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Andromedotoxin (Grayanotoxin) - Containing Plants (Heath, Ericaceae Plant Family) (9-Aug-1999)

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Chapter Sections
Rhododendron
***Kalmia* - Laurels**
***Pieris* - Japanese Pieris**

Rhododendron

Rhododendron albiflorum - Rhododendron
R. occidentalis - Western azalea, white laurel
R. californicum - Rhododendron, California rose bay
R. catawbiense - Rose bay
R. maximum - Great laurel

Major Species	Usual Time of Onset	Usual Duration (if survives)	Full Table for Andromedotoxin (Grayanotoxin) - Containing Plants (Heath, Ericaceae Plant Family)
Esp. goats, most species	Hours	Several hours to days; often lethal	

Family - Ericacea (Heath family)

Images

- Great laurel (*Rhododendron maximum*). Knight A.P. and Walter R.G. (Eds.). A Guide to Plant Poisoning of Animals in North America. Ithaca: International Veterinary Information Service (www.ivis.org), 2003. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Catawba rhododendron (*Rhododendron catawbiense*). Knight A.P. and Walter R.G. (Eds.). A Guide to Plant Poisoning of Animals in North America. Ithaca: International Veterinary Information Service (www.ivis.org), 2003. - To view this image in full size go to the IVIS website at www.ivis.org . -
- *Rhododendron albiflorum* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Western azalea, white laurel, *Rhododendron occidentalis* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Rhododendron, California rose bay, *Rhododendron californicum* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Rose bay, *Rhododendron catawbiense* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Great laurel, *Rhododendron maximum* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -

Description

- *R. albiflorum.*
  - Plant - Erect, deciduous shrub, 3 - 6 feet tall.
  - Stem - Woody.
  - Leaves - Thin, elliptical, 1 1/2 - 3 inches long.
  - Flowers - Axillary, creamy white, in groups of 1 - 3
  - Fruit - Capsule.
- *R. occidentalis.*
  - Plant - Deciduous, shrub 3 - 9 feet tall.

    - Stem - Slender.
    - Leaves - Thin, alternate, elliptical, entire, 2 - 3 1/2 inches long.
    - Flowers - Terminal, white with yellow or pink markings.
    - Fruit - Capsule, oblong, 3/4 - 1 inch long.
- *R. californicum.*
    - Plant - Evergreen shrub or small tree, 3 - 15 feet tall.
    - Stem - Coarse, branched.
    - Leaves - Alternate, elliptical, entire, 4 - 11 inches long.
    - Flowers - Terminal, dense, show, rose-white, 1 1/2 inches across.
    - Fruit - Capsule, subcylindrical, 1/2 inch long.
- *R. maximum.*
    - Plant - Large, evergreen, shrub or open tree, 35 feet tall.
    - Leaves - Alternate, oblong, 4 - 10 inches long, acute at both ends.
    - Flowers - Dense, showy, rose to pink or white or mixed.

Habitat

- *R. albiflorum*: Pacific Northwest.
- *R. occidentalis*: California.
- *R. californicum*: California to Washington and British Columbia.
- *R. catawbiense*: Allegheny Mountains, Virginia to Georgia.
- *R. maximum*: New York southward to Georgia, Allegheny Mountains.
- General.
    - Found mostly in moist/wet soils.

Toxic Principle

The glycoside, andromedotoxin. Now commonly referred to as grayanotoxin.

Mechanism of Action

Grayanotoxin stabilizes voltage-sensitive sodium channels in the open position. Because of the influx of sodium, effects on the heart may resemble those of digitalis (which inhibits Na-K ATPase).

Susceptible Species

Cattle, sheep, goats, rarely horses, people, etc.

Toxicity

- Leaves are tough, and sometimes regarded as bitter and unpalatable.
- All parts of the plant, but especially the foliage, contain the poison.
- Two or 3 leaves may produce severe toxicosis.
- Sucking flowers free of nectar may produce serious illness.
- Most toxicoses occur in the winter and early spring, when other forage is unavailable. Rhododendrons are more likely to retain green leaves year round than are most other plants.
- Approximately 0.2% of the BW is a toxic dose.

