



## Assessment of Ag Injuries and Illnesses in the Gila River Indian Community

**O**ccupational injury and illness data for Native Americans is scarce to non-existent, impeding development of effective health and safety programs.

Additionally, occupational hazards and their resulting injuries continue to change markedly as job characteristics and technological advances alter the type and nature of agricultural activities performed.

In July 2000, the UC Agricultural Health & Safety Center allocated funds to researchers to assess agricultural injuries and illnesses in the centuries-old Gila River Indian Community (GRIC), located about 40 miles south of Phoenix, Arizona (within the Center's Western regional charge). The reservation, which encompasses 372,000 acres and supports a population of approximately 15,000, was established in 1859 by an act of Congress.

The GRIC includes the Maricopa (Pee Posh) Indians and the Akimel O'odham (River People), descendants of the Hohokam Indians who farmed the Gila River Valley around 300 B.C., digging more than 500 miles of canals to irrigate their fields.

Agriculture plays a prominent economic role in the community, in which cotton, wheat, millet,

(see **GRIC** on page 2)



Cotton is one of many crops grown by the GRIC. Photo courtesy of Agricultural Research Service, USDA

## Chemical Exposure on and off the Farm

**U**se of pesticides for protection against household insect pests results in unintentional and unavoidable, low-level human chemical exposures.

Studies in residential and agricultural use of pesticides help researchers reveal new knowledge about chemical exposures and human health. The products used by both homeowners and professional applicators contain active ingredients that are usually semi-volatile and form deposits on indoor surfaces.

These chemicals persist longer indoors than in agricultural environments due to diminished or filtered sunlight, reduced moisture and air movement, surface area and lack of soil microorganisms. Measurable dermal, oral and inhalation exposure occurs over a period of weeks to months. However, when used as directed, the systemic exposure levels of household pesticides are well below toxic thresholds based upon the normal experience of consu-

(see **Exposure** on page 4)

(GRIC from page 1)

alfalfa, barley, melons, pistachios, olives, citrus and vegetables are grown on 12,000 acres. Independent farming operations cultivate an additional 22,000 acres of similar crops, bringing the total agricultural product value to more than \$25 million. The community owns and operates related agricultural activities, including chemical fertilizer, cotton gin and grain storage facilities. In addition, the community hosts three industrial parks.

GRIC community leaders have been concerned about the occupational injuries and illnesses resulting from exposure to physical, chemical and biological agents on the farms. In January 1999, the GRIC hospital released statistics placing asthma among the most prevalent illnesses within the reservation's population. Asthma and other chronic respiratory diseases are sensitive indicators of the effects of air pollution, especially particulate matter and possibly volatile organic compounds and pesticides. In conjunction with the Center's funding for "Assessment of Agriculture Injuries and Illnesses in the GRIC, the American Lung Association awarded a grant to the Environmental Health Program

to evaluate an association between commercial pesticide applications and chronic respiratory disease within the GRIC.

Eric Faisst, the principal investigator for the UC Agricultural Health & Safety Center's GRIC assessment project, is the director of Environmental Health Services within the Department of Public Health. GRIC Environmental Health Service staff members check to see if workers are provided a safe workplace and actively assist in programs to develop safety and health programs for the GRIC. The objectives of Faisst's Center-funded GRIC study include:

- ▶ Obtaining and analyzing descriptive epidemiologic data regarding agricultural workers in the Gila River Indian Community;
- ▶ Establishing a community planning and evaluation committee that will assess the information and decide the course to take to reduce or eliminate agricultural hazards;
- ▶ Disseminating findings, including establishment of a community agricultural Web site;
- ▶ Providing assistance to all farming operations in the community in developing specific health and safety programs.

GRIC Environmental Health Service staff members developed a questionnaire and identified agricultural employers whose workers would participate in the interview. The questionnaire was



Courtesy of Agricultural Research Service, USDA

designed to characterize workers at GRIC and included questions about occupational injuries and illnesses.

Investigators gathered information from medical records for past injuries and illnesses related to farming, worker compensation claims and records of accident and injury investigations, and developed an agriculture injury and illness tracking database. Data collection was completed in July and will be evaluated by a qualified statistician. An analysis team will then study the data and release information concerning injury and illness trends to help identify hazards.

