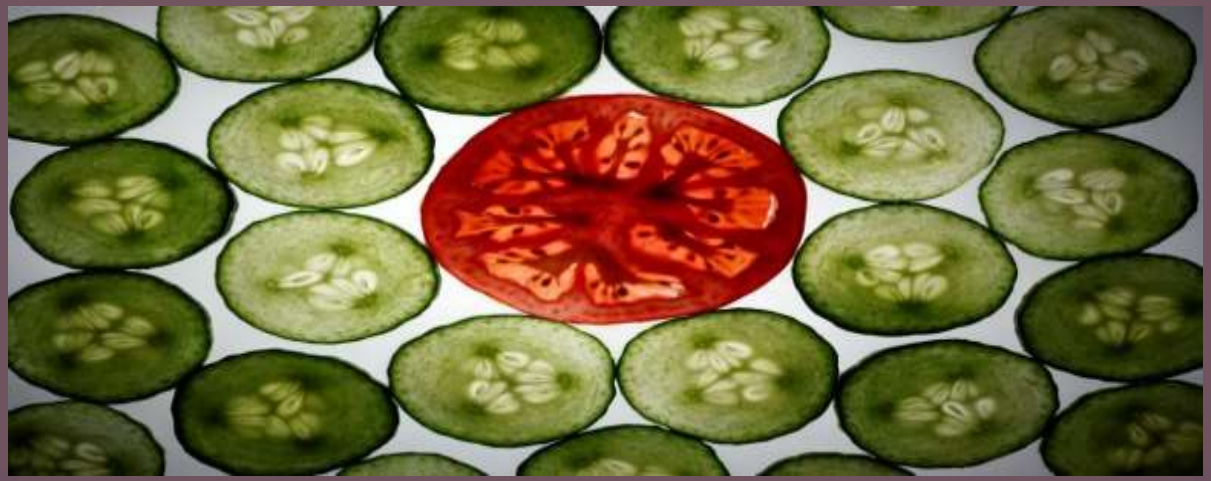
WELCOME



Food Toxins

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PALB- 5332

Contents

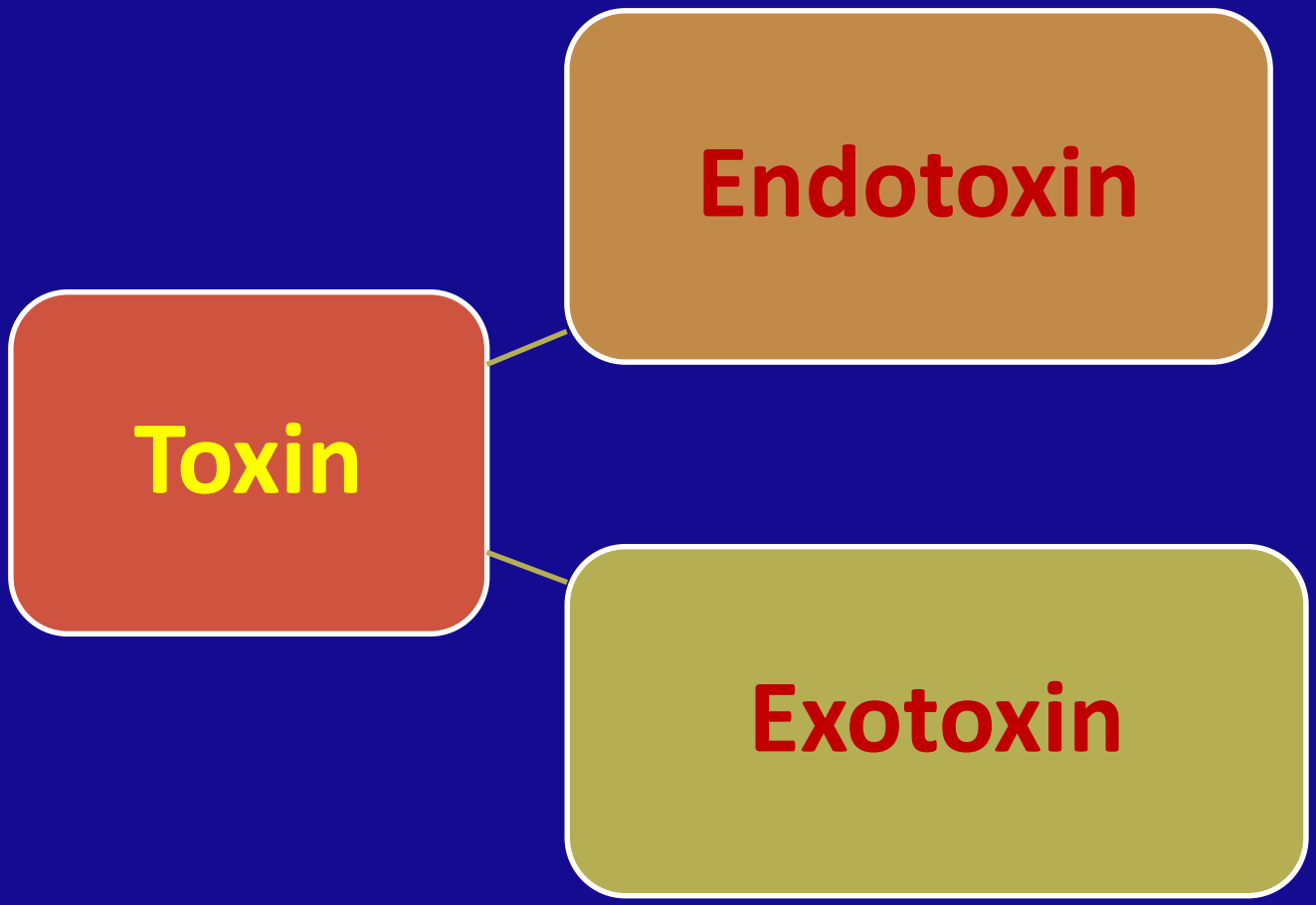
Introduction

- Toxin is derived from Latin word ‘Toxicum’ means Poison
- Definition: Small molecule, peptide or protein which alters the normal metabolism of host cells with deleterious effect on the host
- The condition caused by this toxin when infected by the host is reffered as toximia

