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Spatial or Area Repellent Products

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Definitions for this Presentation

- Pest: Any arthropod that is attracted to humans from a distance, resulting in damage from bites, stings, infestation, or annoyance. Excludes lice and scabies mites.
- Repellent product: A product the intended use of which is to interrupt damage from pests by disrupting the pests' normal behavior during the host seeking process. Note that "repellent" has a technical definition based on behavior rather than on product function. For this presentation "repellent" is synonymous with "repellent product."

- Topical repellent: A repellent product applied directly to the skin.
- Clothing repellent: A repellent product applied to clothing.
- Spatial repellent: A repellent product applied between the human and the immediate source of pests. Synonymous with area repellent.

Lethality vs Repellency

- Some repellent products disrupt behavior by killing the pest as it seeks its host
- Products that kill some of the pests may repel others that either receive a sublethal dose or that seek to avoid the repellent
- Non-lethal products may cause long-lasting or permanent damage to the pest
- There is an indefinite distinction between spatial repellents and pesticides

Types of Products and Potential Products

- Passive emission: Emit chemical into the air without addition of energy to the product
 - Mosquito Beater-Volatiles on vermiculite
 - Sumi One-Metofluthrin on paper or plastic
 - No-Pest Strip-Dichlorvos in solid solution in plastic
 - DDT (not in US)-Indoor residual spray; evidence that more effective as repellent than toxicant against some vectors

- Active emission: Emits chemical into the air by volatilizing the material with heat, aerosolization, or air current
 - Registered in US
 - Thermacell-Butane catalytic heater, allethrin on paper strip
 - Mosquito Lamp-Candle-heated strip
 - Malibu products-Solar powered fan blowing across reservoir of linalool
 - Mosquito coils-Allethrin impregnated in slow burning medium; very popular worldwide, sometimes with different active ingredients
 - Candles-Citronella, linalool, other natural products

- Not registered in US
 - Kerosene lamps-Active ingredient added directly to fuel (neem) or to pan above flame (transfluthrin)
 - Electric heated reservoir-Up to 30 days constant emission or light-regulated (e.g., transfluthrin)
 - Various heating devices for paper mats designed for indoor use

- Physical devices: Emit energy or air current
 - Radiofrequency and sonic: No evidence of efficacy
 - Air curtains: Commonly used in industrial applications, more of a barrier than spatial repellent; chemicals added to stream experimentally
 - Magnetic fields: Disrupt mosquito behavior, but no commercial products

Strategies for Evaluation

- Unlike topical and clothing repellents, standardization has not been attempted
- Extensive development of mosquito coils in 1950s and 1960s created a literature of testing based usually on lethality, sometimes biting rates
- Advantage of product (no direct application; works at a distance from human) should confer advantage on standard evaluation (no need to expose human to pests during testing)

Two Potential Testing Strategies

- Evaluation of movement using traps for those products that have general repellency or toxicity
- Evaluation of behavioral disruption using human bait with no pest contact, for those products that interrupt specific host-seeking behavior