Understanding Pesticide Risk

In 1993 enrollment began for the largest health study of the US farming community, the Agricultural Health Study (AHS). Twelve years later, data from the 89,658 enrollees in Iowa and North Carolina are beginning to generate the most comprehensive assessments of the link between individual pesticides and cancer risk ever published. The risk of various cancers is just one set of health endpoints monitored in this groundbreaking study; other health problems addressed include diseases of the nervous system, as well as respiratory and reproductive health.

There have been various epidemiological attempts to better understand the relationship between pesticide exposure and cancer risk. These, together with laboratory work, have presented a patchwork of data linking some pesticides with increased risk of some cancers. The large scale and comprehensive design of the AHS are meant to specifically address the weaknesses and gaps in prior research.

Enlisting the long-term support of a large portion of the farming communities of two states, Iowa and North Carolina—both with strong agricultural sectors with diverse agricultural methods and products—enables researchers to employ the strengths of prospective cohort studies. The chemical exposure and lifestyle information that is collected from these participants is the most detailed ever: participants responded to about 250 questions in the initial survey.

Fifty pesticides were selected based on their widespread use or if previous studies indicated their potential association with health risks, and 30 more were added based on participant “write-ins.” Follow-up surveys every five years provide scientists with updated information. Including spouses in the research is an important aspect that is providing data on women and pesticide use and exposure never before collected. There is also a small percentage of female certified (North Carolina) and licensed (Iowa) pesticide applicators included in the study. Overall, two-thirds of participants are applicators and one-third are spouses. With children also registered, the understanding of the health of farm families is being greatly enhanced by the AHS.

Cancer Findings

Previous research indicates that farmers experience some cancers to a lesser extent than the general population and some cancers to a greater extent. Fewer farmers die from lung, esophagus, bladder, and colon cancers, possibly the result of smoking less, eating a healthier diet and getting more physical exercise than the average American. But studies also suggest that farmers as a group experience higher rates of Hodgkin’s disease, leukemia, multiple myeloma, non-Hodgkin’s lymphoma, and cancers of the lip, stomach, prostate, skin, brain, and connective tissue.

Put in your own words:

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This project provides information from the fourth year of a study assessing the feasibility and performance of golf course turf management with an IPM approach utilizing population-based pest management to a system that utilizes biologically-based controls and reduced risk chemistry. The work was initiated on the Green Course at the Bethpage State Park, Long Island, New York in 2003. The Green Course is one of five public courses at the park and accommodates approximately 50,000 rounds of golf annually. The greens are push-up native soil greens that have been heavily sand top-dressed for the last six years, and are typical of a high-use public course in a northern metropolitan community. A more detailed discussion of methodology and results from 2003 through 2006 can be found at http://usgatero.msu.edu/..

Putting Green Management Systems with Reduced Pesticides: A Continuing Evaluation

The experiment was designed as a 3 x 2 factorial, with three pest-management and two cultural-management regimes.

Pest Management: 1) Unrestricted: All legal and currently available chemical pesticides in New York State may be used. 2) IPM: Cultural and biological approaches to prevent and minimize pest problems were emphasized, but reduced risk chemical pesticides were used occasionally to prevent turf loss. Cultural Management: 1) Current Standard: Cultural practices currently being employed at the golf courses of the Bethpage State Park. 2) Alternative: Modified cultural practices selected to reflect the most progressive practices that maximize turfgrass performance and minimize stress to the grass. The experimental design resulted in six management systems. Each green served as a replicate, with all 18 greens of the Bethpage Green Course used to accommodate 3 replicates.

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Understanding Pesticide Risk

The AHS is now at the stage at which disease rates can be assessed, and the study is producing some important cancer findings. These findings reflect about five years of follow-up, following several years of enrollment and data collection. The two ways in which cancer rates are analyzed in the AHS are 1) the comparison of cancer rates amongst enrollees with those of the general population, and 2) the comparison of cancer rates of those using specific pesticides with those who do not.