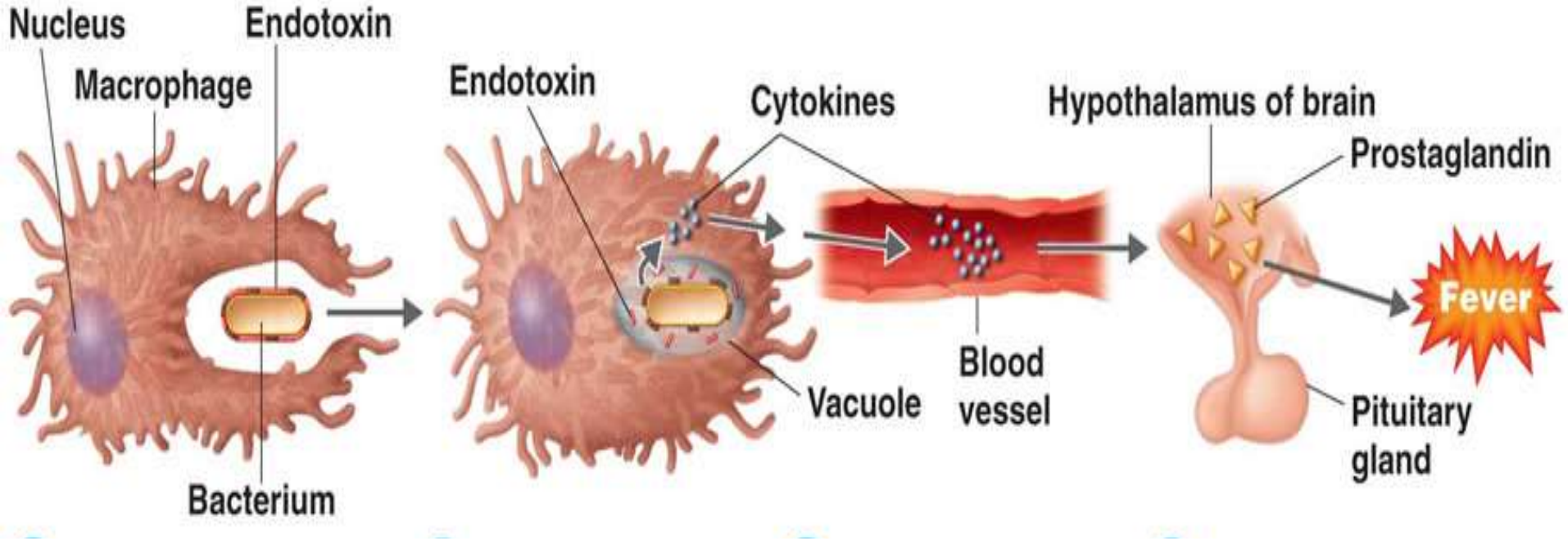
Defination

According to title 18 of United States code, the term “toxin” means toxic material or product of plants, animals, microorganisms or infectious substances, whatever their origin and method of production

Classification of Toxin



ENDOTOXIN MECHANISM



Endogenous Toxin in Plants

1. Lectins/Haemaglutinin
2. Saponins
3. Alkaloids
4. Glucosinolates
5. Coumarine
6. Toxic amino acids
7. Toxic lipids
8. Lathyrogens
9. Favism
10. Enzyme inhibitors