Signs

- Clinical signs generally appear within 6 hours of ingestion.
- Acute digestive upset, salivation, nasal discharge, epiphora.
- Anorexia, depression, nausea, projectile vomiting, frequent defecation, repeated attempts to swallow.
- Weakness, incoordination, paralysis of the limbs, stupor, depression of the heart and central nervous system.
- Aspiration of vomitus is common in ruminants and results in dyspnea and often death.
- Pupillary reflexes may be absent.
- Coma precedes death.
- Animals may remain sick for more than 2 days and gradually recover.

Lesions

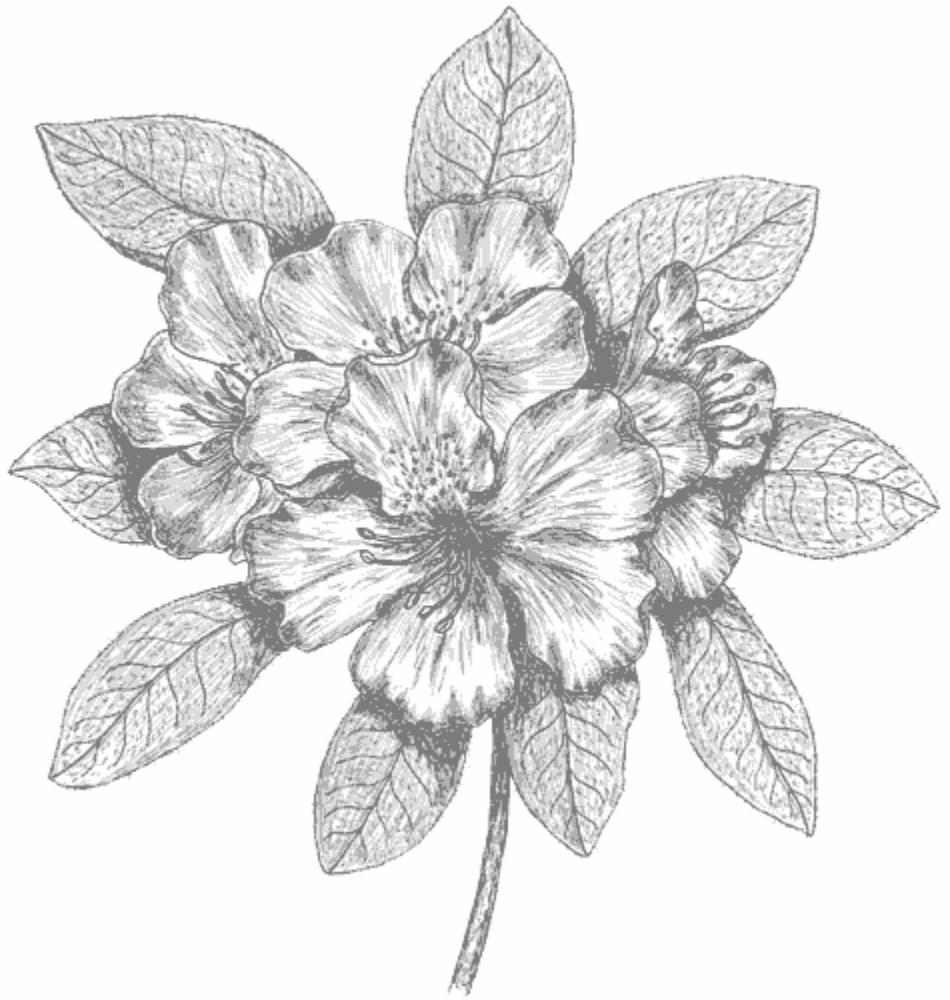
- Gastrointestinal irritation with some hemorrhage.
- Renal tubular damage.
- Mild liver degeneration is sometimes present.
- Aspiration pneumonia.

Diagnosis

Identification of *Rhododendron*, evidence of consumption and appropriate clinical signs and lesions.

Treatment

- Prevent absorption.
    - Emesis for appropriate species if not contraindicated.
    - Activated charcoal and a saline or sorbitol cathartic. Repeat activated charcoal as a dilute slurry at 2, 5, 8, and 12 hours.
- Atropine as needed for bradycardia.
- Intravenous fluid therapy.
- Antiarrhythmics may be warranted in seriously affected animals that do not respond with the therapy given above.



