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New Technologies to Monitor Infectious Disease Outbreaks

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Outbreaks of infectious diseases are a constant danger to the agriculture industry. Pennsylvania has experienced first hand the devastation such an outbreak causes. The poultry industry remembers well the avian influenza epidemic in 1983. To prevent re-occurrence of an epidemic of that magnitude, researchers at the School are relying on technology high in the sky and on powerful computers equipped with sophisticated software.

At New Bolton Center, **Dr. Sherrill Davison, V'83, Dr. Robert Eckroade, Susan Casavant** and **Stephen Gallo** have applied Global Positioning System (GPS) and Geographic Information System (GIS) technology to assist Pennsylvania's poultry community in controlling diseases to minimize economic loss. GPS/GIS technology has many applications because it can accept a great number of different parameters which then can be analyzed with the help of powerful software programs. Law enforcement offices use this technology to track incidents of crime in specific geographic areas; health officials and epidemiologists employ it to monitor health problems in specific populations or geographic areas; emergency management officials utilize it to cope efficiently with the consequences of a natural or man-made disaster.

"GIS is a computer-based tool for mapping and analyzing data to predict outcomes and planning control strategies," says Dr. Davison. "This technology has been used not only in city and county governments, but also in farming, public safety, community health surveillance, marketing, and telecommunications companies." The program allows for tracking of multiple parameters and analysis of trends.

The group has mapped the location of commercial poultry flocks, feed mills, processing plants, rendering plants, hatcheries and as many components of the live bird market as possible in the Commonwealth. To collect the data, surveys were developed and sent to all poultry clients. Geocoded addresses (matched to a commercially available street database) and driving directions were used to determine the location of each farm or facility in addition to the use of GPS receivers that provide longitude and latitude coordinates from satellite signals.

Historically, the Pennsylvania poultry industry has experienced outbreaks of diseases such as avian influenza, *Mycoplasma gallisepticum*, and infectious bronchitis. These out-

breaks affect many flocks through a wide geographic area and the economic impact can be devastating. In the past, to determine the potential area of the spread of the disease, someone needed to locate the poultry flocks near infected flocks by driving through the area and visually locate poultry facilities. "This was very time consuming and it took a while to collect these data," says Dr. Davison. "The use of GPS/GIS technology allows for easier and quicker access to the location and identification of surrounding poultry facilities.

"Our application permits a more rapid response in control efforts for avian influenza

mountains may limit disease spread. "On the other hand, during the 1997-98 outbreak of avian influenza, wind was a factor in the transmission of disease to neighboring farms," says Dr. Davison. "If data on wind direction in future outbreaks is collected, we can include this information as part of the epidemiological study. Temperature and humidity data may also be useful parameters in the analysis of spread of disease."

ArcView, created by the ESRI corporation, is the widely used GIS software employed by the poultry researchers. This software takes information stored in spreadsheets and data-

bases and creates layers of spatial features in map form which are linked to the original database tables. Information can be identified, queried, and analyzed to visually represent a situation. Buffer zones around an infected flock can be created in seconds along with a list of the farms within the zone in order to implement rapid surveillance testing and a possible quarantine in the specific area. During the most recent outbreak of avian influenza in Union, Snyder and Juniata counties (Dec. 2001), the NBC researchers used their GIS application and the evolving database to assist the poultry community in controlling disease and minimizing loss. The group increased its database by mapping farm and plant locations by geocoding addresses, obtaining latitude-longitude coordinates by GPS

and mapping facilities by driving directions. They were able to produce an inventory of poultry and support facilities in the counties and recommend steps to contain the disease. The poultry group was able to view maps of farms that were depopulated, under surveillance testing, or scheduled to go to market soon. With this information, a complete picture of the outbreak situation was viewed on a daily basis.

