



Recovery Plan for Rathayibacter poisoning

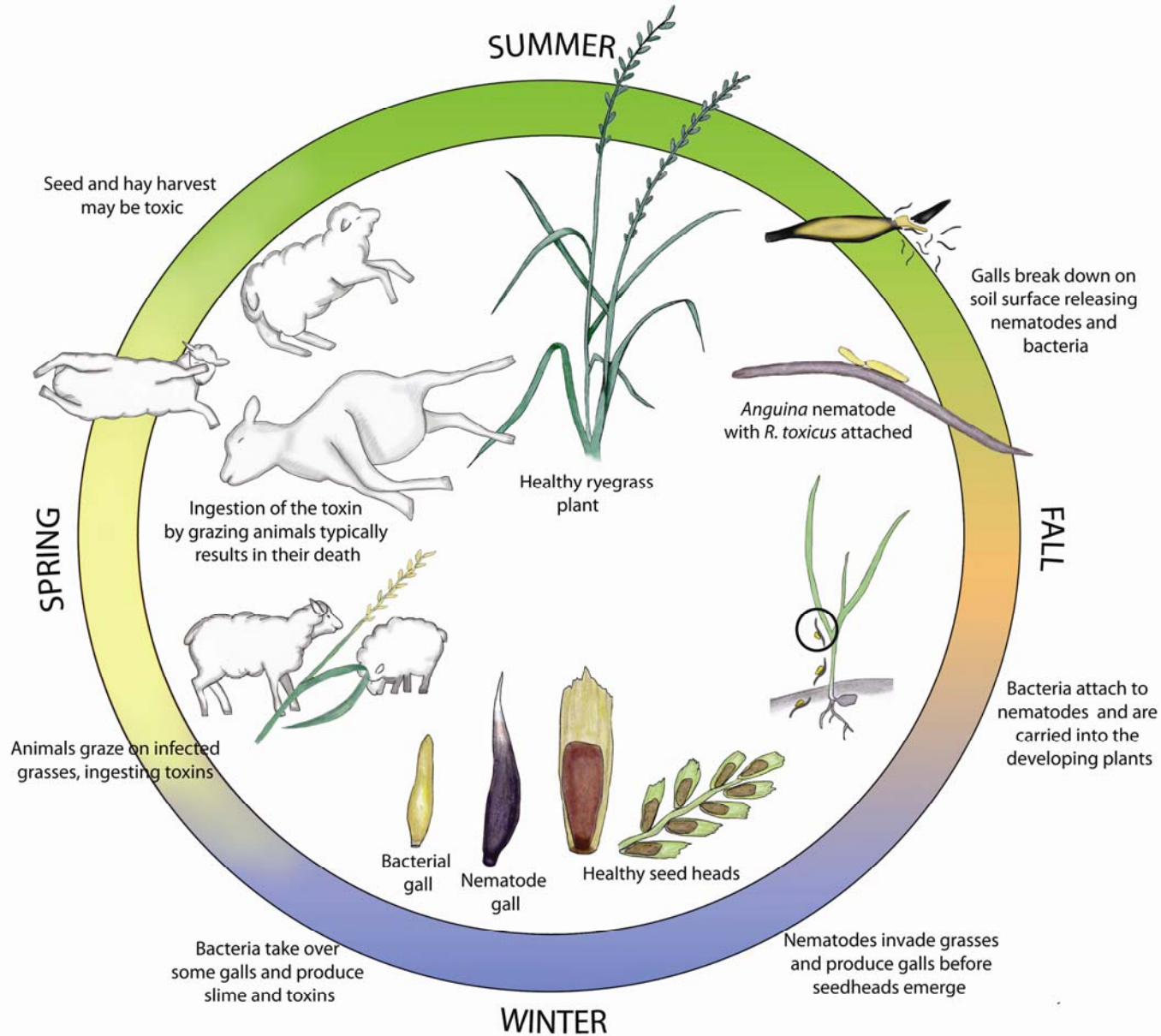
R. toxicus: a cross-domain
pathogen

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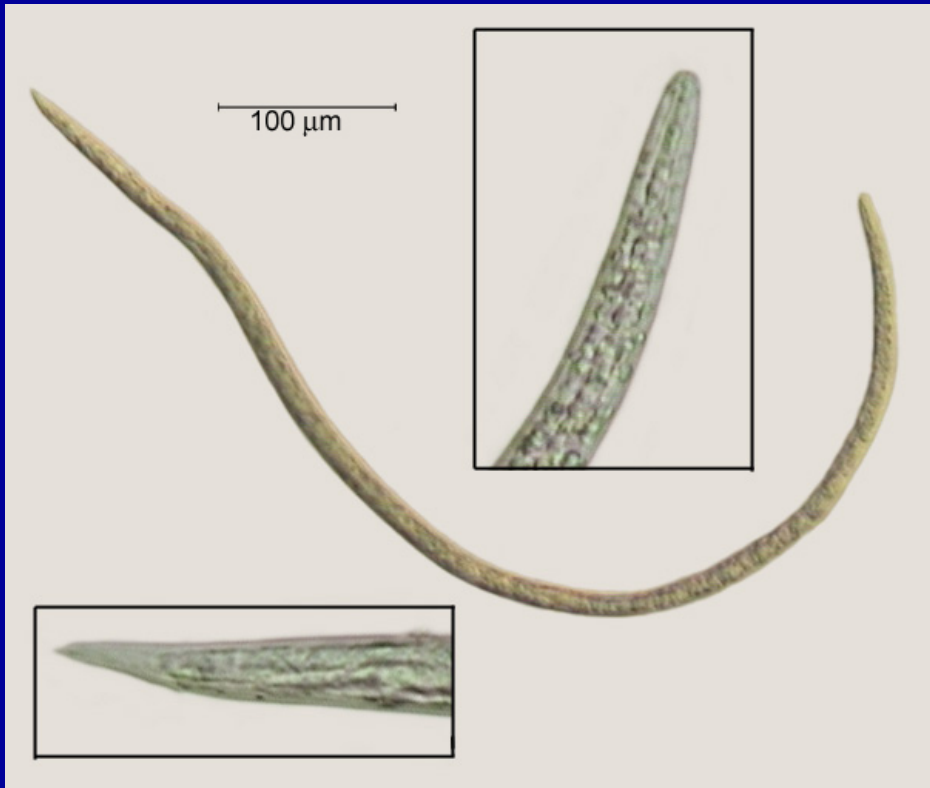
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Life cycle



Nematode *Anguina* spp serve as a vector for *R. toxicus* infection



Microphotograph of *Anguina* sp. nematode juvenile (J2)
[photo courtesy of Dr. T.O. Powers]



Nematode *Anguina funesta* juveniles with *R. toxicus*
(seen as dark dots on the surface of nematodes)
adhered to the cuticle [photo from Stynes and Bird,
Phytopathology, 1982, **72**:336-46]

Ingestion of the toxin by grazing animals results in their death



Dead sheep after eating infected annual ryegrass (*Lolium rigidum*) in South Australia
[photo: J.W. Finnie, Inst. of Medical and Veterinary Science (IMVS), South Australia]

Affected plants



Symptoms of gumming disease (*R. rathayi*) in Maryland and Oregon [photos: N.W. Schaad (left) and M. L. Putnam (right)].

Affected seeds



Healthy *Lolium rigidum* seed (left), *Anguina funesta* gall (center), and *Rathayibacter toxicus* colonized nematode gall (right) [photo: I. Riley]



Challenges

- Vector (nematode) not specific
- Host plant: primarily pasture grasses
- Gumming, slime in plant seed heads
- Toxins affecting all grazing animals produced: multiple
- Can be undetected for years
- Survival of vector, bacterium long term (years)



Veterinary challenges

- Neurological symptoms can mimic other diseases
- Animals do not develop immunity
- Treatments limited
- Toxins transmitted in contaminated hay/grass
- Primarily in Australia: also Japan, S. Africa



U.S. Situation

- Susceptible grasses
- Potential nematode vectors
- Related pathogens, e.g. *R. rathayi* in Oregon and Maryland
- Trade, transport, weather dissemination



Management practices

- Crop rotation
- Rotation among grazed pastures
- Harvesting hay before toxin production
- Inspection (surveys)
- Use of certified seed free of *R. toxicus*



Recovery

- Quarantine for hay products/forage grass seeds
- Reliable I.D. tests for *R. toxicus* and vectors
- Surveys/monitoring of grasses
- Education: plant & animal personnel



Needs

- Rapid, accurate diagnostic tools for *R. toxicus* and nematode vectors
- Toxins: role in ecology; genetic basis
- Nematode control
- Plants: breeding for resistance to toxin; pasture management for U.S.
- Animals: protection mechanisms, incl. vaccine(s)