroxidation, bilirubin is the catalyst of peroxidation, favouring $\text{HO}\bullet$ formation, LP and CL are the outcome of peroxidation and the glutathione is an indicator of the efficiency of the defence systems against peroxidation. In this respect, an

TABLE 1
CHANGES IN SOME BIOCHEMICAL PARAMETERS OF PATIENTS WITH VARIOUS LIVER DISEASES

Disease	Number of patients	LP	Bilirubin	GPT	TG	GSH	CL
Control	37	8,6 ± 3,8	1,05 ± 0,8	26,5 ± 3,5	136 ± 12	47,4 ± 4,3	53,7 ± 6,1
Alcoholic hepatitis	11	10,8 ± 5,4	5,8 ± 3,7	38,5 ± 4,1	243 ± 62	32,5 ± 1,6	67,4 ± 7,5
Viral hepatitis	35	21,9 ± 3,2 ⁺	9,3 ± 4,1	496,3 ± 24,3 ⁺	315 ± 24	36,9 ± 2,8	74,5 ± 4,8
Acute viral hepatitis	15	66,8 ± 8,4	19,9 ± 2,6 ⁺	532,7 ± 36,5	428 ± 31 ⁺	24,6 ± 3,9 ⁺	85,8 ± 6,4 ⁺
Chronic hepatitis	14	11,3 ± 3,8	3,8 ± 1,6	47,5 ± 5,2	278 ± 21	53,8 ± 6,1	64,7 ± 5,4
Cyrrhosis	8	17,5 ± 4,3	15,7 ± 4,2	36,8 ± 3,6	236 ± 45	29,6 ± 4,9	42,5 ± 5,8
Hepatic coma	10	7 ± 9,5	21,5 ± 8,5	530,2 ± 34,5	410 ± 30	28,5 ± 4,5	84,6 ± 5,4

LP - lipid peroxides
CL - chemiluminescence

GSH - glutathione
TG - triglycerides

GPT - glutamate:pyruvate-transaminase

Parameters have been expressed in this way :

LP - nmole/ml
Bilirubin, TG, GSH - mg %
CL - pulse/minute/0,1 ml ser

+ = significant differences compared to control for $p < 0,01$

Figure 2 Bilirubin and Lipid Peroxides concentration in Hepatic Coma

increase of PL, TG, BR and CL when GSH is reduced can also be accounted for.

Chemiluminescence of biological systems which undergo peroxidation has a direct relationship with LP concentration and MDA, their product of decomposition, although these parameters of peroxidation are formed by different ways and at different stages (Table 1)^{3, 9, 10}.

Individual variations of the values under study are greater in mild insufficiencies when, due to prompt and efficient functioning of the defence systems, peroxidation is low.

From the correlation of biochemical parameters and the significance of their values in various hepatic diseases, it results the lipid peroxide level may be a sensitive indicator of the degree of involvement hepatic integrity, as well as of the incapacity and exceeding of antioxidant systems.

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