Rhododendron and Azalea
Colorful flowers and attractive leaves characterize these beautiful ornamental shrubs.

Kalmia - Laurels

Kalmia angustifolia - Lambkill, sheepkill, calfkill, dwarf laurel, wicky
K. latifolia - Mountain laurel, calico bush, ivy bush
K. polifolia* var. *microphylla - Pale laurel, bog laurel

Major Species	Usual Time of Onset	Usual Duration (if survives)	Full Table for Andromedotoxin (Grayanotoxin) - Containing Plants (Heath, Ericaceae Plant Family)
Esp. goats, most species	Hours	Several hours to days; often lethal	

Family - Ericaceae or heath family

Images

- Mountain laurel blooming shrub (*Kalmia latifolia*). Knight A.P. and Walter R.G. (Eds.). A Guide to Plant Poisoning of Animals in North America. Ithaca: International Veterinary Information Service (www.ivis.org), 2003. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Mountain laurel flowers (*Kalmia latifolia*). Knight A.P. and Walter R.G. (Eds.). A Guide to Plant Poisoning of Animals in North America. Ithaca: International Veterinary Information Service (www.ivis.org), 2003. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Mountain Laurel, *Kalmia latifolia* - U.S. G.S. Northern Prairie Wildlife Research Center. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Sheep Laurel, *Kalmia angustifolia* - U.S. G.S. Northern Prairie Wildlife Research Center. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Sheep Laurel, *Kalmia angustifolia* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Mountain laurel, *Kalmia latifolia* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Pale laurel, *Kalmia polifolia* var. *microphylla* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -

Description

- *K. angustifolia.*
  - Plant - Open woody shrub, rarely 3.5 feet tall.
  - Stem - Branches are strongly ascending.
  - Leaves - Opposite or in threes, pale green and glabrate underneath, bright green above, narrowly oblong, obtuse, petioled, leathery, 2 - 5 cm long, persist through the winter.
  - Flowers - Many, showy, crimson or rose, rarely 1 cm across; calyx is glandular; inflorescence is corymbose and produced laterally on the stem, perfect, regular, slightly glandular.
  - Fruit - Pod depressed, nearly smooth, 5 cavitied, many seeded capsule.
- *K. latifolia.*
  - Plant - Evergreen shrub-tree, dense, woody, round-topped, 3 - 10 feet tall.
  - Leaves - Alternate, both sides are bright green, ovate-lanceolate or oblong, acute at each end, petioled, coriaceous, evergreen, entire, 2 - 5 inches long.
  - Flowers - Many, showy, clammy-pubescent, pink or white, inflorescence corymbose, produced at stem tips, rose-white with purple markings, 0.6 - 1 inch across.
  - Fruit - Pod depressed, glandular, many seeded.

Habitat

- *K. angustifolia.*
  - Northeastern USA (Appalachian Mountains), rocky hillside woodlands, acid soils, nonfertile soils, abandoned pastures, meadows.
- *K. latifolia.*
  - Eastern USA. Rocky wooded areas, clearings, rocky slopes, gardens.
- *K. polifolia.*
  - California to Alaska. Wet meadows and bogs, Rocky Mountains.

Toxic Principle

Andromedotoxin (grayanotoxin).

Mechanism of Action

See *Rhodendron* and *Pieris* sections.

Susceptible Species

Sheep, cattle, horses, goats, people, etc.

Toxicity

- General.
    - Leaves are tough and leathery, animals often avoid; most cases of poisoning occur in winter or early spring when *Kalmia* spp. are the only conspicuously green plants available.
- *K. latifolia.*
    - Minimum toxic doses: Cattle - 0.4% of BW, goats 0.4%, sheep, 0.35% (similar doses in various species of ruminants).
    - The poisonous principle is present in all parts, foliage is especially hazardous.
    - Honey made from these plants may be poisonous.
    - Children have been poisoned by chewing leaves or sucking juice from blossoms or by making "tea".
    - Deer may tolerate ingestion of *K. latifolia*.
    - Grouse have been known to feed on *K. latifolia* fruit in winter and were not apparently affected.
    - It has been suggested that poisoning may result from the eating of flesh from animals that had eaten *Kalmia*.