A major finding—one that correlates with previously existing data—is that this population of farmers experiences lower overall cancer rates than the general population. The rates found thus far of all cancers except prostate cancer were lower. However, early findings do suggest an association between the use of specific pesticides and an increased risk of specific cancers. It is important to note that discovering these associations does not mean a causal relationship has been found. The AHS employs a rigorous strategy of criteria for causal inference.

Chlorpyrifos and Lung Cancer

In an AHS analysis of exposure to chlorpyrifos, one of the most widely used insecticides in the US, researchers found an association between the use of this pesticide and the incidence of lung cancer, but not with any other cancer.

Job characteristics more common among those who reported a high pesticide exposure score included repairing pesticide application equipment oneself and having first used pesticides more than 10 years ago.

New Insights Regarding Pesticide Exposure

One of the major challenges in studying the effects of pesticide exposure on human health is the difficulty in precisely assessing real-life exposures. Pesticides are widely used without a detailed understanding of all the various ways they might enter the body and in what quantities they do so. As part of its study of the Iowa and North Carolina farming populations, the AHS has prioritized the improvement of scientific methods to better understand pesticide exposure. This work has revealed much information that enables scientists to more accurately determine potential health effects of pesticide exposure, and also aids in the development of better controls and practices to decrease exposure.

For example, early on in the study members of the research team looked closely at the characteristics of people who self-reported a "high pesticide exposure event." Closely examining this 14% of the study population enabled the epidemiologists to determine what home and farm features or practices are associated with incidents or experiences leading to unusually high personal exposures. These characteristics ranged from how, where and when the clothing was laundered and the types of pesticides being used, to whether the family was experiencing financial stress. After taking into account education and the total number of lifetime applications made, researchers saw that women who had significantly fewer children than men who applied pesticides.

Job characteristics more common among those who reported a high pesticide exposure score included repairing pesticide application equipment oneself and having first used pesticides more than 10 years ago. While the demographic, work practice and job characteristics identified were not necessarily the cause of the high pesticide exposure, identifying these factors is a first step in the eventual prevention of these potentially hazardous events. Computer modeling—used as a tool in the AHS for exposure assessment and analyses, in addition to biological measurements—showed that following all pesticide label requirements could prevent many of these high exposure events.

Other analyses looked at exposure hazards of families of pesticide applicators. The design of the AHS takes into account that farmers "living where they work" present potential exposures for spouses and children. Researchers found that 21% of homes are within 50 yards of an event included repairing pesticide application equipment oneself and having first used pesticides more than 10 years ago.

Synthetic Turf Performance

The popularity of synthetic turf surfaces is at an all-time high with the introduction of long pile fiber systems infused with various combinations of crumb rubber and sand. Over 1,000 new synthetic turf systems were installed in 2003-2004 in the US. The rapid popularity has lead to questions regarding surface performance relative to natural turf fields.

Ball rebound was measured by dropping a #5 FIFA approved soccer ball from 10 feet and measuring the percentage of rebound. Ball rebound on natural fields ranged from a low of 34 percent on a wet goal-mouth to 55 percent in the dry. The lowest ball rebound on synthetic turf was 41 percent and highest of 54 percent. This suggests that the infiltrated systems perform similarly with regard to ball rebound. However, other measurements of velocity indicate the ball rolls significantly faster and further on synthetic turf than on natural turf.

The synthetic turf systems also proved surprisingly similar to natural turf fields regarding traction. In early on in the study, managers exploring surface performance relative to natural turf, there was some evidence that AFL players were preferred to play on artificial grass systems over natural turf. The results reflect a detailed understanding of all the various ways that players prefer to play on the ones which are most likely to incur an ACL injury.

ACL injuries and Field Measures

Anterior cruciate ligament (ACL) injuries are considered to be career-ending for many athletes. In fact, the Australian Football League (AFL) estimates that ACL injuries cost the league one million dollars (Australian) per year. There was some evidence that AFL players were hurt more often on fields outside of Melbourne, but no clear conclusion was drawn.

