## TOPIC 2. NATURAL AND INTRODUCED TOXINS

Toxins are poisonous substances. Many toxins are produced by microorganisms, and many by plants and animals. There are natural toxins, a part of the natural world, and problem-causing only when local concentrations are great enough to upset the physiology and metaoblism of an individual.

Introduced toxins may be for specific target organisms, or they may be compounds introduced into the environment that have side effects. Examples of the former are herbicides and pesticides and of the latter, inorganic fertilizers that may reach unexpected concentrations in water.

Brief comments and fairly short lists of references are included in UNITS 2.1 and 2.2.

### REFERENCES, TOPIC 2

### NATURAL AND INTRODUCED TOXINS

### BOOKS


| TYPE | PUBL | CITY | PGES | ANIM | KEY WORDS---------- | AUTHORS/EDITORS-- | YEAR |
|---|---|---|---|---|---|---|---|
| edbo | tcpc | rege | 380 | anim | (p. 131-151) magnesium, en | jones,jb,jr;bloun | 1972 |
| edbo | tcpc | rege | 380 | anim | (p. 153-175) magnesium, en | jones,jb,jr;bloun | 1972 |
| edbo | acpr | nyny | 270 | many | fate of pestic in lg anims | ivie,gw; dorough, | 1977 |


## UNIT 2.1: NATURAL TOXINS

The definition of a natural toxin is based not on the presence of an element or compound in the diet of an animal, but on the quantity of the element or compound in the diet. Thus even minerals required in the diet, for example, may become toxic and cause metabolic disorders when present in too large quantities. Selenium is such a mineral. Several different naturallymoccurring elements and compounds are described as poisonous substances in PART II, TOXICOLOGY in the Merck Veterinary Manual (1967).

Natural toxins usually do not become a problem for wild ruminants unless range conditions are poor and the animals are in stressful conditions. As in the case of parasites and diseases, prevention of a problem is better than having to cure it. Good management practices which result in productive animals on a productive range will eliminate any potential harmful effects of natural toxins almost entirely. If animals are forced to consume potentially toxic plants on overused range, the danger of plant poisoning increases. Over 50 different plants found in the United State are

listed in the Merck Veterinary Manual as poisonous. The list includes such common plants as Quercus (oaks) and Prunus (cherries). It may be that wild ruminants have a higher tolerance to the effects of such species than domestic ones, or it may be simply a matter of conditioning and adaptation.

The reference lists include a number of papers that may be of interest, as well as some that are on both the poisonous plant list and the nutrition lists in CHAPTER 11.

## LITERATURE CITED

Siegmund, O. H., Ed. 1967. The Merck Veterinary Manual. Merck and Co., Inc. Rahway, N. J. 1686 pp.

## REFERENCES, UNIT 2.1

## NATURAL TOXINS

### SERIALS


| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| AZATA | 75--- 1 | 39 | | od-- | experimental feeding of de | nichol,aa | 1938 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| ECOLA | 12--2 | 323 | 333 | odvi | mt laurel, rhododen, foods | forbes,eb; bechde | 1931 |
| WDABB | 3---2 | 42 | 46 | odvi | fluorosis in deer | karstad,l | 1967 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| FLUOA | 8---4 | 182 | 191 | odhe odvi, | industrial fluorosis | kay,ce; tourange/ | 1975 |
| JANSA | 41--1 | 412 | 412 | odhe | eff high molybdenum intake | nagy,jg; chappel/ | 1975 |
| JWIDA | 12--1 | 39 | 41 | odhe | fluorosis in black-ta deer | newman,jr; yu,m | 1976 |
| PYTCA | 17--4 | 803 | 803 | odhe | prunasin, amelanchier alni | majak,w; bose,rj/ | 1978 |