Lectins/Haemoagglutinins

- ✓Phytoagglutinins
- ✓Agglutinate the RBC

Saponins (saotoxins)

- ✓Bitter taste
- ✓Foam producing activity
- ✓Causes nausea and vomiting

Alkoloids

- ✓ Heterocyclic compounds
- ✓ Pharamcological effect
- ✓ Glycoalkaloid: solanine and tomatine

Glucosinolates

- ✓Brassiaceae
- ✓Hydrolysis the enzyme
- ✓Thyiocyanate ion released

Coumarine

- ✓Chemically 1,2 benzopyrine
- ✓Cinnamom
- ✓Heptatoxicity
- ✓EFSA TDI for coumarine as 0.1mg/kg body wt

Toxic amino acids

- ✓non-proteinaceous amino acid
- ✓Hypoglycin A – Hypoglycemia

Toxic lipids

- ✓Eurcic acid- MUFA (rape seed)
- ✓PUFA oxidized by cooking & storage,

Protease inhibitors

- ✓Cereals and potatoes
- ✓Supress the release of amino acids
- ✓Pancreatic hyperplasia

Lathyrogens

- ✓Lathyrus sativus
- ✓It causes lathyrism
- ✓β-OAA, free amino acid
- ✓<300g/day

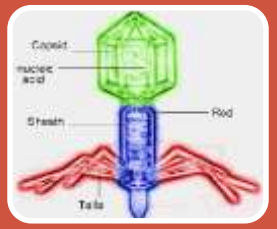
Favism

- ✓ Broad beans
- ✓ Inhaling the pollen of its flower
- ✓ Haemolytic anemia

Control measures

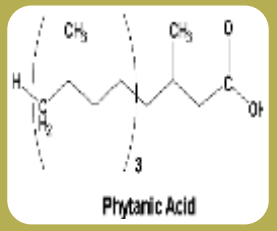
- Thermal treatment
- Soaking
- Fermentation
- Germination

Endogenous Toxin in Animals



Prion

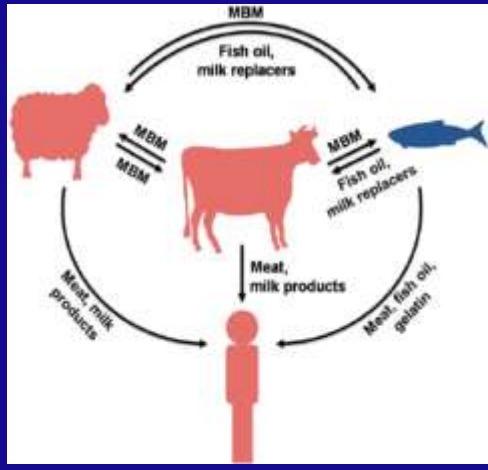
Avidin



Phytanic acid

Prion

- ✓ Infectious particle
- ✓ Degeneration of CNS
- ✓ Crutzfelt Jacob's disease & BSE



