

Self-assembly of chlorin-e6 on γ -Fe₂O₃ Nanoparticles: Application for Larvicidal Activity Against *Aedes Aegypti*

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Abstract

Aedes aegypti mosquitos are widespread vectors of several diseases and their control is of primary importance for biological and environmental reasons, and novel safe insecticides are highly desirable. An eco-friendly photosensitizing magnetic nanocarrier with larvicidal effects on *Aedes aegypti* was proposed. The innovative core-shell hybrid nanomaterial was synthesized by combining peculiar magnetic nanoparticles (called Surface Active Maghemite Nanoparticles - SAMNs, the core) and chlorin-e6 as photosensitizer (constituting the shell) via self-assembly in water. The hybrid nanomaterial (SAMN@chlorin) was extensively characterized and tested for the photocidal activity on larvae of *Aedes aegypti*. The SAMN@chlorin core-shell nanohybrid did not present any toxic effect in the dark, but, upon light exposure, showed a higher photocidal activity than free chlorin-e6. Moreover, the ecotoxicity of SAMN@chlorin was determined in adults and neonates of *Daphnia magna*, where delayed toxicity was observed only after prolonged (≥ 4 h) exposure to intense light, on the green alga *Pseudokirchneriella subcapitata* and on the duckweed *Lemna minor* on which no adverse effects were observed. The high colloidal stability, the physico-chemical robustness and the magnetic drivability of the core-shell SAMN@chlorin nanohybrid, accompanied by the high photocidal activity on *Aedes aegypti* larvae and reduced environmental concerns, can be proposed as a safe alternative to conventional insecticides.

Keywords: *Aedes aegypti*; Chlorin e6; Larvicidal activity; Maghemite nanoparticles; Photosensitizer.

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