The information will be posted on a Web site created on the tribes' intranet to aid in the process of developing community health and safety priorities and interventions, including education, training programs, monitoring and promotion of targeted health services.

For more information about the Gila River Indian Community project, please call Eric Faisst at (602) 528-1226, extension 1089, or e-mail [efaisst@gilanet.net](mailto:efaisst@gilanet.net).



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## ZOOZOSES WARNING

## Nearly Half of 1,700 Human Pathogens Originate With Other Species

**A**dvancing technology and international trade are clearly associated with emerging bacterial zoonoses in the United States, according to Bruno Chomel, DVM, PhD, director of the Master in Preventive Veterinary Medicine program, professor of zoonoses in the Department of Population Health and Reproduction at the UC Davis School of Veterinary Medicine.

Zoonoses (pronounced zo-eh-NO-sis) are defined as diseases communicable from animals to humans under natural conditions. Each year commercial airlines attract 1.5 billion passengers, many of whom travel on international flights. Consequently, a person who is incubating an infectious disease from Africa, for example, can carry that disease into the United States in a day's time. Additionally, a marked increase in worldwide trade augments the opportunity for pathogens to enter our markets through food products and importation of exotic pets.

Chomel presented "Emerging Bacterial Zoonoses" to a group of individuals attending the Center's noon seminar on June 1. "In 1998 an estimated 54 million people worldwide died. Of those deaths, at least 25 percent were caused by infectious diseases," reported Chomel. "Respiratory, viral, tuberculosis and zoonotic infestations are some of the major diseases in humans, and because of advanced technology and economic changes, we are seeing an emergence worldwide of new pathogens and new diseases."

Of the estimated 1,700 organisms that have been identified by scientists as human pathogens, approximately 800 are zoonotic agents. In his talk, Chomel identified the following emerging bacterial zoonoses, which he grouped into two principal categories—food-borne and vector- or insect-born origin.

### Food-borne pathogens:

- ▶ *Campylobacter* is a bacterium found in the intestinal tract of poultry, swine and cattle that can be transmitted to humans by ingestion of undercooked meat.
- ▶ *Salmonella* is most often recognized as a major food-borne pathogen that inhabits

the intestines of humans and animals.

- ▶ *Escherichia coli* 0157:H7, a lactose-fermenting species that causes infection of the urogenital tract and can be life-threatening to children, elderly and immunocompromised individuals, is associated with mass food processing, allowing for food contamination.

### Vector-borne pathogens:

- ▶ *Borrelia burgdorferi*, a spirochete carried by ticks, is associated with Lyme disease in humans.
- ▶ *Erlichiae* are small, bacteria

(see **Zoonoses** on page 5)

## Reduce Your Risk of Lyme Disease

**H**ow familiar are you with Lyme disease, a tick-transmitted disease that is most prevalent in the Northeast, the North Central part of the country (especially Wisconsin and Minnesota), and Northern California? Although 15,000 cases of the disease are reported annually, it is vastly underreported. "One of the problems is that the early symptoms of Lyme disease may resemble other common infections, like the flu. Not everyone gets the typical rash, and the tick may have dropped off before being discovered," Dr. Steve Kirkhorn, medical director of Occupational Health Resources at the Immanuel—St. Joseph's—Mayo Health System in Mankato, Minnesota says. "The late stages may be confused with heart disease, arthritis, or nervous system conditions like strokes." Lyme disease is spread by the bite of deer ticks and western black-legged ticks that are infected with the Lyme disease bacteria. The best way to reduce your risk of contracting this disease is to take certain preventive precautions, particularly at this time of year. These include: dressing appropriately when outdoors in potentially tick-infested areas; keeping grassy areas mowed and brush cleared whenever possible; and promptly removing imbedded ticks. The July 2001 issue of ALERT explains more about Lyme disease, and includes a preventive checklist.

—Barb Mulhern, Editor, Gempler's ALERT newsletter, <mailto:bmulhern@gemplers.com>

**(Exposure** from page 1)

mers, and measured dosages of residents are well below toxic levels, according to Robert Krieger, Ph.D., extension toxicologist who directs the Personal Chemical Exposure Program, Department of Entomology at UC Riverside.

