How often have you heard someone refer to a rattlesnake or black widow spider as “poisonous”? These creatures are not poisonous – they are venomous. People use the terms venom and poison interchangeably without realizing their delivery methods distinguish these substances.

By its broadest definition, poison is any chemical substance that disrupts biochemical and/or physiological processes in an organism. A biologically produced poison is called a toxin. A synthesized poison is referred to as a toxicant.

Toxins are categorized by the effects they have on organisms. Neurotoxin acts on the nervous system, disrupting nerve tissue and producing muscle weakness or paralysis. Hemotoxin acts on the cardiovascular system by destroying red blood cells, degrading the lining of blood vessels, interfering with blood clotting either by decreasing or increasing it, damaging tissue, and corrupting organs. Cytotoxin affects cells throughout the body. Myotoxin affects the heart, preventing or disrupting contractions of that muscle.

Poison is a toxin that is inhaled, imbibed, eaten, or absorbed by the skin. According to zoologists at the San Diego Zoo, the golden poison frog of South America is the most poisonous animal in the world. To create poison, this small, bright-colored frog dines on a variety of toxic insects, ants, caterpillars, and spiders native to the lowland Amazon rainforests. The frog isolates specific toxins from those creatures then mixes those toxins into a powerful chemical concoction that is stored in and secreted by specialized skin glands. A frog without access to a diet of toxic

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insects cannot produce poison. The only creature that is completely immune to this poison is the golden poison frog itself though the northern swamp snake, *Liophis epinephelus*, has partial immunity. Any other predator foolish or hungry enough to pick up one of these tiny creatures is rewarded with severe swelling, violent nausea, and paralysis, if not death.

Venom is a cocktail of 20 to 100 toxins produced in a specialized gland by an animal and injected into another animal via a mechanism such as a wasp’s stinger, a rattlesnake’s fangs, or the nematocysts located on a jellyfish’s tentacles. Over 200,000 species of creatures worldwide employ venom for hunting or defense. Venomous oceanic animals range from the golf-ball sized blue-ringed octopus to the Portuguese man o’war with its 165-foot tentacles. Venomous land animals include many species of amphibians, reptiles, and insects as well as mammals. The World Health Organization reports that five million bites from venomous species around the world result in 100,000 human deaths annually. Actual numbers may be considerably higher since many bites aren’t reported, especially in underdeveloped countries.

A few species are both poisonous and venomous. The venomous rear-fanged Asian tiger snake, *Rhabdophis tigrinus*, procures steroidal toxins called bufadienolides from poisonous toads that make up most of its diet and stores those toxins in its nuchal glands. A predator that grabs the tiger snake by the back of its neck gets a full load of toxin even if the predator avoids being bitten. *R. tigrinus* individuals who live in areas devoid of poisonous toads can’t build up a poison supply and must depend on venom alone. In 2015, scientists discovered that two species of South American frogs previously thought only to be poisonous also have the ability to inject venom via bony spines located on their heads. Greening’s frog, *Corythomantis greeningi*, and Bruno’s casque-headed frog, *Aparasphenodon brunoi*, produce venom deadlier than many pit vipers. Scientists calculated that a single gram of toxin from the latter frog has the capacity to kill 300,000 mice or 80 humans.

A popular past time for science writers is coming up with lists of the world’s most venomous animals. These lists vary depending on each list maker’s criteria for measuring venomousness: mouse-killing potential per drop, amount of venom delivered in a single strike, human deaths per species, speed of death following a bite, etc. Most lists include the golden poison frog mentioned above as well as the box jelly, a cynidarian invertebrate not to be confused with toast topping, and the Inland Taipan, also known as the fierce snake of Australia.

Box jellies are found in oceans surrounding Asia and Australia and have been responsible for 5,600 human deaths since 1954. Box jelly toxin contains neurotoxic, hemotoxic, and cytotoxic components that affect almost every part of the body. Those unfortunate enough to come in contact with a box jelly’s 10-foot tentacles and 75,000 stinging cells are gripped with pain so excruciating that some victims suffer heart failure or abruptly go into shock and drown. People who manage to escape drowning have virtually no chance of survival without

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The Werner Wildlife Museum is now accepting entries for “Genesis: Fine Craft from Wyoming Artisans,” a juried exhibition of contemporary crafts and decorative arts. The show is open to all Wyoming artisans and artists who work with natural materials including, but not limited to, fiber, leather, bone, horn, wood, stone, gems, and metal. Paintings and photographs are not eligible for this show; size constraints may apply due to space limitations. The deadline for entries is Friday, April 5, 2019, at 4:30 p.m. The show opens on Thursday, April 11, 2019 with an open house between 4 and 6 p.m. The Show will remain on view until Friday, July 5, 2019. Museum visitors will be invited to cast a vote for their favorite artwork, and at the end of the show, a People’s Choice Award will be given to the artist responsible for the most favored piece. Both the show and open house are free to the public.

