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Application of rotative liquid-liquid microextraction as a new miniaturized preconcentration method for the determination of cobalt in vitamin ampoules by fiber optic-linear array detection spectrophotometry

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Background and Aims: Cobalt is an essential micro nutrient for all living systems. It is present in vitamin B12 which is involved in the production of RBC and prevention of pernicious anemia. In this research the applicability of a new and fast solvent microextraction technique termed rotative liquid-liquid microextraction (RLLME) was evaluated by the determination of cobalt in three vitamin ampoules include: B12, B-complex, Neobion.

Methods: For cobalt determination in pharmaceutical preparations firstly the samples was digested. Then 1-(2-Pyridylazo)-2-naphthol (PAN) was chosen as the complexing agent. According to RLLME, microvolumes (140 µL) of a high density extractant organic solvent were added into the aqueous sample (5 mL). Afterwards, the test tube contents were rotated around a fixed z axis. Due to different viscosity and density of the organic phase and sample solution, the aqueous phase was rotated with higher velocity over the organic solvent. So, the microextraction was performed by increasing the number of collisions per unit time between two phases. After microextraction, the organic phase was settled to the conical-bottom of the glass test tube. Finally, analysis was carried out by fiber optic-linear array detection spectrophotometry (FO-LADS).

Results: In order to achieve a high recovery and enrichment factor,type and amount of organic solvent, rotation conditions and the other parameters were optimized.Under the optimum conditions, the preconcentration time was 30 s, the limit of detection (LOD) of the method was 0.12 ng mL-1, the recoveries were greater than 96% and the relative standard deviation (R.S.D.) was 1.9 %.

Conclusions: The coupling of RLLME with FO-LADS was successfully used for preconcentration of trace amount of cobalt in vitamin ampoules. The proposed method is simple, rapid, inexpensive in addition, provides good repeatability, recovery and adaptability to field sampling and automation.

Keywords: Vitamin ampoules; Cobalt; Preconcentration; Rotative liquid-liquid microextraction; Fiber optic-linear array detection spectrophotometry