

# DRUGS RELATED TO BALANCE SYSTEM

The overall incidence of dizziness, vertigo, and imbalance is 5-10%

It reaches 40% in patients older than 40 years.

Accounts for 3% of total visits to emergency department

The incidence of falling due to imbalance is 25% in subjects older than 65 years.

1% of falls results in hip fracture

Roughly 50% of fractured hips will not function normally.



*The key to life is balance*

# DRUGS RELATED TO BALANCE SYSTEM

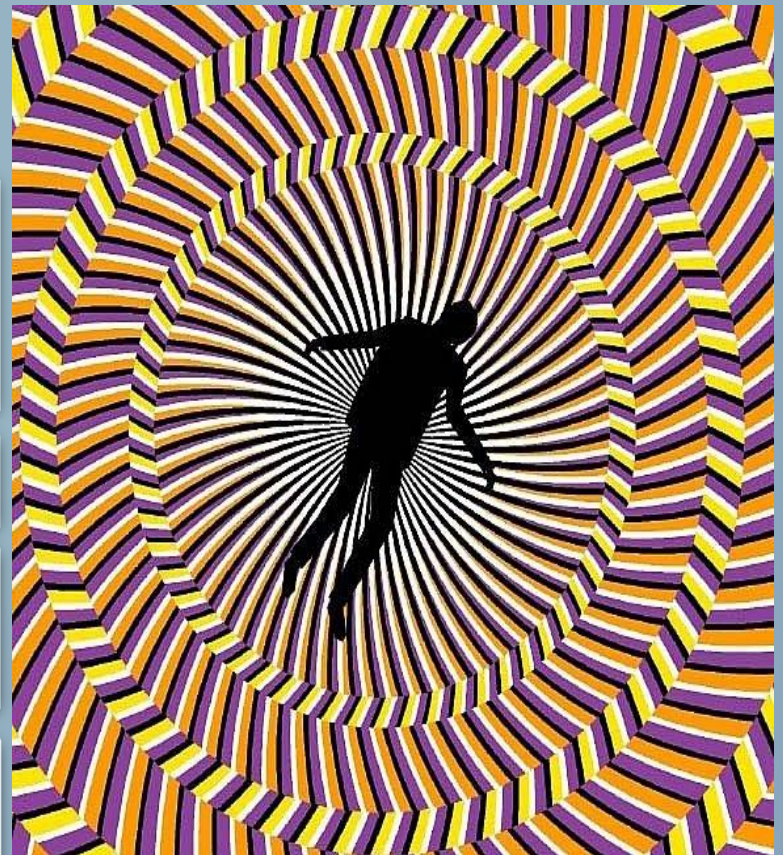
## ILOS

To differentiate between classes of drugs used **to control** or to **prevent** vertigo

To hint on some disorders of balance

To detail on some drugs used **to control** or to **prevent** vertigo

To identify drugs that can precipitate vertigo



# DRUGS RELATED TO BALANCE SYSTEM

## Balance Disorders

## Definition

## Terms

Dizziness

Vertigo

Light headedness



# **SYMPTOMS**

**Spinning (vertigo)**

**Confusion or disorientation**

**Falling or feeling as if one is going to fall**

**Nausea or vomiting**

**Sweating**

**Abnormal eye movement (nystagmus)**

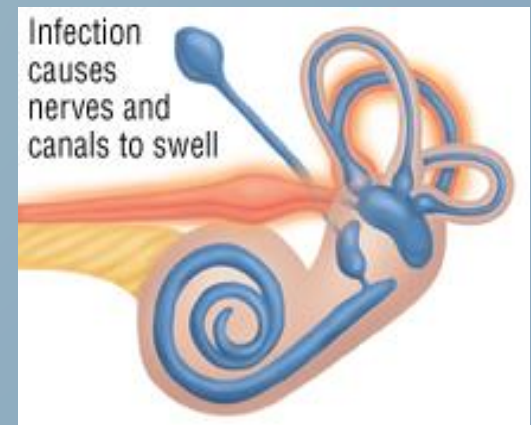
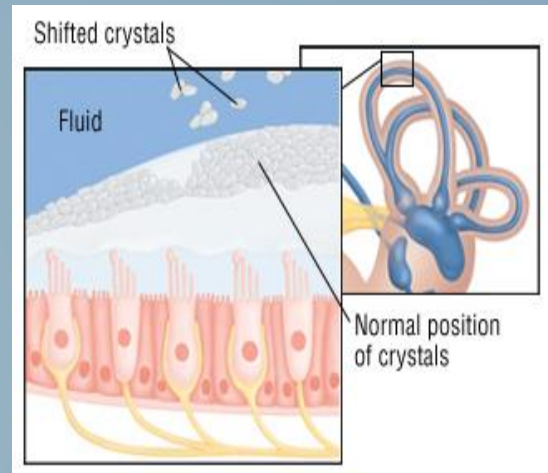


