Penn Researchers Make Manure a More Environmentally Friendly Fertilizer

By Susan I. Finkelstein

In keeping with the increasing overall awareness of environmental issues, dairy, hog, and poultry farmers across the country face growing governmental regulation and public demand to manage a huge quantity of animal manure in an environmentally friendly manner. Using animal manure as a fertilizer is problematic because the large amount of soluble phosphorus in manure is prone to runoff losses in waterways, contributing to water-quality problems in many streams, rivers, and estuaries.

Scientists at the School have found an economical and effective way to stabilize manure phosphorus by lowering its solubility using fly ash—the fine, often airborne particles derived from the burning of coal. When fly ash materials were mixed with dairy, hog, or broiler manures, water-soluble phosphorus decreased by up to 80 percent. Another additive, alum (aluminum sulfate), also reduced water-soluble phosphorus dramatically. Fly ash materials are easily obtainable at minimum cost from coal-combustion power plants. The results of the 2001–2002 study, which was funded by the United States Environmental Protection Agency's Chesapeake Bay Program, appeared in the July–August issue of the *Journal of Environmental Quality* by the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America.

In manure that has been treated with fly ash or alum, highly water-soluble phosphorus shifts to other forms that are less soluble and therefore more stable. The mechanisms responsible for these shifts are precipitation, absorption, and entrapment. Scientists believe the shifts are desirable and beneficial because the phosphorus available for crops would be similar over the long term, while its environmental losses would be substantially reduced.

"Treating manure with alum or fly ash *prior* to field application can be a management tactic particularly useful on farms where manure has to be spread during late fall to early spring. These are sensitive times when crops are not growing and phosphorus and other nutrients cannot be utilized while runoff potential is the highest. With treated manure, phosphorus would have a better chance to stay in the fields until the crops can use it rather than being dissolved in runoff waters and getting into streams and rivers," states lead scientist **Zhengxia Dou, Ph.D.**, at the Center for Animal Health and Productivity at New Bolton Center. Dou was joined in the research by scientists **J. D. Toth** and **James Ferguson, V'81**, both from Penn; G. Y. Zhang of the Soil Science Institute, Chinese Academy of Sciences, Nanjing, China; and W. L. Stout, of the U.S.D.A.'s Agricultural Research Service in University Park, Pa.

The amounts of aluminum or heavy metals in soils that have been fertilized with alum- or fly-ash–treated manure are well below the natural levels and within government-regulated limits. "Of course, soils and crops in fields receiving treated manures should be monitored through proper testing to safeguard the health of animals and humans," adds Dou. An integrated, whole-farm management program is most effective in helping producers improve nutrient efficiency, enhance productivity, and minimize adverse environmental consequences.

Dr. Frank Luca, assistant professor in animal biology, receives the Pfizer Award for Research Excellence from Dr. Pedro Lichtinger, president of the Pfizer Animal Health Group.

New Section at New Bolton Center

New Bolton Center has added a Section of Emergency/Critical Care and Anesthesia. Effective July 1, 2003, Emergency Service, Intensive Care and Neonatal Units, and Anesthesia are organized as one cohesive unit. "We have worked on this since 1999," says **Dr. Pamela Wilkins**, assistant professor of medicine and chief of the new section. "There is a great need for large animal emergency/critical care specialists; most of the of veterinarians board certified in veterinary critical care are companion animal specialists. There are very few places were people can train in large animal emergency and critical care medicine as there are only ten active clinicians board certified in this discipline nationwide."

Dr. Wilkins is one of them. Under the auspices of the new section, the School is developing a residency program in large animal emergency/critical care medicine. "An academic unit puts people of like minds together," says Wilkins. "This is very beneficial for residents and students. It is an emerging specialty and we are formalizing the training. New Bolton Center, with its high caseload, is well suited as a training ground for large animal emergency/critical care veterinarians."

New Bolton has always provided 24-hour emergency care and has a long-standing commitment to critical care. Clinicians in the Connelly Intensive Care Unit and the Graham French Neonatal Section have made great strides in the care of critically ill large animals in the past decade. There is a special emphasis on neonatal care, particularly during foaling season. These services are augmented by outstanding sections of surgery and medicine and a superb nursing staff. The critical care residents will be exposed to all large animals: horses, cows, llamas, alpacas, sheep, goats, pigs, and occasional zoo animals.

The faculty members in the new section are: **Drs. Barbara Dallap, V'94**, **Bernd Driessen**, **Lin Klein, V'70**, **Jon Palmer, V'77**, **Lawrence Soma, V'57**, **Louise Southwood**, and **Pamela Wilkins**. Staff veterinarians **Drs. Brett Dolente, V'96**, **Janet Johnston, V'96**, and **Kim Olson** are also members of the section. Currently, the residents at New Bolton Center training in Emergency and Critical Care are combining this training with standard residency training in allied specialties, such as surgery, medicine, and anesthesia. One focus of the Section of Emergency/Critical Care and Anesthesia will be to formalize training standards for residents in Large Animal Emergency and Critical Care, with a goal of being able to offer standard track training in this emerging specialty.