

# Introduction to the USDA– Agricultural Research Service Poisonous Plant Research Laboratory Special *Rangelands* Issue

By James A. Pfister and Kip E. Panter

Exploration and colonization of western North America brought domestic livestock to this continent as early as 1521, when Gregorio de Villalobos introduced cattle into Mexico. Livestock were brought in large numbers to many Spanish settlements across the Southwest during the 1600s. However, the start of the range livestock industry in the western United States is attributed to the movement of settlers and livestock into the Mississippi Valley, and these herds joined with livestock moving north from Texas in the 1830s. Forage was considered to be unlimited, and poisonous plants were of little concern because large-scale losses of livestock to poisonous plants were rare on eastern rangelands. On western rangelands, however, periodic large losses of livestock from poisonous plants were reported as stockmen encountered previously unknown plants such as locoweeds (*Astragalus* and *Oxytropis* spp.) and larkspurs (*Delphinium* spp.), among many others.

Spurred on by numerous accounts of field losses and Congressional urging, the Secretary of Agriculture assigned V. K. Chesnut as assistant botanist for the USDA to begin poisonous plant investigations in November 1894. The foreword to one of Chesnut's first publications states, "In the annual report of the Botanist for 1894 was emphasized the importance of doing something to lessen the increasing number of fatal cases of poisoning due to carelessness or to a lack of correct knowledge of our poisonous plants." Chesnut reported 20 investigations in the western states during the fiscal year ending 30 June 1899. The 1899 USDA Yearbook of Agriculture stated, "the many deaths of human beings and farm animals caused by poisonous plants justify continued work by this Division [Botany] with regard to them." Chesnut's efforts, and subsequent field investigations

from 1905 to 1930 by Dr C. D. March and other scientists, eventually led to the formal creation of the Poisonous Plant Research Laboratory within the Agricultural Research Service (ARS-PPRL) in 1955. Originally located in Salina, Utah, under the auspices of the USDA–Bureau of Animal Industry, the PPRL was established as a federal laboratory in Logan, Utah, on the campus of Utah State University (USU) with Dr Wayne Binns being the first research leader (RL). Dr Lynn James became RL in 1972, and Dr Kip Panter succeeded Dr James in 2007. The state-of-the-art facility shown on the cover of this issue was completed in 2004.

The mission of the PPRL is to identify toxic plants and their toxic compounds, determine how the plants poison animals, and develop diagnostic and prognostic procedures for poisoned animals. Furthermore, PPRL's mission is to identify the conditions under which poisoning occurs and develop management strategies and treatments to reduce losses. Research information is used by the livestock industry, natural resource managers, veterinarians, chemists, plant and animal scientists, extension personnel, and other state and federal agencies.

PPRL currently has 10 scientists and 17 support staff, representing various disciplines. This team of scientists provides an interdisciplinary approach to applied and basic research to develop solutions to intoxication. The integration of scientific disciplines is a major strength of PPRL, and there is no other research unit in the world with this degree of cross-disciplinary expertise devoted exclusively to the study of poisonous plants. Undertaking a multidisciplinary approach to the problems created by toxic plants has greatly increased our success in attaining the mission originally mandated for PPRL.

Major projects that are currently under investigation at PPRL encompass a variety of plants. Criteria for selecting research problems vary, but typically include scope of the problem (e.g., local, regional, or national importance), severity of the losses, in both animal numbers and financial terms, current focus of the research team, and uniqueness of the poisoning problem.

PPRL researchers are currently pursuing four distinct areas of investigation. These investigations include 1) locoweeds, 2) larkspurs, 3) plants causing reproductive problems such as abortion (e.g., pine needles, locoweed) and birth defects (teratogenic plants such as lupine and locoweed), and 4) plants causing liver damage (e.g., *Senecio* species). Within these four research areas, there are plant-specific objectives given on the PPRL web site (<http://www.pprl.ars.usda.gov>) and so will not be repeated here. The broad overall objectives, however, of the four emphasis areas are similar and include 1) determine how toxic plants cause injury to livestock, and develop diagnostic procedures so that ranchers and veterinarians can better diagnose outbreaks; 2) identify and isolate the chemical compounds (i.e., toxins) that cause toxicity and/or birth defects; 3) determine how the amount of the toxin(s) within poisonous plants is influenced by soils, sites, environmental conditions, plant parts, and stage of growth; and 4) determine the conditions under which livestock consume poisonous plants, and evaluate factors influencing their consumption.

The articles in this issue of *Rangelands* highlight management recommendations and ongoing research from these major research endeavors. In addition, Dr Fred Provenza (USU) has contributed an article on the value of plant diversity in herbivore diets, and Dr Bryan Stegelmeier has provided advice about how producers should investigate suspected poisoning episodes, including what samples should be taken. His recommendations should be followed whenever poisonous plants are suspected to have caused animal losses.

We have limited the citations to improve readability of the articles, but interested readers can view the full citations at <http://www.srmjournals.org>. All articles were peer reviewed, and we thank the reviewers and Ed Fredrickson for their efforts. We encourage those with poisonous plant problems to seek assistance from their local veterinarian and county extension personnel and, when appropriate, to consult with PPRL scientists.

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*Authors are Rangeland Scientist, [jim.pfister@ars.usda.gov](mailto:jim.pfister@ars.usda.gov) (Pfister) and Reproductive Toxicologist and Research Leader (Panter), Poisonous Plant Research Laboratory, Agricultural Research Service, United States Dept of Agriculture, 1150 E 1400 N, Logan, UT 84341, USA. Published with the approval of the Director as Journal Paper No. 8036 of the Utah Agricultural Experiment Station.*