# BALANCE DISORDERS

**Benign paroxysmal positional vertigo:**-A change in head position causes a sudden sensation of spinning.

**Acute labyrinthitis:**-Inflammation of the balance apparatus of the inner ear, probably caused by a viral infection.

**Ménière's disease:**-This causes repeat episodes of dizziness, usually with ringing in the ear and progressive low-frequency hearing loss.



# PHARMACOLOGIC APPROACH

**Specific treatment**

**Symptomatic treatment**

**Prophylactic treatment**

Involves targeting the underlying cause of the

Involves controlling the acute symptoms and autonomic complaints

Aims to (e.g., vertigo and vomiting)

■ Diuretics (but not loop diuretics)

Corticosteroids

■ Ca Channel Blockers

■ Cinnarizine, Verapamil

# SYMPTOMATIC CONTROL

Vestibular suppressants

Vestibular Antiemetics are drugs that reduce the intensity of vertigo and nystagmus evoked by a vestibular imbalance.

**1-Anticholinergics**

**2-Benzodiazepines**

**3-Betahistine**

## **1-Anticholinergics**

Anticholinergics inhibit firing in vestibular nucleus neurons

Reduce the velocity of vestibular nystagmus

e.g. hyoscine, also useful in motion sickness, sedation

ADRs:- dry mouth, blurred vision, sedation

## **2-Benzodiazepines**

In small dosages useful for the management of acute vertigo

Minimize anxiety and panic associated with vertigo

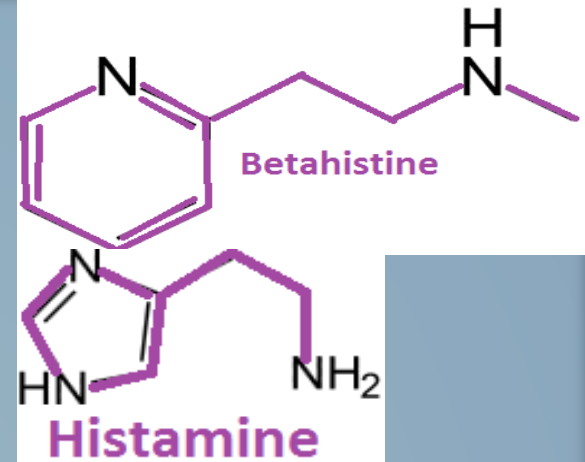
**Lorazepam, Clonazepam, Diazepam**

ADRs:- Dependence, impaired memory, increased risk of falling.