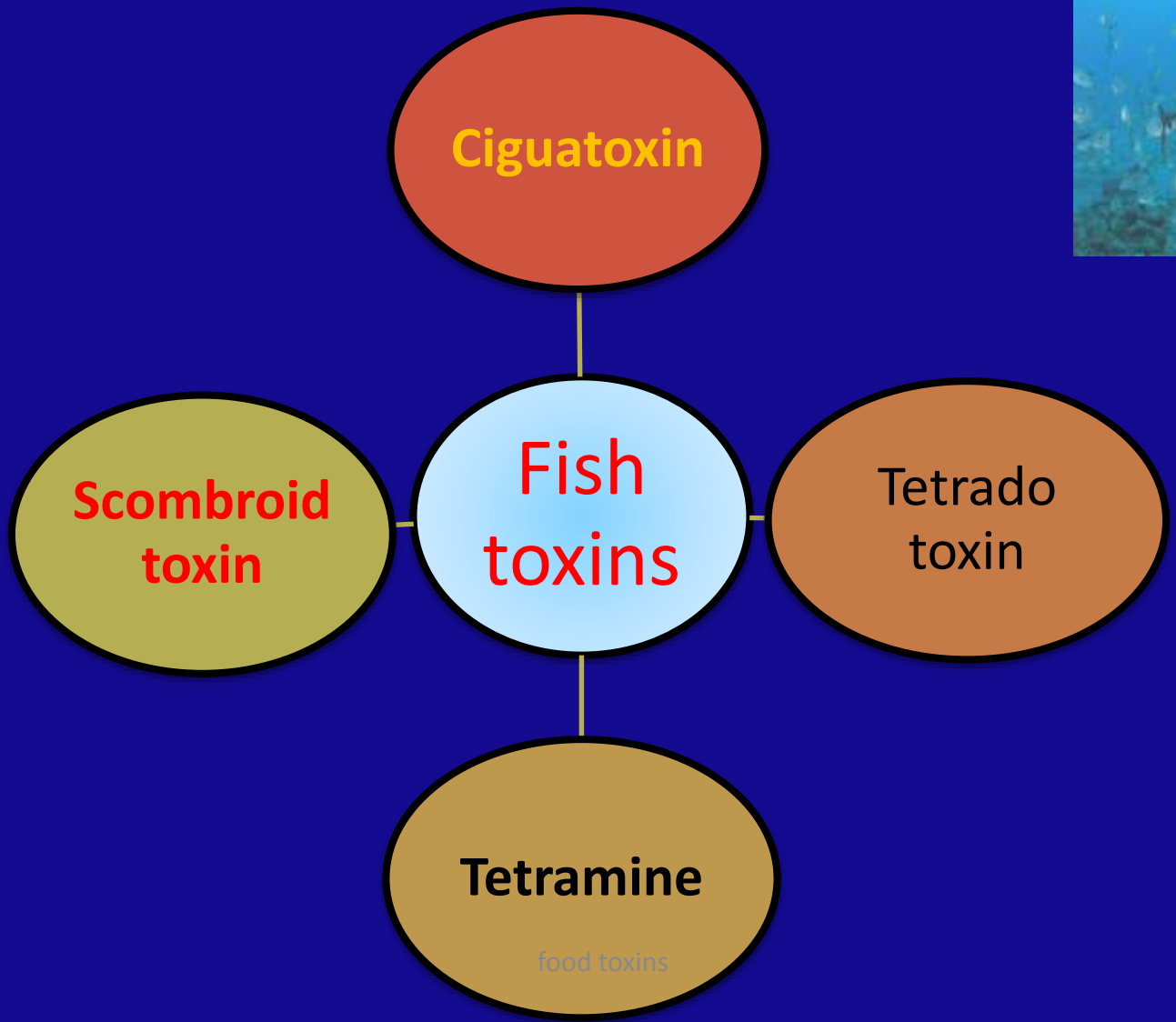
Avidin

- ✓ Egg white
- ✓ Binds non-covalently to vitamin H

Phytanic acid

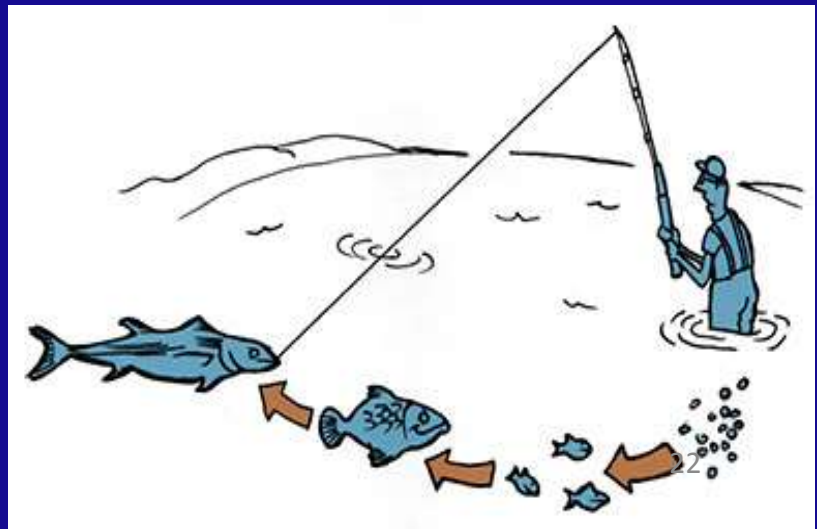
- ✓Chlorophyl metabolism in the rumen of rumenants
- ✓Neurological problem, blindness
- ✓Refsum disease

Endogenous Fish Toxin



Ciguatoxin

- ✓Cigutera fish
- ✓Toxin occurs from the ingestion of fish that feed on sea weed and reef fishes
- ✓Dinoflagellates
- ✓I.P 3-6hours



Tetrodo toxin

- ✓ Present in fugu or puffer fish
- ✓ Potent neurotoxin
- ✓ Blocks the Na channels

Scombroid toxin

- ✓ Bacterial action on Scombroid fish such as tuna or mackerel
- ✓ Histamine toxicity

