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**Short Communication**

# Nanoparticles from microemulsions

M.R. Gasco and M. Trotta

*Istituto di Chimica Farmaceutica e Tossicologica dell'Università di Torino, Torino (Italy)*

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The polyalkylcyanoacrylates are used as biodegradable tissue adhesives in surgery and as particles to entrap and stabilize various molecules. Couvreur et al. (1979a) obtained nanoparticles by polymerization in a surfactant solution of the monomer. The same workers also described the adsorption of many antineoplastic drugs embedded in nanoparticles (Couvreur et al., 1979b).

The present paper describes the preparation of nanoparticles formed from methylcyanoacrylate monomer. The reaction involves a catalyzed anionic mechanism (Coover et al., 1959) with the monomer dissolved in the oil phase of a water-in-oil microemulsion. An in situ polymerization occurs at the interface of the aqueous disperse phase; a molecule dissolved in the aqueous phase should be incorporated into the nanoparticles. The method does not require, as in the interfacial polymerization, the presence of reactive monomers in the disperse phase.

A typical procedure used in the preparation of polymethyl-2-cyanoacrylate is described here. An aqueous solution at pH 1–2 (8 ml) of the material to be incorporated is emulsified in an organic solution constituted of 20 ml isopropyl myristate, 3.5 g aerosol AOT and 2 ml of butanol; 0.4 ml of the monomer methylcyanoacrylate is mixed with 5 ml of the continuous organic phase and added, whilst stirring, in about 5 min. After 30 min the suspension is buffered at pH 7.0, then centrifugated at 12,000 rpm to separate nanoparticles from liquid; therefore the nanoparticles are washed repeatedly with an aqueous solution of Tween 80.

Using as aqueous phase an acid solution of methylene blue (1 $mg \cdot ml^{-1}$), 93% of methylene blue is incorporated into the nanoparticles. Fig. 1 shows a micrograph of the nanoparticles prepared as described above and dispersed in a solution of 2% w/w PTA (Lukas and Perovic, 1985). A Philips EM 300 instrument was used. The nanoparticles appear of size between 80 and 120 nm.

The in situ polymerization of microemulsion w/o is expected to be a successful way for the encapsulation of a high percentage of hydrophylic drugs dissolved in the disperse aqueous phase. Since the drug is in the inner part of the nanoparticles, it could be released in vivo (Grislain et al., 1983) only after the degradation of the polymer. The nanodrops of the microemulsions, having low diameters with a close distribution, should give nanoparticles with a close distribution of the diameters. After the encapsulation of the drug, the highly specific surface could be utilized to adsorb more drug that could be released in vivo more quickly than the one encapsulated.

*Correspondence:* M.R. Gasco, Istituto di Chimica Farmaceutica e Tossicologica dell'Università di Torino, Torino, Italy.

Fig. 1. Transmission electron micrograph of nanoparticles stained with PTA. Magnification 90,600 ×.

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