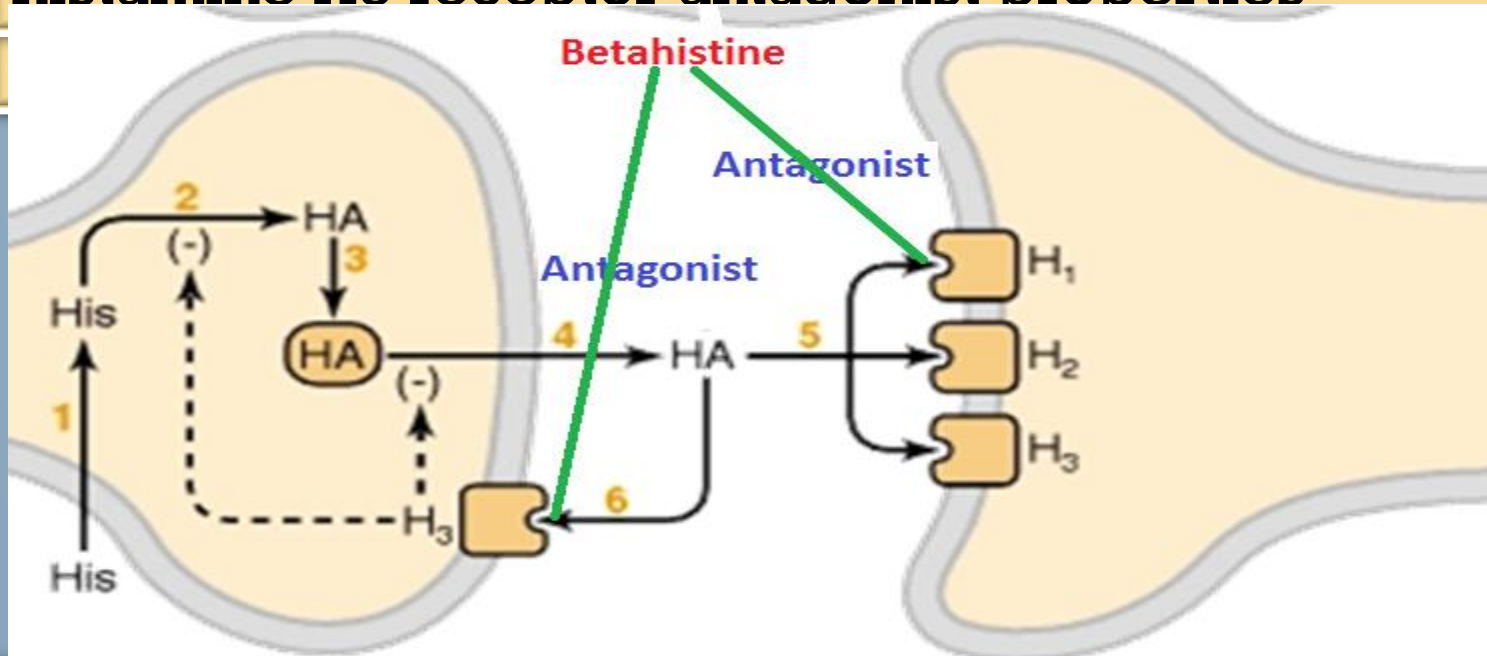


# 3-Betahistine

## Mehanism of Action:-



It is a structural analog of histamine with weak histamine H1 receptor agonist and more potent histamine H3 receptor antagonist properties



# Pharmacokinetics

## Contraindications

al solution

Phaeochromocytoma

sorbed.

Bronchial asthma

urine within 24 hours

History of peptic ulcer

Hypersensitivity reactions



# ANTIEMETICS

Antiemetics are drugs used to control vomiting and nausea

**Antihistamines** e.g. dimenhydrinate

**Phenothiazines** e.g. prochlorperazine

**Dopamine antagonists** e.g. **metoclopramide** and domperidone



# DIMINHYDRINATE

Block H<sub>1</sub> receptors in CRTZ

Sedative effects

Weak anticholinergic effects

Anticholinergic side

↓ Excitability in the labyrinth & blocking conduction in vestibular-cerebellar pathways