Signs

- General.
    - Signs appear within 3 - 14 hours of ingestion.
    - Weakness, nausea, intense abdominal pain, repeated swallowing.
    - Salivation, epiphora, runny nose, vomiting.
    - Dyspnea may occur; heart rate slows.
    - Depression, prostration.
    - Convulsions,paralysis of limbs, coma.
    - Possible death within 12 - 14 hours.
    - May live several days and die from foreign body pneumonia or recover.
- Cattle.
    - Soft, liquid feces, diarrhea.
    - Partial loss of control over hind limbs.
    - Muscular incoordination.
    - Pulse becomes weak, expiration forced, respiration shallow.
- Goat.
    - Regurgitation, nausea.
    - Weak pulse, irregular respiration, groaning on expiration.
- Sheep.
    - Forced, short, shallow respiration.
    - Grating of the teeth.
    - Depression, salivation, regurgitation.
    - Inability to stand, unsteady gait.
    - Head drooped and extended. Animals may present in lateral recumbency and exhibit paddling.
    - Watery, foul-smelling feces.
- Cat.
    - Epiphora, salivation, nasal discharge.
    - Slight fever (102.5).
    - Involuntary paddling of the limbs.
    - Intermittent running "fits".
    - Arching of the back; paralysis of the limbs.
    - Death.
- Also see *Kalmia* and *Pieris* sections.

Lesions

- Fragments of glossy, leathery leaves in the gastrointestinal tract.
- Congestion of the gastric (abomasal) mucosa, duodenum, ileum, kidneys.
- Pneumonia if aspiration has occurred.

Diagnosis

Identification of *Kalmia*, evidence of consumption, and appropriate clinical signs and lesions.

Treatment

See *Rhododendron* section.

Pieris - Japanese Pieris

Pieris japonica - Japanese pieris
P. floribunda

Major Species	Usual Time of Onset	Usual Duration (if survives)	Full Table for Andromedotoxin (Grayanotoxin) - Containing Plants (Heath, Ericaceae Plant Family)
Most species	Hours	Several hours to days, often lethal	

Family - Ericaceae (Heath family)

Images

- Japanese pieris (*Pieris japonicus*). Knight A.P. and Walter R.G. (Eds.). A Guide to Plant Poisoning of Animals in North America. Ithaca: International Veterinary Information Service (www.ivis.org), 2003. - To view this image in full size go to the IVIS website at www.ivis.org . -
- Japanese pieris (*Pieris japonica*). Source: Cornell University, Poisonous Plants Informational Database (www.ansci.cornell.edu/plants/index.html). - To view this image in full size go to the IVIS website at www.ivis.org . -
- Japanese pieris, *Pieris japonica* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -
- *Pieris floribunda* - Google Image Search. - To view this image in full size go to the IVIS website at www.ivis.org . -

Description

- Plant - Woody shrub or small tree; 30 feet tall when mature.
- Leaves - Alternate, obovate-lanceolate, 1 1/2 - 3 inches long, margins finely toothed.
- Flowers - Small, 1/4 inch across, white, terminal on stem; inflorescence paniculate; 10 stamens.
- Fruit - Capsule.

Habitat

- *P. japonica.*
  - Japan, Oregon, Washington, Montana, British Columbia, New York. Ornamental, wet places in higher elevations, mountains.
- *P. floribunda.*
  - Virginia to Georgia.

Toxic Principle

Andromedotoxin (grayanotoxin).

Mechanism of Action

See *Rhododendron* section.

Signs, Lesions, Diagnosis, Treatment

- See *Rhododendron* and *Kalmia* sections.
- Also donkeys exhibited tachycardia, dyspnea, green froth around the mouth, minimal gut activity, paralysis, and inability to open their jaws. Paralysis subsided after four days.

References

Rhododendron

1. Plumlee KH, Van Alstine WG, Sullivan JM. Japanese pieris toxicosis of goats. J Vet Diagn Invest 1992; 4:363-364.
2. Thiemann AK. *Rhododendron* poisoning. Vet Rec 1991; 128:411.