Clostridium botulinum

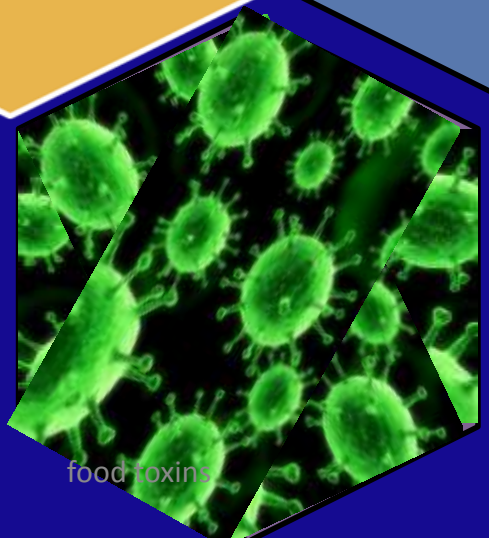
Staphylococ-cus aureus

Clostridium perfrigens

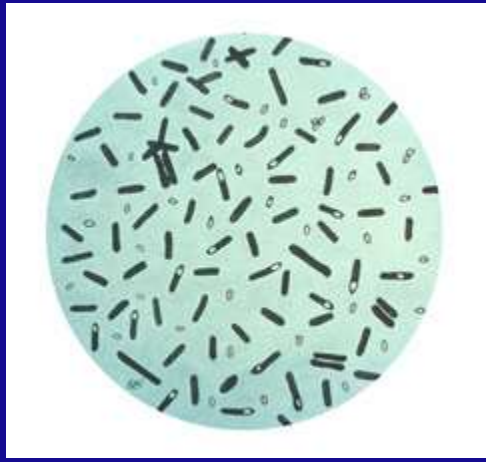
Bacterial toxins

Bacillus cereus

Shigella



Clostridium botulinum



- ✓ Botulin toxin
- ✓ Thermo liable
- ✓ Soils, fresh water and marine sediments and processed canned foods
- ✓ <1µg of botulin is enough to kill an adult by oral administration
- ✓ There are 2 types of botulism
  - Food borne botulism
  - Infant botulism

Staphylococcus aureus

- Ingestion of food that contains enterotoxins
- Heat stable
- Meat, poultry, fish, mucous membrane of nose, throat and skin of the humans

Clostridium perfringens

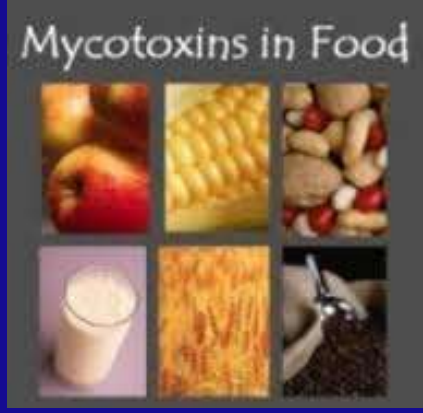
- Gas gangrene
- Heat stable
- Meat, poultry, canned foods

Bacillus cereus

- Types: type 1 and type 2
- Symptom: abdominal cramps, diarrhea and severe vommiting
- Emetic syndrome is also called Chinese restaurant syndrome

Shigella

- ✓ Shigellosis caused by *Shigella* sps.
- ✓ Causes dysentery in humans
- ✓ I.P 7 hr to 7 days
- ✓ Abdominal pain, vomiting and fever
- ✓ Traveler's diarrhea