## Indications

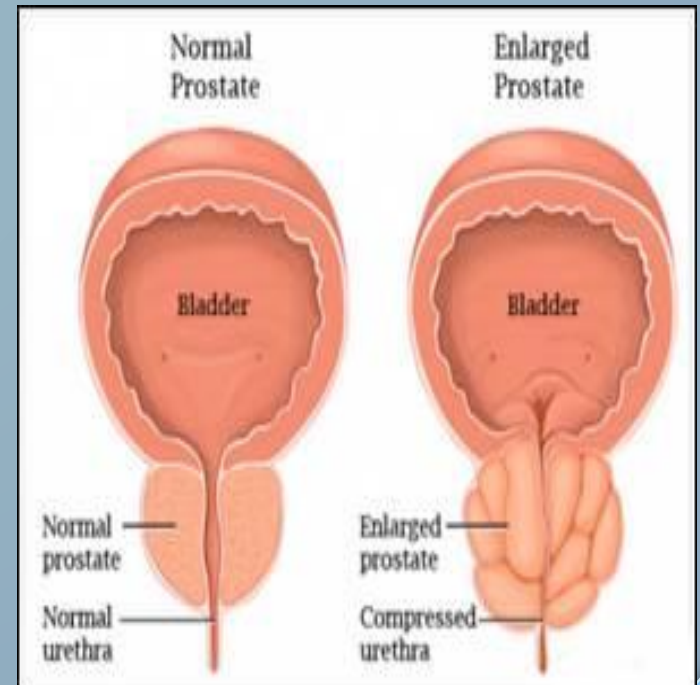
Contraindications:-

Glaucoma

Prostate enlargement

In vertigo

Motion sickness



# **PROCHLORPERAZINE**

**Blocks dopamine receptors at CRTZ**

**Antipsychotic , some sedation + antiemetic**

## **Indications**

**One of the best antiemetics in vertigo,  
has some vestibular suppressant action**

# **METOCLOPRAMIDE**

A potent central antiemetic acting on CRTZ

Has some sedative action

Has potent **gastroprokinetic** effect

## **ADRS:-**

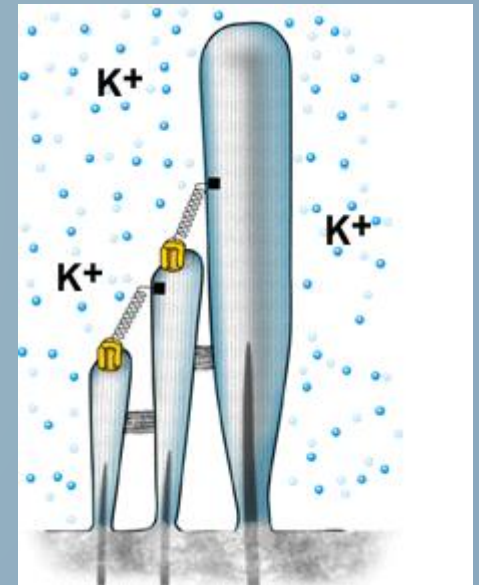
Restlessness or drowsiness  
Extrapyramidal manifestations  
on prolonged use

# CINNARIZINE

Selective calcium & potassium channels blocker,  
antihistamine, antiserotonin, antidopamine

Increased hydrostatic pressure on hair  
It promotes cerebral blood flow

Cinnarizine inhibits  $K^+$  currents



Inhibition of  $K^+$  currents lessen the vertigo and motion-induced nausea by dampening the over-reactivity of the vestibular hair cells.

# PHARMACOKINETICS

## Clinical uses:-

Used to treat nausea and vomiting associated with motion sickness, vertigo, Meniere's disease.

Low oral bioavailability due to hepatic first pass

Car drivers

If administered IV in lipid emulsion, it has better

Muscle rigidity and tremor



# DRUGS INDUCING VERTIGO

Drugs producing damaging effects on structure or function of labyrinthine hair cells &/ or their neuronal connections

Vesibular toxins

Drugs altering fluid & electrolyte balance

Diuretics

Drugs altering vestibular firing

Anticonvulsants

Antidepressants

Sedative hypnotics

Alcohol

Cocaine

Mixed ototoxins

Alter function

# MIXED OTOTOXINS

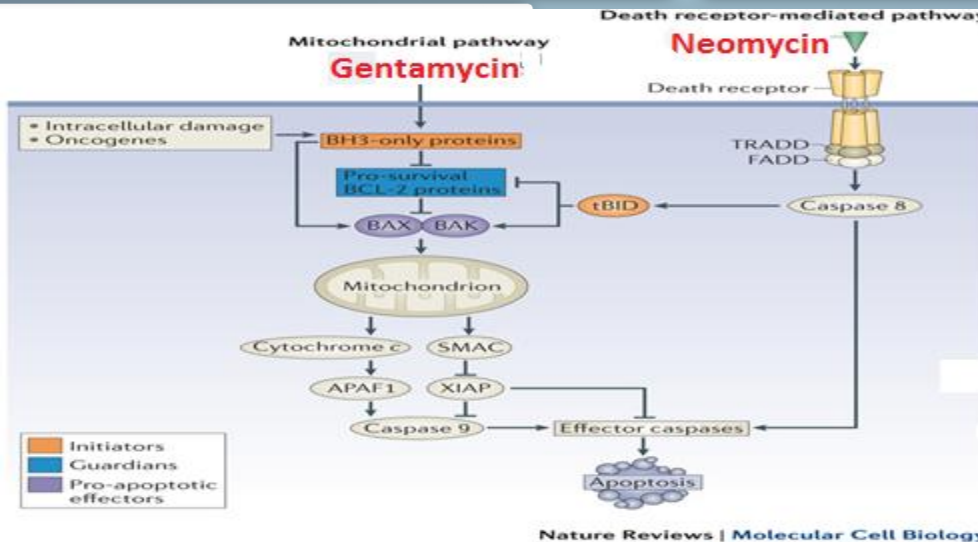
Aminoglycoside antibiotics;  
*gentamycin, kanamycin,*  
*neomycin, streptomycin*

