

This final article of a three-part series will address allegations that pesticide exposure causes asthma, disruption of endocrine (hormone) systems, and neurological effects in children. Suggestions regarding exposure mitigation will be provided, as well as conclusions pertaining to the entire three-part series. References are footnoted in the text and are available on request from the Sports Turf Association. Parts I and II of the series were published in the previous two issues of the *Sports Turf Manager* and can be viewed online at www.sportsturfassociation.com.

Pesticide Exposure and Asthma

Many articles in the press have stated that pesticide exposure is responsible for an increase in the incidence of asthma in children. While the rate of occurrence of asthma, particularly among children, has been rising over the past decade, there is no definitive evidence that pesticide exposure contributes to the frequency of this disease^{10, 11}. The increase itself is somewhat confusing because physicians have long debated which symptoms warrant a diagnosis of asthma. In addition, awareness of the disease has grown which could account for a portion of the reported increase.

Research indicates that factors known to cause or exacerbate asthma are as follows: a family history of the disease, gender (males are more prone), and exposure to tobacco smoke, household dust, dust mites, cockroach integuments and feces, and damp environments^{10, 12}. Diet may also play a role. The fact that we have tightly sealed homes is an issue.

Recent research is suggesting that it is an underdeveloped immune system that is responsible for the development of asthma in children. Current thinking suggests that we are actually keeping our environments *too clean*. Challenges to the immune system early in life (exposures to viruses, bacteria, animal dander, dog

hair, dust, etc.) are required for proper development of the immune system¹³. Through the frequent use of antibiotics, and keeping our homes extremely clean, we may have prevented the immune systems of many children from developing appropriately.

Children from rural areas, where pesticides are commonly used, have a much lower incidence of asthma than children from urban environments^{14, 15}. Farm children are exposed to dander from pets and farm animals, as well as pollens, dust and dirt from an early age. There is no definitive evidence to indicate that pesticides increase the incidence of asthma in children. The use of pesticides may actually help to alleviate allergic reactions among individuals whose condition is made more serious by exposure to weed pollen.

Endocrine Disrupting Chemicals (Hormone mimics)

For the past decade, the news has been flooded with articles on endocrine disrupting substances and the havoc they are creating in the environment and potentially in our children; however, the scientific literature does not support effects in humans. Pesticides have been implicated in the media as endocrine disrupting substances. Almost everything, including the food we eat, contains natural chemicals that act like hormones.

The endocrine system is extremely sensitive and can even be affected by the amount of daylight received by the living organism. It will be extremely difficult to sort out what affects, and what doesn't affect, hormone systems because many things (natural and man-made) influence the endocrine system.

W.J. Waddell, an MD, professor, and Chair of the Dept. of Pharmacology and Toxicology at the University of Louisville School of Medicine, published a review of epidemiology studies and the effects of environmental estrogens and concluded "the data available at present do not lead



to the conclusion that endocrine-modulating substances account for worldwide trends in these epidemiological studies"³⁴.

While some researchers have hypothesized that pesticides act as hormones in the environment, a direct association at environmentally relevant concentrations has not been established. In addition, exposure to pesticides is extremely low in comparison with exposure to endogenous hormones such as 17-B estradiol and estrone, naturally occurring hormones such as estrogen (e.g. phytoestrogens in food such as cabbage), and therapeutic hormone supplementation (e.g. hormone replacement therapy and contraceptives); therefore, this hypothesis is unlikely. Wood and paper products also contain estrogenic substances of natural origin.

Dr. Stephen Safe, of Texas A&M, has authored many papers indicating that the endocrine modulating hypothesis is flawed^{35, 36}. His publications also point out flaws in the hypothesis that endocrine-disrupting industrial chemicals have caused a reduction in sperm counts among men.

The National Research Council (NRC) Report on "Hormonally active agents (HAAs) in the environment" concluded that prenatal exposure to HAAs may af-

fect development and nervous system development but more research is required³⁷. The report stated that data available are inadequate to assess whether exposure affects immune systems in humans and concluded that post-natal exposure to HAAs has been shown not to increase the risk of cancer in endocrine organs.

While more research is certainly needed on this controversial subject, the exposure incurred by applicators and bystanders to pesticides is so minimal that an association between pesticides and endocrine effects in humans is unlikely.

Pesticides and Neurological Effects in Children

A 1998 study conducted by Guillette et al. suggested that pesticide exposure causes effects on the developmental/neuromuscular function and fine motor skills in children³⁸. The authors studied children of two separate villages in Mexico – one located in an agricultural valley where pesticides were used frequently, and the other located in the foothills where ranch-

ing was practiced and pesticides were not usually sprayed.

There are many flaws in this study including lack of proof of the genetic similarity of the two populations studied and failure to conduct chemical analyses of food, water, environment, blood or urine to confirm pesticide exposure and to rule out the possible contribution of other contaminants such as PCBs which are known to cause neurological impairment.