To request entry forms and guidelines, call 307-235-2108, email indiahayford@caspercollege.edu, or come by the Werner Wildlife Museum at 405 East 15th Street, in Casper between 9 a.m. and 5 p.m., Monday through Friday.

Join Werner Wildlife Museum, The Beacon Club, and My Country 95.5 on Thursday, March 7 for a Thankful Thursday fundraiser for Werner Wildlife Museum. Raffles start at 5 with the live auction kicking off at 6:30 p.m. This is a family-friendly event at the smoke-free Beacon Club with door prizes, 50/50 raffles, and tons of fun packages and baskets to win. Thankful Thursday is the only event of its kind that gives 100 percent of the proceeds to local organizations doing local good. Join us at The Beacon Club to have a blast and support the Werner Wildlife Museum.
Venom ... Continued

immediate treatment. Chronic pain and severe scarring plague survivors.

According to toxicologists at Australia’s University of Adelaide, the Inland Taipan produces the most potent snake venom known. The venom consists of neurotoxins which act on the nervous system and procoagulants which interfere with blood clotting. Toxin contained in a single Inland Taipan bite is sufficient to kill 100 humans. This snake lives in isolated, semi-arid parts of central Australia and is described by herpetologists at Australia Museum as shy, relatively placid, and rarely encountered. Its near relative, the Coastal Taipan, is often regarded as the most dangerous snake in Australia due to an aggressive nature, proximity to human populations, and the ability to inflict several bites during a lightning-fast strike.

Venom isn’t limited to crustaceans, insects, and herps. Platypuses, shrews, moles, and vampire bats also produce venom. The only venomous primate is the slow loris, Nycticebus spp. This denizen of the forests of Southeast Asia produces venom in modified sweat glands located near the elbow. When alarmed, the loris licks these glands then delivers the venom via a bite. The slow loris is among the world’s most exploited animals both for traditional Asian medicine and as pets on the international market. Animals destined to be pets have both venom glands and teeth extracted. The characteristic arm waving that some people find so adorable is actually an alarm reaction in which the loris is trying to reach its venom glands to prepare itself for defense.

Wyoming is home to a variety of venomous creatures though only a handful pose threats to humans. Two species of venomous snakes grace Wyoming’s prairies and rock outcrops: the prairie rattler, Crotalus viridus, and the midget faded rattler, Crotalus concolor. Rattlesnakes are pit vipers that deliver venom via hollow retractable fangs. Both species produce hemotoxin which acts on the circulatory system. The midget faded rattler’s venom also contains a significant component of neurotoxin which affects the nervous system, giving it one of the most dangerous bites in the Western United States.

The most serious arachnid threat comes from Latrodectus hesperus, commonly known as the western widow spider, a close relative of Latrodectus mactans, which is the “true” black widow spider. All Latrodectus species produce neurotoxin; envenomation symptoms include chest tightness, muscle discomfort, restlessness, anxiety, partial paralysis, and difficulties with speech and breathing. The western widow is not aggressive and rarely bites except when protecting egg sacs within her web. Susceptibility to widow toxin varies: horses are very susceptible while dogs and rabbits are more resistant. Three other common Wyoming arachnids are mildly venomous and generally not a threat to humans: the banded orb-weaver spider, Argiope trifasciata; the wolf spider, Lycosidae spp.; and the cat-faced spider, Araneus gemmoides. A bite from the last of these is unusual and unlikely to even break the skin.

Despite numerous rumors of brown recluse spider infestations and bites in Wyoming, members of the genus Loxosceles can’t tolerate the state’s cold, dry climate. Whitney Cranshaw, Ph.D., entomologist with the University of Colorado, writes that brown recluses are the most commonly misidentified spiders in Colorado and Wyoming. Several
harmless spiders in the region resemble brown recluses, most notably funnel weaver spiders and wood louse hunters. Out of hundreds of samples submitted by concerned citizens, Crenshaw has seen two brown recluse spiders in the last three decades.

Wyoming has a single species of scorpion, the northern scorpion, Paruroctonus boreus. Its mildly venomous sting is uncomfortable but unlikely to be deadly to humans except in the case of an allergic reaction.

