Flea control pesticides: Companion animals as sentinels for human health effects

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Outline of presentation

- Why study pets?
- Flea control products and organophosphate exposure
- Current initiatives
  - Pioneer Valley Canine Health Study
  - UMass-Tufts study of environmental factors and canine malignant lymphoma

Pets as sentinels

- Disease experience of domestic dogs and cats that share their living environment with humans can help identify potential health hazards for humans

Shared disease etiology

- High incidence of chronic disease in pet dogs and cats
  - Cancer incidence in dogs approx 380/100,000
  - CHD prevalence >10% in domestic animals
  - Diabetes, hyperthyroidism, renal disease, respiratory disease also common
- Disease pathology similar in dogs, cats and humans for many diseases

Kelsey, 1998;

Similar types of exposures

- Domestic dogs and cats and their humans owners share many household environmental exposures
  - Airborne particulates (tobacco & wood smoke)
  - Water contaminants (pathogens, chemicals)
  - Soil (lawn care herbicides, pesticides)

Shorter life span

- In dogs and cats, life events can be observed in a shorter time period
- Shorter latency period for the development of disease after exposure

Fewer additional factors

- Dogs and cats are exposed to relatively fewer other factors that need to be accounted for:
  - Active smoking
  - Alcohol consumption
  - Occupational chemicals

Flea control products

- Flea control products used by approx 50% of US households *(Davis, 1992)*
- In Massachusetts *(Bertone, 2002 and unpublished)*
  - 75% of dog owners reported regular use (2004)
  - 46% of cat owners (1993-1999), 26% in 2001

Flea control pesticides

- Of interest both as sources of pesticide exposure and as model for health effects of chronic exposure to their active ingredients
- Products include collars, sprays, powders, shampoos, dips
- Many contain organophosphates
  - Chlorpyrifos, dichlorvos, phosmet, naled, tetrachlorvinphos, diazinon, malathion

Wallinga, 2000

Level of pesticides exposure

- Exposure dose and health effects of flea control reviewed extensively by National Resources Defense Council: Poisons on Pets (2002)
- Pesticide exposure from flea control exceeds EPA safe levels in children and adults
  - Flea collars containing dichlorvos: toddlers receive 21 times safe level through inhalation; adults receive 10 times safe level (EPA estimate)
  - Flea collars containing chlorpyrifos: toddlers = 7 times safe level (EPA estimate)

Wallinga, 2000

Health effects for humans

- Relatively few studies of human health effects of exposure to flea control products
  - Brain cancer in children *(Davis, 1993; Pogoda 1997)*
    - Significant increase with exposure to flea collars
  - Adverse health effects in veterinarians and dog groomers *(MMWR, 1999)*
    - 36% reported CNS, skin and other symptoms associated with application during 1994 *(Bukowski, 1996)*
    - 50 - 258% elevated risk of respiratory, skin, eye symptoms in pet handlers who worked with flea control *(Ames, 1989)*

Health effects for pets

- Multiple reports of acute toxicity *(Wallinga, 2000)*
- Few studies of effects of chronic exposure
  - Flea/tick dips and transitional cell carcinoma of bladder *(Glickman, 1989)*
    - ≥ 2 applications per year = 3-fold increase in risk
    - 9-fold increase in risk in overweight/obese dogs
  - Flea collars and feline oral squamous cell carcinoma *(Bertone, 2003)*
    - Significant 5-fold increase in risk for ever use

Pioneer Valley Canine Health Study

- Prospective study of risk factors for chronic disease in dogs
  - Funded by University of Massachusetts
- Dog owners in Hampshire and Franklin Counties of Western MA invited to enroll
  - Local veterinary clinics
  - Direct mailing using town hall dog licensing information
  - 740 dogs currently enrolled

PVCHS methods

- Baseline questionnaire in 2003-04
  - Measured demographic information on owners and dogs, environmental chemical exposures, current health status and medication use
- Follow-up questionnaire in 2004-05
  - Updated information on environmental exposures and health status and collected new information on diet and exercise

Flea control and health

- Aspects of flea control to be evaluated
  - Ever use
  - Frequency of use
  - Type of products used & brand name
  - Modifying factors (e.g., bathing, swimming, body condition, health conditions)
- Health outcomes of interest
  - Thyroid disease, seizure disorders, respiratory and skin allergies, cancers

UMass-Tufts Canine Health Study

- Case-control study of environmental factors and risk of canine malignant lymphoma
  - Funded by National Cancer Institute
  - UMass and Tufts/Cummings Veterinary School

CML study methods

- Cases
  - 600 dogs with CML confirmed by biopsy diagnosed at Tufts 2000-2005
- Controls
  - 600 dogs with biopsy confirmed benign tumors
  - 600 dogs with non-tumor conditions
  - All diagnosed at Tufts, 2000-2005
  - Matched to cases on age and diagnosis year

Exposure assessment

- Dog owners mailed questionnaires to assess dog's exposure to environmental factors prior to diagnosis
- Aspects of flea control to be evaluated
  - Ever use
  - Frequency of use
  - Type of products used & Brand name
  - Modifying factors (e.g., bathing, swimming, body condition, health conditions)

Summary

- Flea control products are a common source of pesticide exposure for companion animals and their human owners
- Organophosphate exposure dose from flea control products may be high
- Studies of health effects of flea control products exposure in pets may yield important information of relevance of both humans and animals

References

- Ames RG, Brown SK, Rosenberg J, Jackson RJ, Stratton JW, Quenon SG. Health symptoms and occupational exposure to flea control products among California pet handlers. Am Ind Hyg Assoc J 1989;50:466-72.
- Bertone ER, Snyder LA, Moore AS. Risk factors for oral squamous cell carcinoma in domestic cats. J Vet Intern Med 2003;17:557-62.
- Bukowski J, Brown C, Korn LR, Meyer LW. Prevalence of and potential risk factors for symptoms associated with insecticide use among animal groomers. J Occup Environ Med 1996;38:528-34.
- Davis JR, Brownson RC, Garcia R, Bentz BJ, Turner A. Family pesticide use and childhood brain cancer. Arch Environ Contam Toxicol 1993;24:87-92.
- Glickman LT, Schofer FS, McKee LJ. Epidemiologic study of insecticide exposures, obesity, and risk of bladder cancer in household dogs. J Toxicol Environ Health 1989;28:407-14.
- Kelsey JL, Moore AS, Glickman LT. Epidemiologic studies of risk factors for cancer in pet dogs. Epidemiol Rev 1998;20:204-71.
- Morbidity and Mortality Weekly Report. Illnesses associated with occupational use of flea-control products- California, Texas and Washington, 1989-1997. MMWR 1999;48:443-7.
- National Research Council. Animals as Sentinels of Environmental Health Hazards. Washington: National Academy Press, 1991.
- Pogoda JM, Preston-Martin S. Household pesticide and risk of pediatric brain tumors. Environ Health Perspect 1997;105:1214-20.
- Wallinga D, Greer L. Poisons on Pets: Health Hazards from Flea and Tick Products. National Resources Defense Council, http://www.nrdc.org, November, 2000.