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Non-Selective Toxicological Effects of the Insect Juvenile Hormone Analogue Methoprene. A Membrane Biophysical Approach

João P. Monteiro · Romeu A. Videira · Manuel J. Matos · Augusto M. Dinis · Amália S. Jurado

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Abstract The Gram-positive bacterium, *Bacillus stearothermophilus*, was used as a model organism to identify the non-selective toxic effects of the currently used insecticide methoprene (isopropyl(2E,4E)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate). A significant decrease of the yield of bacterial cultures and a premature appearance of ultrastructural abnormalities in cells cultured in the presence of the insecticide were taken as indicators of cytotoxicity. A putative correlation of this cytotoxicity with methoprene-induced perturbations on membrane lipid organization was investigated, using differential scanning calorimetry and the fluorescence polarization of 1,6-diphenyl-1,3,5-hexatriene (DPH) and its propionic acid derivative (DPH–PA). The membrane physical effects depended on the lipid bilayer composition and packing. The most striking effect was a progressive broadening and shifting to lower temperatures, with increasing methoprene concentrations, of the main transition phase of the dimyristoyl- or dipalmitoylphosphatidylcholine bilayers and of the lateral phase separation of liposomes reconstituted with the lipid extracts of *B. stearothermophilus.*

Keywords Methoprene · Lipid dynamics · Differential scanning calorimetry · Fluorescence polarization · Cell ultrastructure · *Bacillus stearothermophilus*

J. P. Monteiro · M. J. Matos · A. S. Jurado
Centro de Neurociências e Biologia Celular; Department of Biochemistry, University of Coimbra, 3001-401 Coimbra, Portugal

R. A. Videira
Higher School of Technology, Polytechnic Institute of Viseu, 3504-510 Viseu, Portugal

A. M. Dinis
Laboratório de Microscopia Electrónica, Department of Botany, University of Coimbra, 3001-401 Coimbra, Portugal

A. S. Jurado (✉)
Department of Biochemistry, University of Coimbra, Apartado 3126, 3001-401 Coimbra, Portugal
e-mail: asjurado@ci.uc.pt