↓ Loop diuretics

**Gentamycin** → Induce apoptosis  
 by evoking free radicals →  
 Mitochondrial Pathway

**Neomycin** → Induce apoptosis  
 by activating caspases →  
 Death Receptor Pathway

↓ Local  
 biochem  
 electror  
 transdu  
 impulse



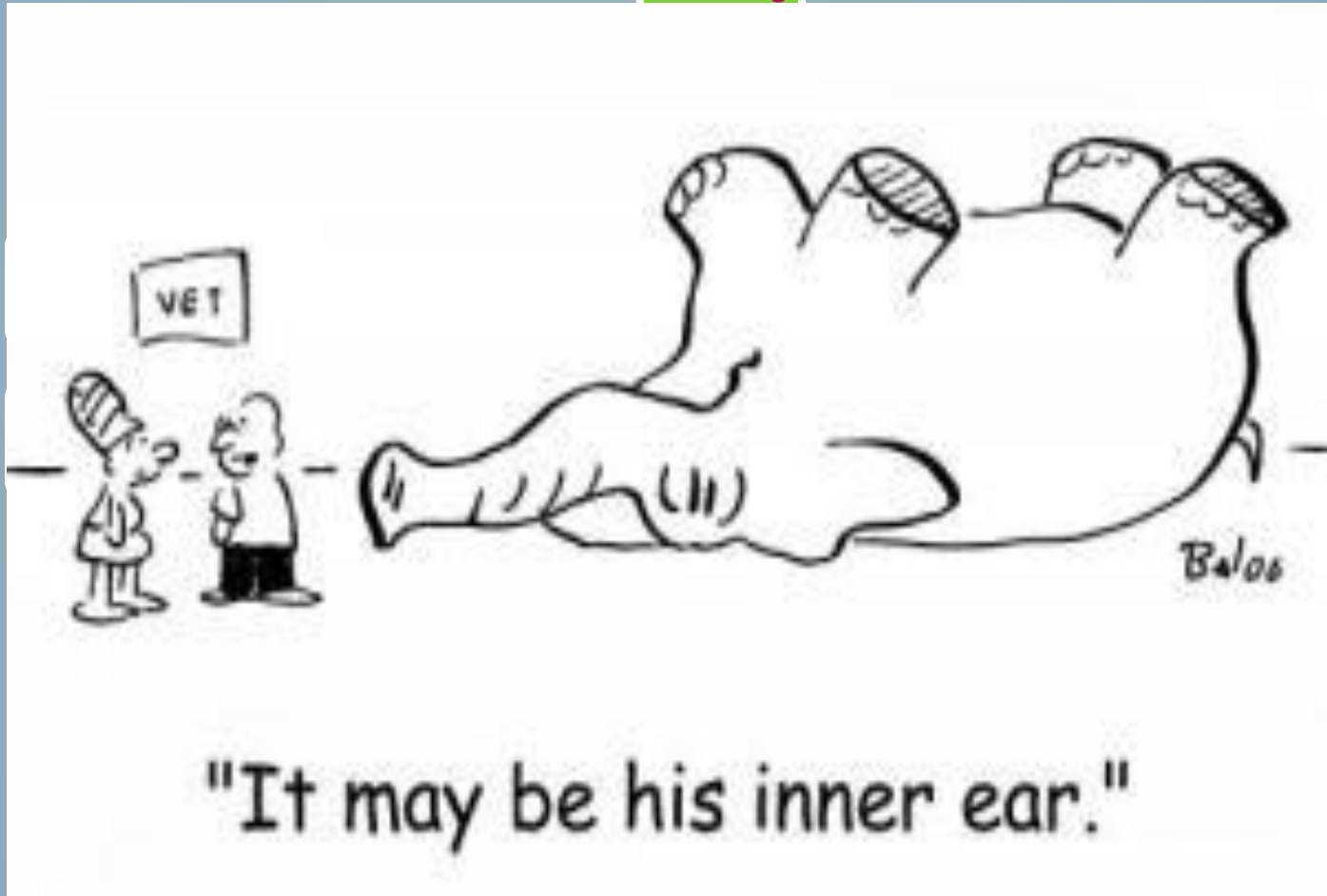
Alte

n

Alter structures

# SYNOPSIS

Drugs  
Affecting



antagonist