

ABSTRACT

Malnutrition is a state in which a deficiency of energy, protein and other nutrients causes measurable adverse effects on tissue, body form, composition, function or clinical outcome¹. Parenteral nutrition (PN) is an alternative method of providing nutritional support for patients via the intravenous route³. PN admixtures consist of fats, carbohydrates, proteins, vitamins, trace elements, electrolytes and fluids. Vitamins are believed to be among the least stable ingredients in PN mixtures and should be added immediately before commencing infusion. The purpose of this thesis was to obtain more punctual information on stability of the vitamins in Intralipid® emulsion depending on different storage conditions and different time.

Water-soluble vitamins and fat-soluble vitamins were investigated in the mixture of Intralipid® emulsion (Fresenius Kabi) with Solvatio® N (water-soluble vitamins) and Vitlipid® N (fat-soluble vitamins) Adult Injections. There were prepared six 50ml Luer-Lock Syringes in total. Each of them was filled with 47 ml of the Intralipid® mixture and closed by Multi-Ad Luer-Lock Syringe cap. Assessing the chemical and physical stability was carried out after: zero time, 7, 14 and 29 days in a refrigerator followed by 24 and 48 hours storage at ambient temperature and day-light protected. Physical tests included pH, osmolality, microscopy and particle size determination by laser diffraction. Chemical tests used validated stability indicating reversed phase HPLC methods. Eight vitamins were suitable for investigation via HPLC method, namely vitamin A and E, thiamine, pyridoxine, riboflavin, pantothenic acid, folic acid and nicotinamide. Ascorbic acid (AA) was eluted very early in gradient run and was not suitable for analysing by HPLC method used.

AA is rapidly oxidised, the oxidation of AA clearly proceeds to inactive products. There is potential appearance of oxalic acid (OA) in the mixture as an end stage degradation product². The purpose of my investigation was to prove the presence of OA as a degradation product of AA dissolved in water after couple-day storage at ambient temperature via HPLC analysis.

According to the Laser diffraction results no lipid droplets in Intralipid® Syringes samples were enlarged. In discussed trials the volume of droplets bigger than 5 µm was 0 %. Concerning the lipid globules size this Intralipid® admixture could be used for intravenous delivery during whole storage period. Vitamin A in the mixture with fat emulsion was shown quite stable if its samples stored in the fridge. Losses of the vitamin E were not rapid in the mixture with fat emulsion. One of the reasons could be that Syringes used for storage of the mixtures are made from polypropylene/polyethylene and are PVC free. HPLC results have shown that degradation of pyridoxine is negligible when the samples are light-protected. Pyridoxine was shown as a stable vitamin, because its losses were small during whole storage period. NA HPLC results have shown that its losses during storage in the fridge were small. More significant degradation of NA was noticed after two days storage at ambient temperature. Thiamine was shown to be stable in the mixture with fat emulsion. Almost no losses were detected when thiamine containing samples were stored in the fridge.

HPLC results have shown that FA was rapidly degraded when the samples were stored out of the fridge. Losses of FA in the mixture with fat emulsion were less if the

samples stored in the fridge. Riboflavin losses were significant throughout investigation, especially when samples were stored at ambient temperature for two days. Degradation of PA was small even after long time storage period. Losses of this vitamin were negligible if samples stored in the fridge as well as at ambient temperature.

It was not possible to finish the AA degradation investigation because of the conclusion of my research fellowship. Stability studies of AA and OA degradation were not complete by the time I have left, therefore it was not possible to publish them in this thesis.