Ian Chivers of Racing Solutions Inc. collaborated with David Aldous of the University of Melbourne to determine specific field characteristics that could be linked with non-contact ACL injuries. No significant relationship was found to exist between ACL injury and surface hardness, moisture content or location. However, a significant relationship was found between injury and traction, especially with regard to amount of thatch and percentage of Bermuda grass. In essence, the more Bermuda grass present in the stand the more traction, the more traction and consequently the more injury.

This study leaves many questions unanswered, especially for the northern sports turf manager. One thing is clear: as traction increases, the injury rate increases faster and further on synthetic turf than on natural turf. As traction increases—either through improved field quality or more aggressively treaded footwear—the risk of ACL injury increases. Interestingly, the authors published a separate paper evaluating player preference of fields and looking at both traction and hardness. They concluded that the high traction fields that players prefer to play on are the ones which are most likely to incur an ACL injury.


Meredith Wins Toma Award

Kevin Meredith of the National Soccer Hall of Fame received the George Toma Golden Rake Award from the Sports Turf Managers Association (STMA), which acknowledges an individual's strong work ethic and job performance.

The George Toma Golden Rake Award was named for one of STMA's Founders, Mr. George Toma, whose work with the National Football League on Super Bowl field preparation has made him a legend. The recipient of this award is someone who is on that quest to reach his goals and is demonstrating the "and then some" spirit which is so much a part of Mr. Toma's approach to sports turf management.

Meredith is the Sports Turf Manager at the National Soccer Hall of Fame in Oneonta, NY, a position he has held for the past 14 years. His knowledge, expertise and dedication have been invaluable in the development of the Hall of Fame. In 2000, he won the STMA Soccer Field of the Year for a municipality. He volunteers for many organizations, including the Oneonta school system and Otsego County as an alcohol and drug abuse counselor and has been a credentialed alcoholism counselor for six years.

Meredith founded a local airplane club and the regional Leather Stocking EEA, and was an aerographer (weatherman) in the Navy. He is a member of the Golf Course Superintendents Association of America and has designed and built a par 3 golf course. He holds a bachelor's degree from the State University of New York at Oneonta.

Sliwa Selected for USGA Internship

Andrew Sliwa was selected by the USGA to participate in an internship with USGA Northeast Agronomist. Andy is in his senior year at Cornell University studying horticulture with a concentration in turfgrass management under the supervision of Dr. Frank Rossi. Sliwa was selected from a highly competitive applicant pool to be part of this exciting program.

Andy is Captain of the Cornell Golf Team and has been playing the game of golf since the age of three. He has worked at the Turfgrass Research Center at Cornell, as well as the Links at Hiawatha Landing, Card Sound Country Club, and this summer at Westchester Country Club in New York.

Calendar of Upcoming Events

February 1, 2006
2006 Turfgrass Advocacy/NYSTA's Lobby Day Empire State Plaza, Albany NY Info: NYSTA (518) 783-1229 or (800) 873-8873

February 27, 2006
Southeast Regional Conference Holiday Inn Suffern, Suffern NY Info: NYSTA (518) 783-1229 or (800) 873-8873

March 6, 2006
Western Regional Conference Buffalo Niagara Marriott, Amherst NY Info: NYSTA (518) 783-1229 or (800) 873-8873

March 30, 2006
A Adirondack Regional Conference Lake Placid Resort, Holiday Inn, Lake Placid NY Info: NYSTA (518) 783-1229 or (800) 873-8873

Clippings

Kevin Meredith is someone who is on that quest to reach his goals and is demonstrating the "and then some" spirit which is so much a part of Mr. Toma’s approach to sports turf management.

Andy Sliwa was selected from a highly competitive applicant pool to be part of this exciting program, USGA Northeast Agronomist. Andy is in his senior year at Cornell University studying horticulture with a concentration in turfgrass management under the supervision of Dr. Frank Rossi. Sliwa was selected from a highly competitive applicant pool to be part of this exciting program.

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