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Introduction (20-Aug-2002)

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Plant poisoning has plagued humans and animals throughout history, especially in North America where many immigrants and their animals were poisoned by unfamiliar plants. In the eastern states, milk sickness was a problem among those who drank the milk of cows that had been grazing white snakeroot (*Eupatorium rugosum*). Numerous deaths of people and animals due to "trembles" or "milk sickness" were reported in Indiana in the early 1800s. Once the association between snakeroot and the disease was determined, destroying the plants and preventing animal access to the plants largely controlled the disease [1]. Similarly, as settlers moved westward, they, and often their livestock, suffered fatalities from eating the bulb of death camas (*Zigadenus* spp.) mistakenly for that of the edible camas lily (*Camassia* spp.) or wild onion (*Allium* spp.) [2]. A group of plants that were particularly troublesome to the early ranchers and farmers in the western states were the locoweeds (*Astragalus and Oxytropis* spp.). These widely distributed plants caused severe disease in all animals that ate them. Locoweeds continue to be the most economically important poisonous plants in North America considering their wide geographic distribution and diverse effects on livestock health.

Not only did early immigrants encounter unfamiliar toxic plants, they also inadvertently introduced weed seeds that contaminated the seed grains they brought with them from Europe and Asia. These weeds soon became established and spread rapidly because of the lack of competition in their new environment. Some of these introduced weeds such as leafy spurge (*Euphorbia esula*) have become noxious weeds in that they displaced indigenous plants and crowded out valuable forages. Other introduced weeds such as yellow star thistle (*Centaurea solstitialis*), Russian knapweed (*Centaurea repens*), and hound's tongue (*Cynoglossum officinale*) are not only noxious but also cause severe poisoning in animals that eat them when other forages are scarce.

Despite our ever-increasing knowledge about plants and their toxins the prevalence of plant poisoning is likely to increase with the influx of small acreage farmers into native rangelands. Livestock on small acreages frequently increase grazing pressure on the land, and, as a consequence, toxic plants may be consumed. Furthermore, overgrazing disturbs the normal balance of plant species, often allowing an aggressive plant or weed to invade the area. Plant poisoning is also being encountered in wildlife that are forced to concentrate their grazing in ever decreasing areas because of the encroachment of human populations on their natural range. A good example of this is the frequency with which elk develop locoweed poisoning as their population density increases in areas where human activity has curtailed the elk's normal migratory patterns.

Plant poisoning can be a significant impediment to profitable livestock management and production. In 1978, a study on the economic impact of poisonous plants on the range livestock industry in 17 western states estimated that the problem cost the industry $107 million annually [3]. In some years and in localized areas the economic losses may be proportionally much higher. Although the most obvious economic losses are those attributable to actual deaths from poisonous plants, many other aspects of plant poisoning contribute a great deal to the overall economic losses. Locoweeds, for example, exert their major effect through decreased reproductive performance including abortions, fetal deformity, and decreased fertility in male and female animals. Decreased weight gains are also common in animals consuming less than fatal doses of locoweed. Additionally, the costs for fencing, herbicides to control the plants,

and decreased carrying capacity of livestock on the land invaded by these plants further adds to the economic impact of

poisonous and noxious weeds.

Veterinarians and animal owners are frequently confronted with the task of determining whether or not a plant is responsible for poisoning of animals. Similarly the presence of plants other than grasses in a pasture are always a concern to livestock owners. A reference source that can help them identify toxic plants and the effects they have on animals is a necessity. Although there are many books dealing with wild flowers, weeds, and toxic plants, none adequately combine definitive color photographs of toxic plants for easy recognition with information on the effects of the plant toxins on animals. To those who are not botanists, many of the available books on toxic plants are frustrating because the illustrations are either line drawings or black and white photographs that make plant identification difficult. At present, the most comprehensive coverage of poisonous plants in North America is John M. Kingsbury's book *Poisonous Plants of the United States and Canada*. It is, however, sparsely illustrated, and since its publication in 1964, there have been numerous new documented plant poisonings that are not included in the book.

With over 50 years combined field and teaching experience, we have compiled a book that will be useful to students, livestock owners, veterinarians, and anyone who is interested in the fascinating effects of toxic plants on animals. Supplementing the book is a CD that contains numerous additional illustrations of the plants discussed in the text. Most books on plant poisoning are categorized according to the toxin in the plant. In reality however, animals with plant poisoning are encountered with one or more clinical signs that the animal owner or veterinarian must try to relate to a particular plant. With this in mind, the toxic plants covered in this book have been grouped into 10 chapters based on the most common presenting clinical signs seen in the animal. This arrangement allows the veterinarian or livestock producer who is confronted with an animal exhibiting specific clinical signs to easily review the plants that would most likely cause the problem. Those who want to know if a particular plant from their pasture, range, or hay is poisonous can match the plant to the color photographs and descriptions of the plants. Once the plant is identified, further information is provided on the toxic components of the plant, the clinical signs it produces, treatment, and management of the plant to prevent poisoning.

At the beginning of each chapter is a general description of the toxicology of the plant toxin and its effects on animals. This is followed by a description and illustration of each plant. Each chapter has a reference list for those who wish to pursue the topic further. In Chapter 1, for instance, there is a general discussion on the plants capable of causing sudden death, the mechanism of action of the various toxins, and relevant treatments, followed by a description of the individual plants. Subsequent chapters cover the most common presenting signs of plant poisoning. Some plant toxins that affect multiple organ systems, such as the pyrrolizidine alkaloids found in various plant species, are cross-referenced for the reader's benefit. A lengthy discussion of herbicide applications is intentionally omitted because of the continual availability of products, differences in the regional use of the chemicals, and the changing recommendations of the Environmental Protection Agency.

This book emphasizes the toxic plants most commonly associated with animal poisoning in North America and that are well documented in the literature. Where documentation is poor, the plant may only be mentioned briefly or listed as being a suspect or potentially poisonous plant. It is beyond the scope of this book to include the numerous poisonous house and garden plants that affect humans and pet animals. Some ornamental plants, however, are included when they have become a problem to livestock. Minimal reference is given to plant poisoning in dogs and cats and, when

included, is for comparative purposes. Some plants such as *Abrus precatorius* are included because of their deadly toxins and not because they frequently cause animal poisoning. We intend this book be a useful compilation of the current information on poisonous plants that will be of benefit to those who are involved with the welfare of animals.

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