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

ceel

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

alal

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

rata

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

JOMAA 36--1 146 146 anam chokecherry toxic to antel ogilvie,sl 1955

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

bibi

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

JAVMA 157-- 1507 1511 ov selenium-responsive diseas muth,oh 1970

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

ovca

CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------- AUTHORS---------- YEAR

ovda

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | obmo | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | oram | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| JONUA | 99--3 | 331 | 337 | dosh | selenium def myopathic lam | whanger,po; wesw/ | 1969 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| JRMGA | 28--4 | 252 | 256 | anim | areas molybden tox, grazin | kubota,j | 1975 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| ECOLA | 52-5 | 935 | 939 | anim/model, | absorp, ret ing ele | goldstein ra; elw | 1971 |
| JRMGA | 29--5 | 356 | 363 | rumi | majr plant toxic, west u s | james,lf; johnson | 1976 |
| JRMGA | 30--3 | 237 | 238 | rumi | toxicity, larkspur extract | olsen,jd | 1977 |

## UNIT 2.2: INTRODUCED TOXINS

Pesticides, herbicides, air pollutants, solid wastes, radioactive fallout... all represent toxins introduced by the activities of man that may affect the physiology and metabolism of wild ruminants. The toxicity to animals is often a secondary effect that, at least a few years ago, was given little thought. Now, after seeing some of the effects on a variety of wild species, more care is given to the handling of introduced compounds that are potentially toxic. Short-term financial advantages may still be gained by rapid dumping of waste products, but these can never be justified if the long-term functions of the ecosystem are disrupted.

The effects of introduced toxins must not be measured only in terms of dead animals, but also in relation to the health of the entire ecosystem. The health of the ecosystem can hardly be known or understood if the normal physiological functions of its components are not known and understood. Thus the need for courses in physiology in wildlife curricula is clear to those of us who think about the functions of individuals and populations rather than of populations alone. Population responses to introduced toxins will ultimately be understood only by having a knowledge of the physiology and metabolism of the productive members of the population.