Frightening as the prospect of an envenomed bite or sting may be to humans, some creatures brush aside attack from a snake or scorpion as no more troubling than any other puncture wound. American animals exhibiting resistance or immunity to various types of venom include woodrats, skunks, horned toads, opossums, and California ground squirrels. The American badger, Taxidea taxus, is not only immune to rattlesnake bite but preys on the rattler as well. According to Lawrence Monroe Klauber’s definitive treatise on rattlesnakes, the American badger is the primary predator of rattlesnakes in South Dakota. Though studies are inconclusive, venomous snakes appear to be at least partially immune to their own venom which would come in handy if in the process of striking at a potential snack the attacking snake managed to bite itself.

The practice of injecting oneself with nonlethal doses of venom in order to achieve immunity or resistance is called mythridatism. King Mithradates IV of Pontus, 120-63 BCE, so feared being assassinated by poison that he sought to inoculate himself by regular intake of sublethal doses of poisonous substances.

Bill Haast, world-renowned herpetologist and founder of Miami Serpentarium Laboratories, injected himself daily for over 60 years with a mixture of venom from 32 different snakes. Haast survived 170+ snake bites, including 20 that were nearly fatal. Donations of his antibody-rich blood saved at least 21 snakebite victims worldwide. He died of natural causes in 2011 at the age of 100.

Attempts to create a vaccine for venom have been spotty. Rattlesnake vaccines exist for dogs and horses, but opinions differ as to its efficacy. Most evidence is anecdotal and complicated by a 25 percent chance of any bite being a dry bite in which no venom is injected.

Scientists have been more successful in isolating specific toxins from venom and using those toxins to create life-changing medication. The FDA has approved a number of drugs derived from animal venom and more are in clinical trials and pre-trial stages. In 1981, Captopril, trade name Capoten, became the first venom-derived drug approved for use in the United States. Created from the venom of the Brazilian lancehead viper, Bothrops jararaca, the drug is used to treat hypertension and certain types of congestive heart failure. Most research has been done on snake venom, which is readily obtainable and often targets warm-blooded species, but venom from spiders, leeches, centipedes, snails, and bees is also relevant to modern medicine. Exenitide, trade name Byetta, is used to treat type II diabetes and was developed from hormones found in the toxic saliva of the Gila monster, Heloderma suspectum. Research on venom from the dusky pygmy rattlesnake, Sistrurus miliarius barbouri, gave rise to Eptifibatide, trade name Integrilin, an anti-coagulating agent that is used to treat acute coronary syndromes. Other approved drugs are used to treat chronic pain.

Ecological and population pressures put many venomous species at risk faster than scientists can study them. Zoltan Takacs, Ph.D., founded the World Toxin Bank in order to create a comprehensive collection of venom to be used in future research. In regard to creating treatment from venom, Takacs told ABC News, “The limiting factor is less of a technological challenge but more of actually getting hold of those toxins from nature. If we do not act in time, we may lose some of the smartest and most valuable molecules on planet Earth.”

Research on pygmy rattlesnake venom resulted in the development of an anti-coagulating agent that is used to treat acute coronary syndromes. Photograph courtesy of India Hayford.
There are no groundhogs in Wyoming. Groundhogs are members of the family Sciuridae with the scientific designation of *Marmota monax* and the common name woodchuck. These animals are found from southeastern Alaska east across Canada to the Atlantic Ocean, south to northernmost Georgia and west to Arkansas and the far eastern portions of the Great Plains states. The only population of groundhogs in the western states is located in the Idaho panhandle near the Canadian border.

What we do have in Wyoming is a groundhog cousin, *Marmota flaviventris*, more commonly known as a yellow-bellied marmot or rock chuck. Members of this genus are found in mountainous regions of California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, South Dakota, Utah, Wyoming, and in Canada in Alberta and British Columbia. The subspecies specific to Wyoming is *Marmota flaviventris dacota* or the Black Hills yellow-bellied marmot. Three other subspecies are found only in Colorado. Though most populations appear to be secure, conservation status for New Mexican marmots is “imperiled.” Worldwide, there are more than a dozen species of *Marmota*, all living in the northern hemisphere. Several extinct marmot species have been found in the fossil record, including a giant marmot, *Paenemarmota barbouri*, which lived in the western United States 3.5 million years ago and was twice the size of the yellow-bellied marmot.

Though groundhogs and yellow-bellied marmots are similar in appearance, they differ in habitat and habit. Groundhogs live at low elevations in open country near woodlands, farms, and cropland. Groundhogs are the more solitary of the two species, rarely interacting with other groundhogs except during mating season. Diet for both species consists largely of grass, herbs, and leaves but unlike their vegetarian western cousins, groundhogs also enjoy regular invertebrate snacks. Both species are primarily diurnal, but groundhogs are often active at night as well.

