

Volume 94/Supplement 1 - 2021

# Journal of Biological Research

Bollettino della Società Italiana di Biologia Sperimentale



**93<sup>rd</sup> National Congress of the  
Italian Society of Experimental Biology**

Palermo, Italy, 22-25 April 2021

ABSTRACT BOOK

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### THE PROBLEM OF INDOOR AIR MANAGEMENT IN A CRITICAL PERIOD: WE CAN LEARN FROM TERMITES

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Currently, about 2200 species of termites have been recorded, compared to 3100 varieties of amphibians or 4100 of mammals. It is one of the smallest orders of insects and, at the same time, one of the most ingenious. Most of the termites live in tropical areas and some species populate the temperate zones. All termites feed on cellulose in its various forms and do not digest it completely, swallowing it and transferring it to areas of the digestive system predisposed to fermentation where the microorganisms continue to demolish macromolecules into glucose. The most evolved species of termites present an upgrade related to the feeding strategy that allows them to produce not only food but also real building material. A typical termite mound of an evolved species consists of a royal chamber, several nurseries, gardens, waste dumps, drinking water wells and, above all, a ventilation system. In fact, these buildings satisfy a common need: to dissipate the dangerous levels of heat and carbon dioxide that accumulate in a building containing several hundreds of thousands of individuals and, at the same time, fungal colonies that consume the equivalent (to scale) of 40 billion kilograms of fertilizer. In free-structured nests, each room can be equipped with its own chimney. Some larger chambers may include a cylinder made of earth and cardboard that protrudes up to 50 cm above the surface. To understand the principle by which the networks of ducts are developed, our research group first made plaster casts in the termite mounds. Once the cardboard with which the termite mound was built was crumbled, it was possible to observe the detail of the main chimneys and of the radial connections that went up from the central cylinders to the peripheral ones as well as of the return pipes that connected the upper external part with the lower external part. From this plastic model a digital model was obtained in which the individual conditions were applied. When this humid air, charged with carbon dioxide, comes out of the vent chimneys, it draws in fresh air coming from the underground part of the nest, where it then begins to diffuse into the various chambers. According to the "design" of the nest, the warmer air can be simply ventilated by the chimneys or it can circulate along the peripheral buttresses. These are riddled with very small holes but sufficient to allow warm, stale air to spread outside, while cooler air filters inside. The "filter" cavities placed immediately after the access of air from outside to inside were also observed, measured and analyzed: in addition to being excellent filters for particulate matter, they contain part of the digestive biome of termites which in this case it acts as a real biological filter. The research continues both in the analysis of the different air exchange systems of the termite mounds, and in the algorithmic modeling and design of Home sapiens in civil areas.

### ACUTE TOXICITY OF PROMETHAZINE HYDROCHLORIDE ON *Artemia salina* NAUPLII

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In the last years, there has been a worrying increase in the

pollution of the aquatic ecosystem caused by residues a lot of emerging contaminants (ECs), such as, pesticides, pharmaceuticals, personal care products and endocrine disruptors compounds that have been detected in wastewater effluent discharges (Grassi *et al.*, 2014; Zhang *et al.*, 2018). Traces of ECs in waters are present in relatively low concentrations but with high toxicity and they can lead negative effects on the health of non-target organisms and the environment. Antihistamines are a class of drugs widely used, whose active ingredients or metabolites are globally widespread in surface waters and effluents, particularly in Europe and North America (Kristofco and Brooks, 2017). Some studies have evaluated the toxicity of antihistamines on model organisms such as *Daphnia magna* (Furuhagen *et al.*, 2014) and *Amphibalanus amphitrite* (Jin *et al.*, 2014). These works show that the antihistamines test on *Dafnia magna* can detect toxicity effects at low concentrations, while the studies on *Amphibalanus amphitrite* have been evaluating the antihistamines as possible use in products antifouling, as some non-toxic concentrations would still allow the larvae to metamorphose in the adult stage. We have evaluated the toxicity of Promethazine hydrochloride (99% pure), an antihistamine widely used and found in the analysis of wastewaters (Kostich *et al.*, 2008). The aim of this study was to evaluate the effects caused by acute exposure (24h-48h; six concentrations range from 2.5 µg to 40 µg) on nauplii of *Artemia salina*, saltwater microcrustacean, widely used as a model organism to evaluate the impact of many contaminants (Pecoraro *et al.*, 2020). The results showed a high percentage of mortality and morphological alterations of nauplii. These results allow us to compare endpoint values on different model organisms.

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### POLYHYDROXYNAPHTHOQUINONE PIGMENTS FROM SEA URCHINS WASTE: STRATEGIES FOR BIOMASS VALORIZATION

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In the last decades, the demand for sea urchins from food industry, is increasing<sup>1</sup>. Most of them come from natural stocks, thus resulting in large environmental impact. In this framework, the CIRCULAR and BRITES projects aim to fully reuse wastes from edible sea urchin industry to convert them, according to the logic of circular economy, into products with high added-value, including materials for biomedical applications and feed supplements to sustain sea urchin aquaculture, a valid alternative to overcome their overexploitation. For this purpose, sea urchins wastes from some Milan's restaurants were finely grinded to produce a powder that could be a valuable additive to the feed for animals requiring high doses of carbonates, like hens and