The children of the two villages do appear to differ in terms of their fine motor skills and neurological development; however, the data do not prove that pesticide exposure is the cause of the difference. Eye exams were not even given to the participants. Guillette et al. did not collect samples to identify what substances the children were actually exposed to, nor did they attempt to adjust or identify confounding factors such as parental alcohol

and drug abuse, parenting skills, level of parental education, genetics, etc.

Exposure Mitigation

The best way to mitigate *occupational exposure* to pesticides applied to turf is to read and follow the label directions, apply the correct application rate, wear the recommended personal protective equipment (gloves, respirator, chemical-resistant coveralls, etc.), change respirator cartridges frequently, launder clothing daily and follow proper hygiene practices.

To reduce *bystander exposure* to pesticide treated turf, the recommended application rate should never be exceeded, spraying should never occur during conditions conducive to drift, surfaces must be dry before allowing contact with treated turf (obey re-entry intervals), and bystanders must not be allowed in the area when pesticides are being applied.

Pesticides are thoroughly tested prior to registration. Products that can't be used safely do not go on the stringent Canadian market.



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Conclusions (of this three part series)

Pesticides are thoroughly tested and the data are reviewed by the Canadian Pest Management Regulatory Agency (PMRA) prior to registration. Pesticide products that PMRA concludes have incomplete databases or that cannot be used safely are not granted registration and cannot be sold, imported, or used in Canada. Our country has the most stringent regulatory requirements in the world. Pesticides, like prescription drugs, *can* be used safely, provided label directions are followed. The recommended personal protective equipment should always be worn when handling and applying pesticides.

The benefits of using pesticides on turf include reduced potential for allergic reactions caused by weed pollen and insect stings and bites, positive health benefits associated with increased participation in outdoor sports such as soccer and golf, fewer sports injuries, reduced soil erosion resulting in less pollution of waterways etc., and the psychological benefits of improved aesthetics. The use of pesticides on residential property is a matter of personal choice which should be respected.

Reviews of sound, scientific, peer-reviewed data indicate that allegations suggesting occupational and bystander exposure to pesticides is associated with health effects such as asthma, cancer, endocrine disruption, developmental effects and neurological impairment in children, is currently *unfounded*. Unfortunately, the media's presentation of possible associations between pesticide use and health effects has served to create an irrational fear about pesticides among the general public.

As mentioned in Part 1 of this article, any pesticide ban approved by a municipality is a political decision based on emotion and not one based on sound science. This fact should be clearly communicated to the constituents of the municipalities involved. ♦

Editor's Note: The STA thanks Dr. Houghton for her informative article on Pesticide Exposure and Human Health. Our appreciation is extended to her for not only sharing her expertise but for all the time and energy spent in editing this information into three parts.

Weather watches, warnings & advisories from the Atmospheric Environment Service

For the safety of people and property, Environment Canada issues severe weather warnings, watches and advisories to the public via the media, weather outlets and Weatheradio Canada.

A *Weather Watch* alerts you that conditions are favourable for the development of severe weather. Watch the skies and listen for updated watches and possibly weather warnings.

A *Weather Warning* alerts you that severe weather is occurring or that hazardous weather is highly probable. Severe thunderstorm or tornado warnings may be issued less than one hour in advance. Other weather warnings may be issued six to twelve hours in advance.

A *Weather Advisory* means actual or expected weather conditions may cause general inconvenience or concern, but don't pose a serious enough threat to warrant a weather warning. An advisory may also be used when conditions show signs of becoming favourable for severe weather when the situation is not definite enough or too far in the future to justify a warning.

The following are some of the more common seasonal weather watches, warnings and advisories issued by Environment Canada. Note that criteria for warnings are established to meet local and regional needs and may vary slightly from region to region across Canada. Contact your nearest weather outlet to confirm criteria for your area.

Freezing rain warning. Expect slippery walking and driving conditions, and possible damage to trees and overhead wires due to rain freezing on contact to form a coating of ice. Avoid travel.

Wind warning. Expect winds blowing steadily at 60 km/h or more, or winds gusting to 90 km/h or more, for

at least one hour. Secure or put away loose objects such as outdoor furniture, put your car in the garage, and bring livestock to shelter. Definitely not a winter wonderland!



Blizzard warning. Expect snow or blowing snow, with a severe wind chill and visibility reduced to less than one kilometre, for four hours or more. Stock up on heating fuel and food. Stay indoors and wait out the storm.

Heavy snowfall warning. Expect a snowfall of 10 cm or more (15 cm or more in Ontario) in 12 hours or less. Travel could become hazardous.

Winter storm warning. Issued in Ontario when two or more winter conditions reach warning proportions (e.g. wind and snow, or freezing rain followed by heavy snowfall). Be prepared to cancel travel plans and stay indoors.

Wind chill warning. Expect very cold temperatures combining with wind to create outdoor conditions hazardous to human activity. Be prepared to stay indoors.

Cold wave advisory. Temperatures are expected to drop by 20°C or more within 18 hours. Dress warmly and check the weather forecast before travelling or venturing outdoors. ♦

To receive weather information when, where and how you want it, sign up for Environment Canada's free service e-Weather at:
www.weatheroffice.pyr.ec.gc.ca/e-weather/default_e.html