Mycotoxins

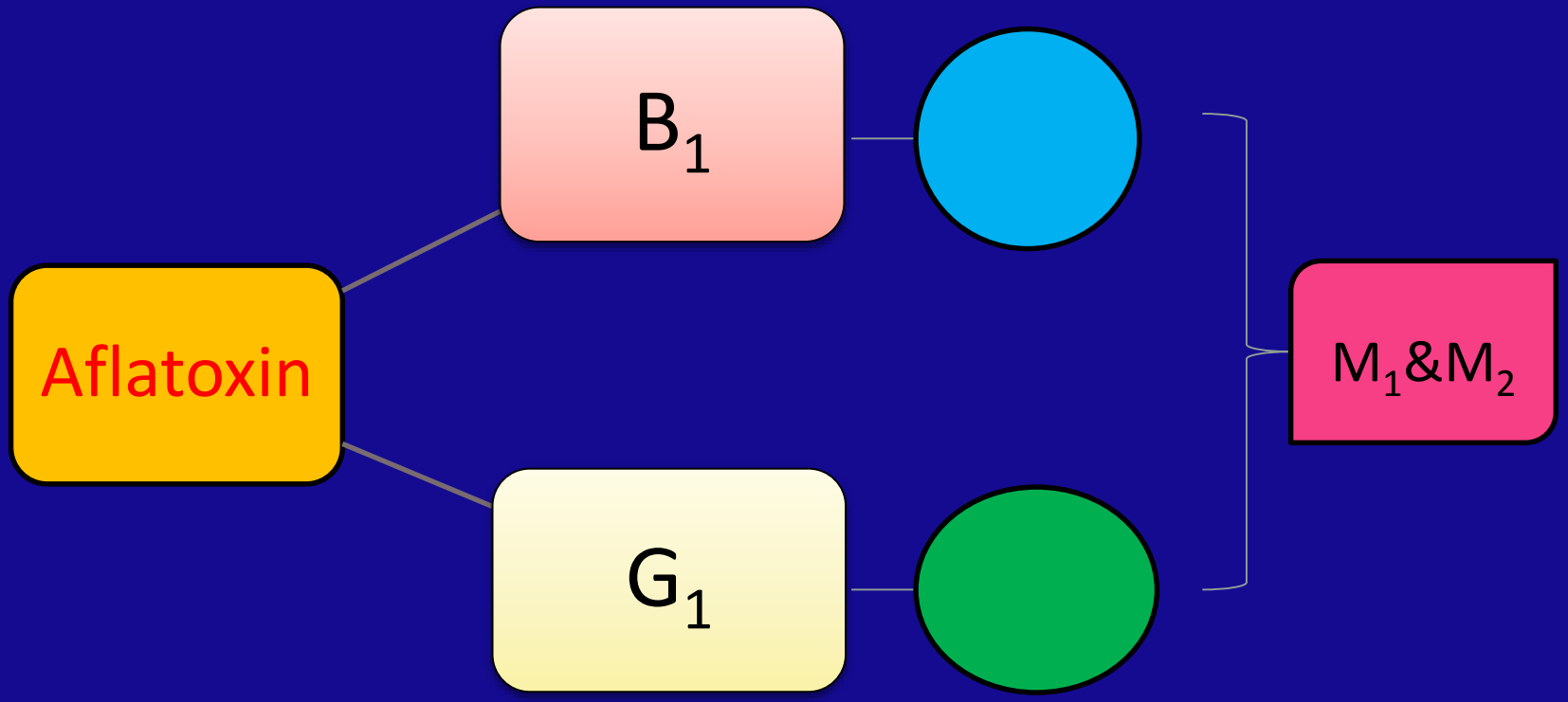
- Mycotoxins are produced as secondary metabolities of fungi
- Some Mycotoxins are mutagenic and carcinogenic
- 14 Mycotoxins are known to be carcinogens
- Secondary metabolities are formed during end of the exponential growth phase

Different Types of Mycotoxins

- Aflatoxins
- Patulin
- Ergotoxin
- Zearalenone
- Citrinin
- Ochratoxin
- Alternaria Toxins
- Mushroom Toxins

Aflotoxins

- *Aspergillus flavus, A. parasiticus , A.nominus*
- High temperatures and humidity levels
- Carcinogenic substances
- peanuts, milk , corn

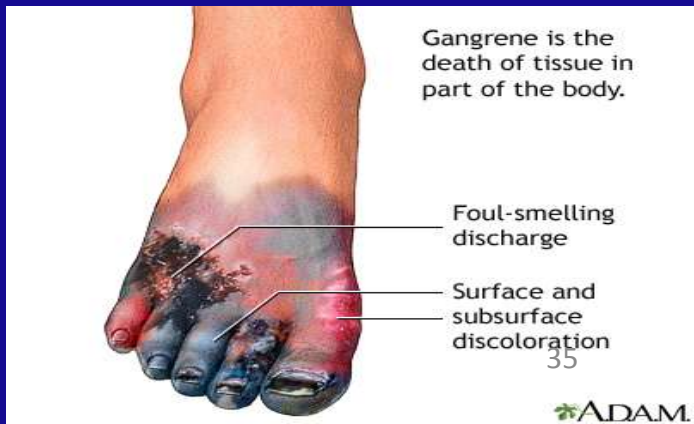

Aflatoxin
B_1
G_1
M_1&M_2

Patulin

- *Penicillium claviforme*, *Penicillium expansum*, *Penicillium patulum*, *Aspergillus clavatus*
- Corn, beans, apple

Ergot

- It is an alkoloid
- Causes Ergotism
- Caviceps purpurea and C. paspali
- Rye, barley, wheat, oats and pearl millet



Zeralenone

- *Fusarium graminearum* and *F. tricinctum*

- Field corn at the silking stage
- Most cereals are affected

○ Citrinin

- *Penicillium citrinum*, *Penicillium viridicatum*

- moldy bread, wheat, oats, rye and other similar products

Ochratoxin

- It comes in three secondary metabolite forms, A, B, and C
- *Penicillium* and *Aspergillus* species
- Potent nephrotoxin
- Cereals, barley

