

Questions About Pesticide Impregnated Clothing (e.g. “Buzz Off”)

Biting insects such as mosquitoes and deerflies are annoying. Some mosquitoes may even carry human diseases such as West Nile Virus. There are many ways to manage this problem, such as removing breeding spots, avoiding being outdoors when mosquitoes are active (dusk and dawn) and using personal protection.

Personal protection includes wearing long-sleeved shirts, long trousers and maybe a head veil in severe situations. Other available personal protective tactics include applying repellent to exposed skin and wearing pesticide impregnated clothing. Questions have been raised about the safety of wearing clothes with chemical pesticides in contact with the skin for extended periods and the chance that these chemicals may be transferred to other clothing in the laundry. We recently posed these questions to the US Environmental Protection Agency (EPA), the government agency responsible for ensuring pesticide safety. The following is a commentary between the Pennsylvania Integrated Pest Management Program (PA IPM) and EPA Region III about the growing concerns of pesticide impregnated clothing, sold at some outdoor clothing stores under brand names such as “Buzz Off!” The commentary is a series of questions and answers from email conversations in the spring of 2007.

PAIPM Question 1:

We've been wondering about pesticide-impregnated clothing:

- a) Did this "formulation" fully comply EPA registration procedures?
- b) How will people realize this is a "registered pesticide" – assuming there are no “pesticide label” on the clothes?
- c) Isn't permethrin (the active ingredient in the pesticide) a suspected endocrine disruptor?

EPA Answer 1:

Permethrin treated clothing is registered for civilian and military use.

The risk was reviewed and assessed by EPA. The same was also done by the National Research Council/National Academy of Sciences in an NRC published report. We did include impregnated clothing in both our residential and occupational risk assessments. In all scenarios, the risk estimates were below the Agency's levels of concern. The risk assessments, as well as the Reregistration Eligibility Decision, are available on the public docket at <http://www.regulations.gov> (docket # OPP-2004-0385).

There should be a tag sold with every article of clothing that includes information from the label.

Below is the Agency's latest response regarding permethrin as an endocrine disruptor:

In the Agency toxicology database on permethrin, there was no evidence of endocrine disruptor effects that was supported by findings from the two-generation reproduction and chronic and carcinogenicity study. There was no evidence that suggested permethrin caused any impairment in reproductive performance nor toxic effects on endocrine - related organs. The Agency acknowledges that there are considerable uncertainties regarding the test protocols for screening and classifying chemicals as endocrine disruptors. When additional appropriate screening and/or

testing protocols being considered under the Agency's EDSP have been developed, permethrin may be subjected to further screening and/or testing to better characterize effects related to endocrine disruption.

PA IPM Question 2

In general, PA IPM is curious about how this "formulation" complies with FQPA (Food Quality Protection Act) and the mandate to reduce risk to children of pesticide exposure from all sources. We realize permethrin is not an OP (organophosphate) or the other a.i.s (pesticide active ingredients) targeted for specific reductions. However, given human behavior, parents will think they are "protecting" their child by putting these kinds of clothes on them.

So now, rather than reduction of exposure, we have added:

- a) Direct skin contact (exposure) to a pesticide via clothing
- b) The whole family's clothing (no matter what the label says) will be washed together. If it "washes off after 20 some washes" it is both contaminating other clothing and the water.
- c) If it washes off in water, it dissolves in sweat.
- d) Does it kill the mosquito that lands on clothing and if so, how does that actually protect the person from being bitten on the skin? Has the efficacy of pesticide-impregnated clothing been evaluated?
- e) In the risk/benefit analysis, what is the overriding need for this product in civilian life? Does it do anything a repellent doesn't do?
- f) Does the label on a piece of impregnated clothing include all the standard pesticide information and cautionary statements? Do people *know* they are wearing a pesticide and therefore can they make an informed decision? Is the label on a shirt "the law" as labels on other pesticide containers are?

As for endocrine disruption, permethrin is on the Illinois EPA List.

EPA Answer 2

Please find a more detailed response to your questions in *italics* below.

FQPA

The re-registration process for permethrin complied with all aspects of the FQPA. The Agency assessed the dietary (food and drinking water), residential (including impregnated clothing), and aggregate (dietary and residential) risks to the general US population and all sub-populations, which includes children. As with all chemicals, when a permethrin risk scenario exceeded the Agency's acute, chronic non-cancer, and/or chronic cancer levels of concern, appropriate risk mitigation measures were implemented to ensure the risks were below the Agency's level of concern.