The database for the poultry industry is growing. Additional information continues to be gathered about components of the live bird

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Lockheed Martin Missiles and Space

and other diseases." The system facilitates the analysis of data such as type and number of birds affected or the companies involved. It allows the integration of travel routes for feed, bird and egg trucks, schedule of service personnel, etc. into the program. The role of environmental factors can be analyzed as to whether the spread of disease is mechanical in nature (i.e. personnel or vehicles) or whether wind or water play a role.

GIS technology allows for the creation of maps which show geographic features of an area. These may either be beneficial or detrimental to disease control. Rivers, highways,

Animal Crackers



Most Popular Breeds

The American Kennel Club registered 1,081,335 dogs in 2001. Labrador retrievers lead the list with 165,970 followed by golden retrievers with 62,497 individual registrations. Labradors have been in first place since 1991 but poodles ruled for 21 years – 1960 to 1982 – and still are in the top ten along with German shepherd dogs, dachshunds, beagles, Yorkshire terriers, boxers, Chihuahuas and Shih Tzu.

The statistics do not list varieties – only breeds, (nine breeds are divided by color, size or type of coat). Of the 150 breeds, otterhounds and foxhounds are among those with fewer than 100 registered.

The AKC and parent club web sites are extremely helpful in educating potential puppy buyers. <www.akc.org> provides a wealth of information including just about everything you might want to know about the different breeds and breed clubs, dog events and more.

V.M.D. or D.V.M.

There are 27 Colleges of Veterinary Medicine in the United States which are accredited by the American Veterinary Medical Association.

tion. Of these, 26 award a D.V.M. Only the University of Pennsylvania grants a V.M.D. (Veterinariae Medicinae Doctoris) degree.

The University of Pennsylvania graduates can be recognized by their degree. Through 2001, the V.M.D. has been awarded to 5,727 graduates (1,757 women and 3,970 men), beginning with the first class in 1887.

To be grammatically correct, if “Dr.” is used before a name, the academic degree is not included after the surname. It should be Dr. John Doe, or John Doe, V.M.D., never Dr. John Doe, V.M.D.

Veterinarian is a noun, veterinary is an adjective. There is a veterinary school, not a veterinarian school.

Book Review

***A Breed Apart. The Art Collection of the American Kennel Club and the American Kennel Club Museum of the Dog by William Secord.* Antique Collectors Club Books. \$80.00**

This is the coffee-table book for all dog lovers. Full-color reproductions of 400 works representing 247 artists and 112 breeds are examples of canine art beginning with the 17th century. Biographies of all the artists are given.

There are many works from the early 20th century. This was the heyday of large kennels and portraits of dogs were very much in demand. Millie the English springer spaniel, “first dog” at the White House under former President George H. Bush is shown. There are pictures and notes about collars, which in the early days could be offensive and defensive weapons. A number of small bronzes are pictured.

William Secord is a leading authority on canine art.

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market system (dealers, haulers, flocks, markets, etc.) The ArcView database is used for storage, analysis and display of the poultry industry data. The information is updated on a continuous basis.

In the short time since its inception, the GIS database has been applied to the epidemiology of nephropathogenic bronchitis, Mycoplasma gallisepticum (MG) and avian influenza. In addition, the Penn GIS researchers were able to minimize the risk of the spread of disease to susceptible flocks by advising the industry on placement of potentially positive MG infected birds moved to Pennsylvania from out of state.

This application of GIS technology can serve as a model not only for the poultry industry in other states, but for other food ani-

mal industries in Pennsylvania and nationwide. It can also be helpful to monitor outbreaks of diseases like Foot and Mouth disease and Bovine Spongiform Encephalopathy (Mad Cow Disease) in other parts of the world. The implementation of GIS technology in the agricultural community to control disease, limit economic losses and protect elements of the food supply is vital.

At New Bolton Center, researchers are now applying this technology to inventory and map dairy and swine facilities in the Commonwealth. The beef cattle and sheep industry are also prime candidates for GIS technology. The work at Penn is supported by grants from the Pennsylvania Department of Agriculture.