Krieger presented “Models and Measures of the Pesticide Exposures in Californians” during the UC Ag Health and Safety Center’s May 4 noon seminar. His research involving household and agricultural worker exposure to pesticides has appeared in various publications,



including those of the American Chemical Society and the British Occupational Hygiene Society. An important generalization resulting from the studies was that measured aggregate pesticide exposures are substantially less and more persistent than pesticide exposure estimates resulting from default models.

During his noon seminar talk at the Ag Health and Safety Center, Krieger discussed a revealing study conducted with his colleagues at UC Riverside investigating the effects of insecticide use in residences. Researchers monitored human chlorpyrifos exposures following three different types of household pesticide applications—fogger, broadcast and crack-and-crevice.

Their initial studies included

two successive fogger applications in a 2,000-sq.ft. residence approximately a year apart. Both studies were conducted by biomonitoring a family of eight in Highland, near San Bernardino, Calif. Flea and roach foggers were discharged into six primary unobstructed areas, and the home was ventilated after two hours. The occupants re-entered later in the day.

The researchers performed three post-application situational monitoring studies based upon the interest and cooperation of family members, friends and acquaintances who were familiar with previous exposure studies.

Homes were treated by the residents themselves as part of normal pest management activities. The “Poly Fogger” study was conducted by biomonitoring a family of four residing in an 1,800-sq. ft. nylon-carpeted home in Riverside, Calif. The broadcast (indoor and outdoor insect control) situational monitoring of a family of five in Riverside was conducted following treatment of the residence with a broadcast application of diluted aqueous suspension of Spectracide Dursban indoor and outdoor insect control for houseflies and unspecified nuisance insects.

The crack-and-crevice study was conducted by biomonitoring a family of five living in Corona, Calif., that had contracted with a certified pesticide applicator to apply a diluted aqueous suspension of Dursban Pro.

Study results revealed persistence of total residue on carpet that was substantially greater than the persistence of transferable residue. Urine

samples showed low-level exposures of family members that lasted for periods of weeks to a month after pesticide use. Children eliminated more trichloro-2-pyridinol (TCP) biomarker than their parents on a kg/body weight/day basis, measured through spot urine specimens corrected for volume by an age-specific creatinine correction.

“Environmental residues may become useful elements of predictive residential exposure models,” says Krieger, “but their potential contribution to indirect exposure assessments must include careful determination of residue availability for contact transfer to clothing or skin.”

Krieger used environmental data from this study to estimate residential exposure according to established residential exposure assessment standard operating procedures, and found measured exposures to be substantially less than default model estimates assessments. Therefore, experimental and situational monitoring of exposed persons are valuable for meaningful and responsible predictive pesticide exposure model building.

In other studies conducted in 1995 and 1997 involving malathion exposures of strawberry harvesters in Watsonville, Calif., Krieger and his colleagues monitored the mono- and diacids of malathion in urine specimens of workers. Dermal pesticide exposure through hand absorption is well known, but the estimation of the quantitative contribution of hand contact to absorbed dose had been very poorly studied. Krieger reported an almost 50 percent reduction in dermally absorbed

*(Continued on page 6)*

**(Zoonoses** from page 3)

that reside within a phagosome. They are associated with the deer and tick population and often contracted during recreational activities. The first human erlichial infection was recognized in the United States in the mid-1980s.

Incidences of human tick-borne zoonoses have increased over the past two decades primarily due to ecological change caused by reforestation of the northeastern coastal states. The number of human cases of Lyme disease steadily increased in the United States to more than 10,000 cases since the mid 1990s. The pathogen responsible for Lyme disease is transmitted via the deer tick.

- ▶ *Bartonella* sp. is an infectious pathogen that is found in the red blood cells and cells of the lymphatic system, spleen, liver and kidneys of infected individuals. *Bartonella henselae*, the agent of "cat scratch" disease, results from human contact with an animal infected by ticks carrying the bacteria.

Chomel and graduate student Chao-Chin Chang, working with colleagues from the Santa Clara County Department of Health Services, discovered that almost 20 percent of ticks collected in Santa Clara County carried the *Bartonella* bacteria that infect cats, dogs, cattle and sometimes humans. *Bartonella henselae*, the agent of "cat scratch" disease, usually causes a mild fever in humans but can be serious or fatal in patients with a weakened immune system.