So now, rather than reduction of exposure, we have added
a) Direct skin contact (exposure) to a pesticide via clothing

As stated in an earlier e-mail, the Agency assessed the post-application exposure of permethrin-impregnated clothing in both our residential and occupational risk assessment. Specifically, we assessed the post-application dermal exposure for both adults and youth, and post-application dermal and oral exposure for children. In all scenarios, the risk estimates were below the Agency's levels of concern.

No risk mitigation was necessary for this use scenario.

b) The whole family's clothing (no matter what the label says) will be washed together. If it "washes off after 20 some washes" it is both contaminating other clothing and the water.

The label specifically instructs the users to wash permethrin-impregnated clothing separately from other laundry. If the consumer was to ignore the label, this would be considered misuse, and unfortunately, it is not the Agency's practice to mitigate for misuse. However, permethrin binds very well with fabric fibers and the goal of permethrin-impregnated clothing is to keep the permethrin in the clothing. If the permethrin is not retained in the clothing the product will not be efficacious. Wash-off data for permethrin impregnated clothing shows that much of the permethrin that is removed during washing does not end up in the wash water, it actually comes off bound to the clothing particles that end up in the dryer's lint trap. To this extent, efficacy may be reduced, however, the Agency does not believe that sweating or rainy weather would significantly increase the transfer of permethrin to an individual's skin.

c) If it washes off in water, it dissolves in sweat.
See answer above.

d) Does it kill the mosquito that lands on clothing and if so, how does that actually protect the person from being bitten on the skin? Has the efficacy of pesticide-impregnated clothing been evaluated?

Permethrin is a neurotoxicant. It also works as a repellent by irritating biting insects that land.

The database for permethrin is public and is extensive. The National Academy of Science/ National research Council concluded that the clothing protects from bites provided there is at least 0.01 mg permethrin/square cm. The initial loading is 0.125 mg/square cm, equivalent to 0.52% permethrin w/w.

Per the RED, the Agency is requiring product specific efficacy data for all permethrin impregnated fabric products, and wash-off data to support the efficacy claims. Refer to the product-specific data call-in (PDCI) for more detail regarding the required data.

e) In the risk/benefit analysis, what is the overriding need for this product in civilian life? Does it do anything a repellent doesn't?

The Agency does not make a finding of necessity under our FIFRA registration process. However, with that said, all potential risk estimates for impregnated clothing are below the Agency's levels of concern; therefore, no risk mitigation or risk/benefit discussion was necessary.

Permethrin is currently the only pesticide registered as a spray that can be applied to clothing.

f) Does the label on a piece of impregnated clothing include all the standard pesticide information and cautionary statements? Do people know they are wearing a pesticide and therefore can they make an informed decision? Is the label on a shirt "the law" as labels on other pesticide containers are?

YES- the product label is the law. All pesticide products are required to have full labeling (directions & precautions) on the immediate container or on the outside container if this is the container that is sold to the general public. Pesticide manufacturers are permitted to provide part of the label text in the form of a booklet or other "pull off" type labeling when it not feasible or possible to literally fit the entire label on the container. In the case of treated clothing the Agency allowed the manufacturers to place the full complete labeling on a hangtag on outside of garment and a partial label sewn inside each apparel item. On the hangtag is the statement "Retain this tag for future reference on proper handling of this garment. This tag not to be removed except by consumer.". On the partial label sewn inside each apparel is required at the minimum a) product name, b) statement of the active pesticide ingredient, c) the EPA registration number and d) a reference statement to the label of the outer container (hangtag) for directions and precautions.

We believe this combined information will alert the user that they are purchasing and using a pesticide.

As for endocrine disruption, permethrin is on the Illinois EPA List.

The Agency is aware the permethrin is on the Illinois List. However, to reiterate the Agency's current position, in the Agency toxicology database on permethrin, there was no evidence of endocrine disruptor effects that was supported by findings from the two-generation reproduction and chronic and carcinogenicity study. There were no evidences that suggested permethrin cause any impairment in reproductive performance nor toxic effects on endocrine-related organs. The Agency acknowledges that there are considerable uncertainties regarding the test protocols for screening and classifying chemicals as endocrine disruptors. When additional appropriate screening and/or testing protocols being considered under the Agency's EDSP have been developed, permethrin may be subjected to further screening and/or testing to better characterize effects related to endocrine disruption.