

## THE POTENTIAL USE OF MODIFIED ATMOSPHERES TO CONTROL HOUSEHOLD INSECT PESTS

MICHAEL K. RUST

Department of Entomology, University of California, Riverside, CA 92521, US

The potential for the use of modified atmospheres (less than 0.1% O<sub>2</sub>) to kill various household and structural pests was evaluated. Pressurized cylinders of nitrogen (99.999%) and Ageless® oxygen scavenger were used to reduce oxygen concentrations below 0.1% in 0.04 m<sup>3</sup> methacrylate chambers. Packets of Ageless® were used to eliminate oxygen inside 5-litre polyvinylidene chloride coated plastic bags. All developmental stages of each insect were exposed in open containers or buried in flour or inside wood blocks.

The minimum length of exposure to kill 100% of stage varied with each developmental stage and insect tested. In general, the eggs and pupae were the most difficult developmental stages to kill. Exposures of 192, 72 and 48 hours were required to kill 100% of exposed eggs of cigarette beetle (CB), confused flour beetle (CFB) and furniture carpet beetle (FCB), respectively. Larvae were generally more susceptible than were eggs or pupae requiring 144 (CB), 48 (CFB) and 24 (FCB) hours to kill 100%. The oothegae of American and brownbanded cockroaches required exposures of 120 and 72 hours, respectively. However, adult and nymphal American, German, and brown-banded cockroaches were killed within 24 hours. Adult CB, CFB and FCB required 144, 48, and 24 hours, respectively. Exposures of 72 hours were required to kill 100% of nymphal western drywood termites sealed in wood blocks.

Insects were principally killed by water loss, but latent mortality over 14 days was observed with western drywood termites suggesting other slower modes of action. Some stages of cockroaches and firebrats died within 3–6 hours suggesting anoxia may also contribute to killing insects.

The use of modified atmospheres has been successful in controlling insect pests in museums in limited programs. The technique may be extremely useful in sensitive situations where chemicals may damage electronic equipment or residual chemicals are inappropriate.