### REFERENCES, UNIT 2.2

### INTRODUCED TOXINS

### SERIALS


| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| NATUA | 182-- | 1294 | 1294 | cerv | fall-out radioact, antlers | hawthorn,j; duckw | 1958 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| HLTPA | 34--6 | 691 | 696 | od-- | iodin-129 in man, cow, dee | ballad,rv; tan,s/ | 1978 |
| HLTPA | 36--4 | 516 | 519 | od-- | pluton conc, nucl plnt dee | kirkham,mb; adri/ | 1979 |
| JWMAA | 17--- | 33 | 36 | od-- | ammate in the diet of deer | haugen,ao | 1953 |
| PAAZA | 21--6 | 16 | 17 | od-- | DDT in man, anim, soil ari | roan,cc; laubsch/ | 1969 |
| PCGFA | 5.... | 1 | 7 | od-- | ammate in the diet of deer | haugen,ao | 1951 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | OEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| BMSCB | 1---- | 39 | 56 | odvi | ecol, physiol eff insectic | morris,je | 1972 |
| FLUOA | 8.... | 182 | 919 | odvi | odhe, industr fluorosis in | day,ce; touragne/ | 1975 |
| HLTPA | 25--5 | 515 | 516 | odvi | rapid field-mon cesium-137 | rabon,ew; johnson | 1973 |
| JWMAA | 28--1 | 45 | 49 | odvi | sampl antler for stront-90 | schultz,v | 1964 |
| JWMAA | 29--1 | 33 | 38 | odvi | stron-90 lev in antle, man | schultz,v | 1965 |
| JWMAA | 29--1 | 39 | 43 | odvi | sex, age, stront-90 accumu | schultz,v; flyge, | 1965 |
| JWMAA | 34--4 | 887 | 903 | odvi | repro, grow. tis res diel | murphy,da; korsch | 1970 |
| MISTB | 6---- | 166 | 166 | odvi | ecol, physiol eff insectic | morris,je | 1972 |
| PSEBA | 129-3 | 733 | 737 | odvi | calcium, stront, age, antl | cowan,rl; hartso/ | 1968 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| BECTA | 8---1 | 1 | 9 | odhe | pesticide levels in deer | benson,ww; smith, | 1972 |
| BECTA | 13--3 | 316 | 323 | odhe | metabo, oral dose DDT, DDE | watson,m; pharao/ | 1975 |
| FLUOA | 8.... | 182 | 191 | odhe | odvi, industr fluorosis in | kay,ce; touragne/ | 1975 |
| HLTPA | 11--- | 1407 | 1414 | odhe | accum fallout cs 137, colo | whicker,fw; farr/ | 1965 |
| HLTPA | 21--6 | 864 | 866 | odhe | tissue distri radio cesium | hakonson,te; whic | 1971 |
| JANSA | 31-1 | 235 | 235 | odhe | infl pesticides rum bacter | barber,ta; schwa/ | 1970 |
| JWMAA | 32--3 | 621 | 623 | odhe | accumu stront-90, yearling | longhurst,wm; sc/ | 1978 |
| NATUA | 214-- | 511 | 513 | odhe | radionuclides, liver, colo | whicker,fw; walt/ | 1967 |
| NAWTA | 36--- | 153 | 162 | odhe | eff pesti on rumen bacteri | barber,ta; nagy,j | 1971 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | ceel | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | alal | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| AUMGA | 65--5 | 284 | 287 | rata | lichen, cari, high radiati | pruitt,wo | 1963 |
| BPURD | 1--- | 64 | 70 | rata | radiocesiu cycl, reind/car | holleman,df; luic | 1975 |
| CATRB | 4---1 | 1 | 12 | rata | osteocytic osteolysis | belanger,lf | 1969 |
| CJZOA | 54--6 | 857 | 862 | rata | tritium wat dilut wat flux | cameron,rd; whit/ | 1976 |
| ESTHA | 1--11 | 932 | 939 | rata | radioacti, 137 CS, alaskan | blanchard,rl; kea | 1967 |
| HLTPA | 18--2 | 127 | 134 | rata | lead-210, polonium-210,ala | blanchard,rl; moo | 1970 |
| HLTPA | 20--4 | 393 | 402 | rata | stront-90, annu vari, swed | persson,br | 1971 |
| HLTPA | 20--6 | 585 | 591 | rata | cesium-137, seas pat, alas | hanson,wc | 1971 |
| HLTPA | 21--5 | 657 | 666 | rata | radiocesium, lichen, alask | holleman,df; lui/ | 1971 |
| HLTPA | 29--1 | 27 | 41 | rata | radioactiv in lichns, swed | mattsson,ljs | 1975 |
| JEENA | 69... | 260 | 262 | rata | famphur, oxy analog, resid | ivey,mc; palmer,/ | 1976 |
| RHDRA | 11... | 487 | 509 | rata | radioactiv, sweden, nuc | magi,a; snihs,jo/ | 1970 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| BECTA | 3---5 | 269 | 273 | anam | insecti residues, s dakota | moore,gl; greich/ | 1970 |
| CJZOA | 50--2 | 213 | 216 | anam | accumul stront-90, females | mitchell,gj; hon/ | 1972 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | bibi | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| BECTA | 19--1 | 23 | 31 | ovca | chlor hydroc residu in fat | turner,jc | 1978 |
| BECTA | 21... | 116 | 124 | ovca | trnsplac mvmt pestic resid | turner,jc | 1979 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | ovda | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | obmo | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| | | | | oram | | | |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| CNJNA | 45--3 | 197 | 202 | doca | selenium, hair, malnutriti | hidiroglou,m; ca/ | 1965 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| WIDIA | 37--- | 1 | 11 | ceni | sika deer, potassium defic | christian,jj | 1964 |

| CODEN | VO-NU | BEPA | ENPA | ANIM | KEY WORDS---------- | AUTHORS---------- | YEAR |
|---|---|---|---|---|---|---|---|
| ECOLA | 52--5 | 935 | 939 | anim | model, absorp, ret ing ele | goldstein,ra; elw | 1971 |
| FLUOA | 9.... | 73 | 90 | ungu | pop var of fluor param, wi | kay,e; tourangea/ | 1976 |
| HLTPA | 29--1 | 43 | 51 | | fall-out pluton, swed lich | holm,e; persson,r | 1975 |