Yellow-bellied marmots live between 6,500 and 11,000 feet in elevation in alpine tundra, mountain forests, rocky foothills, and canyons. In Wyoming, yellow-bellied marmots are commonly seen perching on rock outcroppings or slash piles in logged areas, looking adorably pudgy with reddish to yellowish brown coats, yellow bellies, and short bushy tails. Adults range from 18 to 28 inches in length, 5 to 9 inches tall, and up to 10 pounds in weight. The large incisors in the front of their upper and lower jaws grow continuously and are kept short and sharp by gnawing.

Yellow-bellied marmots may live alone, in pairs, or join colonies consisting of one or more adult males and several females, their young, and yearlings of both genders. Some females establish separate small habitats which they share with dependent offspring. Burrow entrances are located beneath boulders, downed logs, or thick clumps of brush, and consist of a series of small passageways branching off from a main artery. Within a colony, the smaller tunnels may provide passage between different burrows. Scent produced in cheek glands is used to mark territory and possibly to establish social status.

Marmots communicate with each other via high-pitched whistles, chirps, chucks, and teeth chattering. Some of these characteristic noises gave rise to the popular question: "How Many Rocks Would a Rock Chuck Chuck If a Rock Chuck Could Chuck Rocks?"

By: India Hayford, Museum Assistant
common names like whistle pig and rock chuck. Upon spotting a predator, chirping accelerates into a high-pitched trill of alarm. Females with pups that have just begun to emerge from their burrows are most likely to sound the alarm for the benefit of their offspring. Animals without young generally avoid drawing attention to themselves by trilling to alert others and upon hearing an alarm call head straight for safety. The most common predators of yellow-bellied marmots are coyotes, fox, badgers, wolves, bear, and eagles. Being extremely shortsighted, marmots depend on excellent senses of smell and hearing for survival.

Marmots are diurnal. In spring and fall, activity peaks in the early afternoon. Summer activity shifts to mornings and late afternoons. Marmots living in lower elevations may repair to their dens for periods of estivation during hot, dry parts of the summer. All marmots hibernate during the winter, but while residents of high elevations hibernate between late August and May, animals in lower elevations emerge from burrows in late February or early March.

Elevation and dates of snowmelt have a huge influence on reproduction as well as on hibernation. Females living in extremely high elevations don’t produce litters every year. Mating takes place soon after animals emerge from burrows in the spring. After a 30-day gestation, females produce litters of three to five youngsters who are born in the burrow and remain there for up to a month before venturing forth. Almost all males and half of the females leave the home burrow as yearlings. Most relocate no more than a couple of miles from mom though some males have been known to travel over 9 miles to find a new territory. A single animal’s home range is usually about an acre in size, but ranges of up to 25 acres have been noted in parts of Colorado.

Yellow-bellied marmots live an average of 10 years in the wild; some individuals have lived up to 18 years in captivity. Historically marmots provided meat and fur for Native Americans and early European settlers. Marmot fur is still available for purchase and was especially popular in Europe during the twentieth century before the anti-fur campaigns became prevalent.

The primary difference between groundhogs and yellow-bellied marmots becomes apparent in late winter. Every February 2, slumbering groundhogs are ruthlessly awakened to take part in public ceremonies wherein winter-weary humans petition the creatures to remain above ground in order to bring about an early spring. Yellow-bellied marmots remain underground to avoid the West’s inevitable spring blizzards and leave predicting duties to distant Sciuridae relative Lander Lil, the prairie dog.

In 2015, Groundhog Day hoopla took an ugly turn in the northeast when groundhog Punxsutawney Phil accurately predicted six more weeks of winter but failed to mention just how harrowing those weeks would be. Snow piled high, and by the first of March police departments in the region were receiving regular complaints about the groundhog’s dereliction of duty. Merrimac P.D. in New Hampshire put out a warrant for the groundhog’s arrest but had no jurisdiction over Phil, a Pennsylvania resident. Phil was asleep in his cozy Punxsutawney den at press time and couldn’t be reached for comment.
The Werner Wildlife Museum, located just a short walk from Casper College’s campus, houses a diverse collection of Wyoming’s native and introduced mammals, fish, and birds. Also on display are species from Africa, the Arctic, and other worldwide locations, including award-winning exhibits of exceptional animals from antelope to walrus.

The Werner Wildlife Museum features:
- Exhibits
- Children’s area
- Adult reading area
- DVD viewing area
- Lecture series
- Picnic area
- Special biannual exhibits
- Guided tours