○ Alternaria Toxins

- Produced by *Alternaria citri*, *A.alternate, A.solani* and *A.tenuissima*

- Apples, tomatoes, blue berries , grains

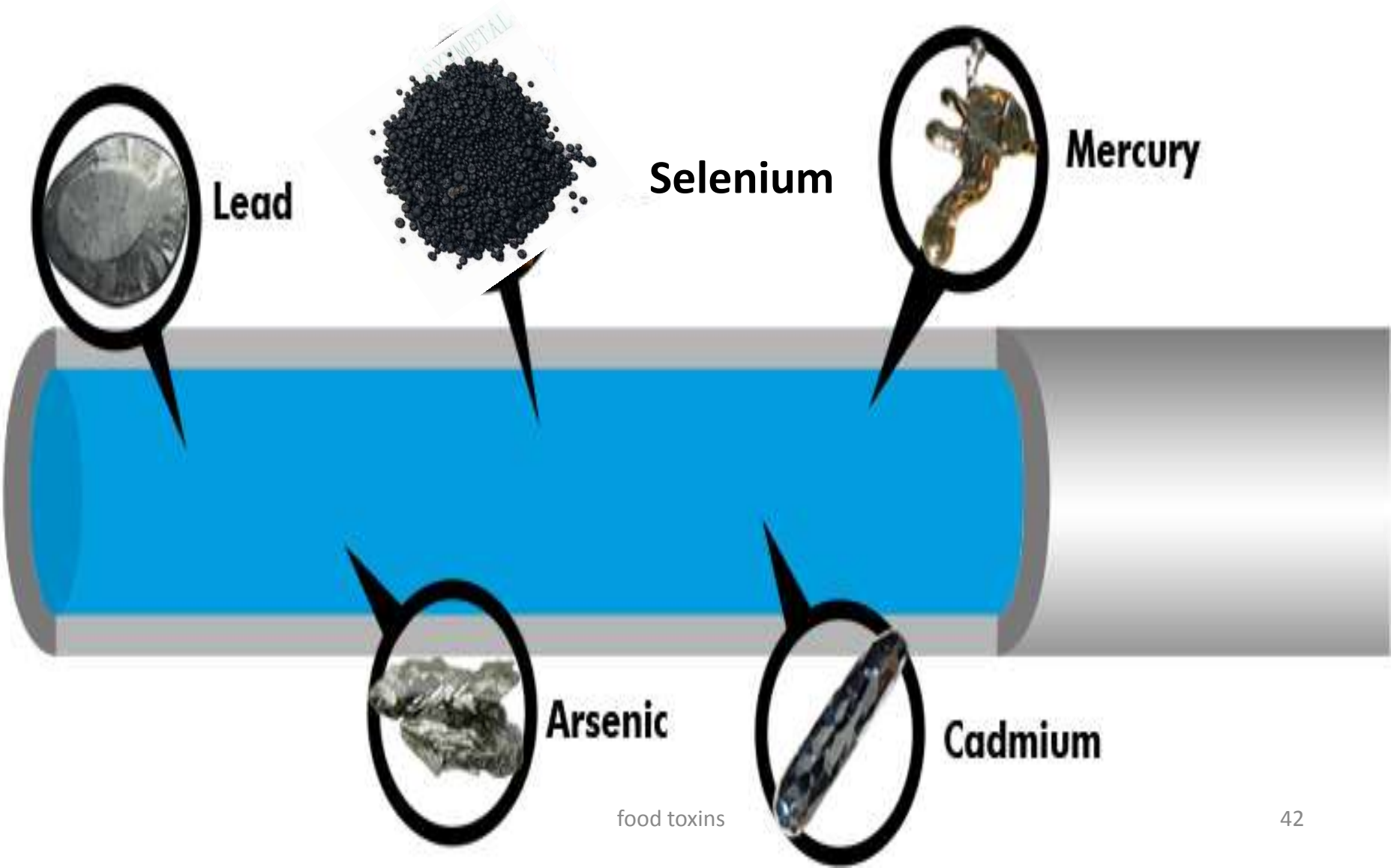
Mushroom toxin

- *Amanita phalloides, Amanita verna and Amanita muscar* are highly toxic
- Cause serious illness, even death
- Paralysis of nervous system and degeneration of the liver

Control of Mycotoxin in Food and Feed

- Proper Cultural practices
- Post harvest storage
- Proper handling
- Resistance varieties

Heavy Metal Toxins



Mercury

- ✓ Fungicides as dimethylmercury
- ✓ Silver amulgum used for filling teeth
- ✓ Toxicity: Hg reacts with –SH groups
- ✓ Causes tiredness, loss of apetite, weight loss and kidney failure

Lead

- ✓Industrial emissions, air pollution from automobile, gas fire powerstation, paint's and anti-rust agent
- ✓Binds with enzyme participating in Heme synthesis
- ✓Damages CNS system and reproductive organs