"Another important factor leading to the emergence of bacterial zoonoses is our kindness for all creatures on this planet," said Chomel. "In 1996, Miami imported 7,000 mammals (of which 1,000 were rodents). We also imported almost 1 million Iguanas and other various lizards."

The popularity of Iguanas and other pet reptiles has raised the number of *salmonella* cases in the United States. "We know that 94 to 95 percent of reptiles harbor *salmonella* in their digestive tracts," said Chomel. "The big problem is that *salmonella* causes serious illness and death in children and toddlers who come into contact with the pathogen." Chomel cited one tragic death involving a toddler who contracted *salmonella* after sucking on the finger of his father, who had been petting the family's Iguana. Another reported death

of a child involved an individual who placed an Iguana in the bathtub while cleaning its cage and later bathed the children in the contaminated bathtub.

The breakdown of public health measures is also associated with the emergence of infectious diseases. "In the United States, the West Nile disease outbreak was a major warning of the fact that we didn't have good mosquito control in a lot of states, particularly in the eastern part of the country," said Chomel.

New bacterial zoonoses are likely to be identified in the near future with the use of new molecular tools, explained Chomel. Pets are the main source for human infection, and most of these diseases can be easily prevented with good hygiene and common sense.



## NIOSH Ergonomics Booklet Available

**M**echanical aids may be generally classified as either back savers or buck savers, but they can be both. The National Institute for Occupational Safety and Health has just published a 46-page booklet that contains a number of inexpensive low-tech solutions for common agricultural tasks that will both reduce strains and sprains as well as enhance worker performance. Some of the chapters in *Simple Solutions: Ergonomics for Farm Workers* include a specialized harvest cart as an alternative to stoop labor, a rolling dibble marker for easy transplant spacing, a lifting tool for carrying plant containers, advantages of a smaller picking tub, a weeding stand for plant nurseries, using a power cutter for woody plants, new rakes for harvesting berries, and several articles on materials handling for small packing operations. When the lifting tool was field tested, researchers had a problem with workers hiding the tools overnight because they feared otherwise they would not get to use them the following day. And when the trial was completed, the employer did not want to see them go! It's free. Call 1-800-356-4674 or e-mail [pubstft@cdc.gov](mailto:pubstft@cdc.gov) and ask for *Simple Solutions: Ergonomics for Farm Workers*, Pub. No. 2001-111. The booklet may soon be posted along with other publications of interest to agriculturalists at <http://www.cdc.gov/niosh/pubs.html>

(**Exposure** from page 4)

malathion in harvesters who used rubber latex gloves, compared to dermal pesticide absorption by bare-handed workers in the same fields. An isopropanol rinse



removed about three to 10 times more malathion from workers' gloves than was absorbed by ungloved workers. This finding provides direct evidence of the contribution of hands to absorbed dose. The high pesticide levels recovered from glove rinses make gloves an unreliable dosimeter under most conditions. This finding is not general and requires further study.

Risk reduction in the use of

pesticides is an important objective that is defined differently by regulators, manufacturers, product representatives, pest control advisers and operators, pesticide handlers, re-tailers, consumers and their advocates, and politicians. Usually the issue is exposure rather than the likelihood that a harmful effect will occur. Common exposure reduction strategies include engineering controls, substitution of less toxic products, personal protective equipment, behavioral modification, regulatory and institutional responses, and protective clothing. By developing more accurate personal chemical exposure data, the risk of exposure to chemicals used as pesticides can be reduced. Without modifying pesticide use practices or using "safer" pesticides, more accurate human exposure data can result in risk assessments that are less reliant upon uncertainty and default

assumptions that inflate exposure assessments and may misguide development of mitigation measures and people's perception of their well being.



## CALENDAR

**SEPT. 20-21**

***Fall Retreat and Strategic Planning Session*** for

Agricultural Health & Safety Center Investigators. Location: Inn at the Tides, Bodega Bay. For more information, call Kathy Ponce at (530) 752-4050; e-mail [kponce@ucdavis.edu](mailto:kponce@ucdavis.edu)

***UC Agricultural Health & Safety 2001-2002 Seminar Series***

Schedules will be available in August. If you'd like to be placed on the mailing list, please call Kathy Ponce at (530) 752-4050; e-mail [kponce@ucdavis.edu](mailto:kponce@ucdavis.edu). The schedule will also be available on our Web site at <http://agcenter.ucdavis.edu>

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