Poisonous Plant Research Laboratory

It was an educational experience for me to recently participate with a rather distinguished group in an Onsite Review of the Poisonous Plant Research Lab (PPRL). We spent one day listening to presentations from scientists regarding their current research and touring the facility. The second day was spent discussing ways to expand outreach and how to improve interaction with sister agencies, such as Extension. I am glad I had the opportunity of participating.

This beautiful building (26,700 square feet) with modern, functional laboratories and limited animal housing was dedicated in 2005. Located on the USU campus, this impressive facility is a dream come true for livestock producers and many dedicated scientists. It only came to fruition because of the unrelenting persistence of former Research Leader, Dr. Lynn James, and with federal assistance from Senator Robert Bennett. The Utah Agricultural Experiment Station and Utah State University are also cooperating partners.

Work done at the PPRL is directed by Agricultural Research Service (ARS), USDA's chief research agency. ARS scientists conduct research of high national priority in more than 100 national and international research facilities. The PPRL is unique in that it is the only Federal entity mandated to study the effects of poisonous plants on livestock and to provide science-based solutions to poisoning problems.

I was impressed by the diversity of personnel who work to accomplish the mission of the PPRL. Toxicologists, physiologists, veterinarians, chemists, biologists, pharmacologists, range management specialists, lab technicians, office workers and animal care takers. Dr. Kip Panter, new Research Leader, directs the work of these professionals to identify poisonous plants, isolate and identify plant toxins and determine factors that impact plant toxin concentrations. This interdisciplinary team of scientists also work to determine the mechanism of actions of toxins, document toxin metabolism and clearance from animal tissues, and to develop diagnostic and prognostic procedures. Additional research includes efforts to identify conditions of poisoning and factors influencing plant population ecology. When sufficient data is collected and analyzed, these professionals develop management strategies, treatments and other recommendations to reduce losses and promote animal and human health.

Our onsite review committee all agreed that the quality research conducted at the PPRL has already gone far beyond the initial benefits anticipated for the livestock industry. Several examples were given of ways that applied research at the PPRL has extended to significant progress in human medicine. A few examples of those linkages include cancer, diabetes, mental retardation and cleft palates. We were also impressed with PPRL's exceptional international reputation and agreed that many people, who do not even know of the lab's existence, are direct beneficiaries of the research conducted here.

Poisonous plants cause an estimated $340,000,000 annual economic loss in the 17 western states and substantially more when all states are considered. Research is being conducted on key poisonous plants, such as larkspur, locoweed, pine needles, broom snakeweed, plants containing pyrrolizidine alkaloids that cause liver damage and plants that cause birth defects. Many of these plant problems occur worldwide. Common losses result from deaths, abortions, birth defects, poor performance, immune incompetence, and decreased reproduction.

For example, ewes grazing Veratrum californicum on the 14th day of gestation give birth to lambs with cyclopian-type facial birth defects. The causative agent has been identified as cyclopamine. This model is currently being used to study facial birth defects and several other health problems in humans. Certain species of lupin, when consumed by cows during the 40-70 days of gestation, result in skeletal malformations and cleft palate in calves. These studies have been extended to goats at PPRL and the prenatal kids with cleft palate thus produced are currently being used as a model to study the etiology of cleft palates and thus surgical repair in-utero. The information and techniques learned from the goat model are being extended to humans where it has the potential for fetal intervention which would allow the normal development of the mouth and palate following surgery, thus avoiding the physical and psychological scarring in children.

The toxin in locoweed is shown to be an indolizidine alkaloid named swainsonine which inhibits certain enzymes involved in structural and metabolic processes in mammalian cells. This information has stimulated research on the control of metastasis in the management of cancer. Representatives from the National Cancer Institute are delighted with anticipated research coming out of the new facility.

Among other things, Dr. H. Paul Rasmussen, Director Utah Ag Experiment Station, spoke of numerous young people who are free of substance abuse because of tours, demonstrations and lectures provided by the PPRL staff. Young people think twice about taking drugs into their bodies after seeing what happens to livestock when toxins are taken into their systems. The connection between plants, animals and humans is illustrated rather convincingly by scientists at the PPRL.

Information gathered at this impressive research facility is utilized world-wide, but local producers will especially want to take advantage of this valuable resource. Livestock producers with poisonous plant problems should seek assistance from their local veterinarian, county Extension personnel and, if necessary, consult with scientists at the PPRL. Interested readers will also want to visit the PPRL website at http://www.pprl.ars.usda.gov.