els in the LDL and HDL1 fractions, paralleled by a striking induction of HMG-CoA reductase and cholesterol 7α-hydroxylase activities. This induction was lower when the soy protein diet was supplemented with methionine. The [VLDL + LDL] susceptibility to Cu-induced peroxidation was markedly enhanced in rats adapted to soy protein, compared to those receiving casein. It is noteworthy that methionine supplementation only partially recovered the lipoprotein resistance to peroxidation, despite the high GSH status in such conditions.

In conclusion, it appears that the potential cholesterol-lowering effect of some plant proteins requires that the sulfur amino requirements of the organism are fulfilled. When this supply is inadequate, various disturbances of lipid metabolism may be observed, and especially the susceptibility of lipoproteins to oxidative stress.

Importance of cation concentrations on the stability of parenteral nutrition solutions. R Collomp, E Peroux, JM Pons *(Laboratoire de fabrication, Pharmacie centrale CHU, 06730 Saint-André-de-Nice, France)*

This study was designed to determine the influence of cation concentration on the stability of nutrient solutions for parenteral use.

Four nutrient solutions were modified by reducing their calcium and magnesium concentrations and by increasing their potassium phosphate content.

The influence of cations on stability can be estimated by calculation of the critical aggregation number (CAN): CAN = $a + 64b + 729c$, where a is the molar concentration of monovalent cations, b is the molar concentration of divalent cations and c is the molar concentration of trivalent cations [Bumham et al (1983) *Int J Pharmacol* 13, 9-22]. For industrial preparations, the limit of destabilization is set empirically at CAN = 200.

The overall stability of emulsions, expressed in exploitable days, is estimated by determining the evolution of five parameters over a period of time: the height of creaming, the average diameter of oil droplets, the percentage of oil, pH and osmolality. Tests are performed on tubes and on bags over a period of 14 days.

The modified nutrient solutions having fewer divalent cations exhibited improved stability, even when their monovalent cation concentration was increased. This phenomenon was correlated with a decrease in CAN, although this parameter was not always linearly related to the global stability of the emulsions (eg, samples P2 and P4).

Cation composition of the mixtures.

	P1	*P'1*	*P2*	*P'2*	*P3*	*P'3*	*P4*	*P'4*
Na^+ (mmol/L)	28.6	39.9	36.3	34.6	26.6	32.4	42.8	38.6
K^+ (mmol/L)	24.6	34.3	31.2	34.9	24.6	28.9	33.6	41.7
Ca^{2+} (mmol/L)	3.6	2.4	4.6	2.1	3.6	1.7	4.0	2.4
Mg^{2+} (mmol/L)	2.2	1.2	2.8	1.0	2.2	0.9	2.3	1.2
CAN	424	304	541	268	422	228	480	310

P1, P2, P3, P4: original formulas; P'1, P'2, P'3, P'4: new formulas; CAN: critical aggregation number.

	P1	*P'1*	*P2*	*P'2*	*P3*	*P'3*	*P4*	*P'4*
Creaming (mm) d 3; d 14	1.5;2	1;1	1;2.5	0.5;1.5	1;2	1;1.5	1;2	0.5;1.5
Diameter of oil droplets (nm) d 1; d 14	323;325	328;324	353;329	327;324	359;345	323;320	362;352	331;327
Percentage of oil (%) d 1; d 14	< 3; < 3	< 3; < 3	< 3; < 3	< 3; < 3	< 3; < 3	< 3; > 3	< 3; < 3	< 3; < 3
pH d 1; d 14	6.40; 6.45	6.40; 6.35	6.38; 6.35	6.30; 6.32	6.31; 6.33	6.35; 6.33	6.40; 6.36	6.20; 6.17
Osmolality (mosm/L) d 1; d 14	1 041;1 017	1 414;1 419	1 486;1 482	1 524;1 454	1 557;1 541	1 386;1 385	1 541;1 539	1 478; 1 463
Stability (d)	11	14	12	14	12	14	4	14

d: day

This study demonstrated that cations play an important role in the stability of nutritional emulsions, although other factors are also involved. The CAN remains a valuable tool for predicting cation-induced destabilization and can be used to elaborate new nutrient solutions offering adequate stability for specific therapeutic indications.

VITAMINS–OLIGOELEMENTS

Effects of vitamin E on insulin sensitivity and peroxidation parameters in insulin-resistant rats. P Faure [1], E Rossini [1], PY Benhamou [2], S Halimi [2] *([1] GREPO and [2] Service de diabétologie, Université J-Fourier and CHU de Grenoble, 38700 Grenoble, France)*

A recent study revealed an improvement in insulin sensitivity in non-insulin dependent diabetic (NIDDM) patients after treatment with pharmacological doses of vitamin E. The aim of our study was to investigate in an animal model of insulin resistance, rats fed with a high fructose diet (58% of carbohydrates [CHO]), the effects of vitamin E on insulin sensitivity (glucose uptake = Rd). Measurement of glucose uptake was performed using an euglycemic hyperinsulinic clamp (2 mU/min/rat) in conscious animals. We measured the markers of lipid peroxidation (MDA) and protein oxidation (Thiols, SH) and protective enzyme against oxidative stress (Cu Zn SOD). We studied three animal groups: control rats ($n = 6$), fructose fed rats ($n = 9$) and fructose + vitamin E fed rats: 3.4 g/kg diet ($n = 8$). The animals fed with the high fructose diet showed a significant decrease of Rd (14.5 ± 1.3 vs control group 31.7 ± 1.6 mg/kg/min). Vitamin E administration significantly increased Rd (21 ± 2.7 mg/kg/min). The high fructose fed rats exhibited increased MDA concentrations, a decrease of SOD activity (0.87 ± 0.21 vs 1.44 ± 0.34 U/mg/Hb) and a decrease of thiols. These defects were corrected by vitamin E admistration. In summary, in this insulin-resistant rat model, vitamin E improves insulin sensitivity by 60%,