Arsenic

- ✓Mining ores, various pesticide and ground water(main source).
- ✓Causes pigmentation of skin, keretosis, goitre, cancer.
- ✓Affect to CNS

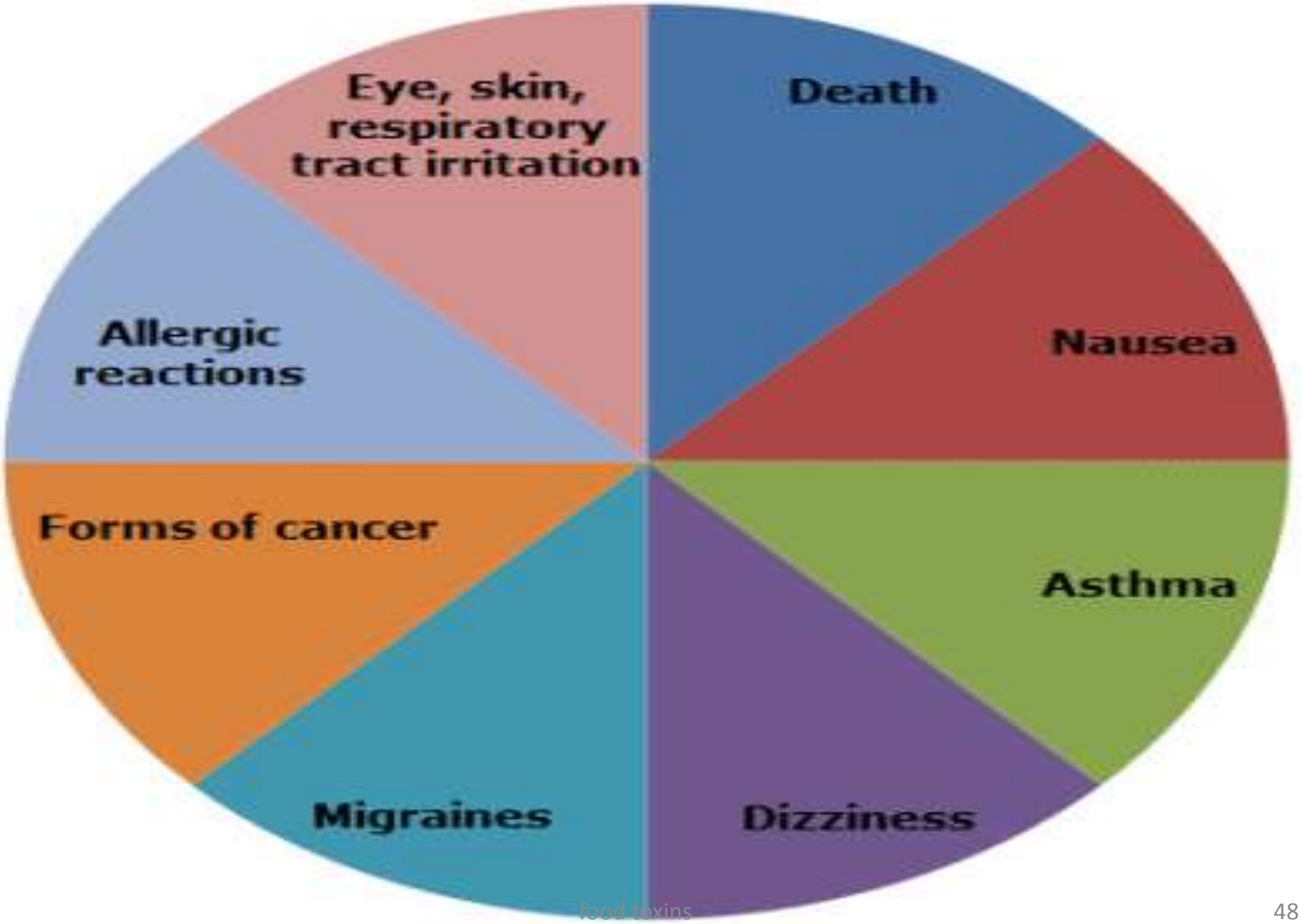
Cadmium

- ✓Mineral fertilizer & fungicides, from the water pipes.
- ✓Causes severe pneumonitis caused by enzyme inibition.
- ✓It will lead to fragile bones as it affects the ‘Ca’ metabolism

Selenium

- ✓Fertilizers
- ✓Daily dose of 50-200µg of selinium is recommended
- ✓Causes fatigue, numbness of hands, digestive disorder, irritability and loss of hair.

Effect of Toxic Food



Preventive measures

- Thermal treatment
- Risk assesment
- Hyginic practice
- Refrigeration

Conclusion

- Awareness
- Varies of food
- Risk assesment
- Processing
- Visual examination
- Permissible limits

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Thank You