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PHARMACOLOGY FOR QUICK REVIEW

PARASYMPATHETIC NERVOUS SYSTEM

MUSCARINIC RECEPTOR AGONISTS	**Examples:**	Pilocarpine, ACh, Carbachol, Bethanechol
	Uses:	Treat glaucoma, increase GI motility, relieve urinary tension, reduce tachycardia
	Mechanism:	Activate muscarinic receptors (M1-M5, dependant on area)
	Action:	Bradycardia, decreased C.O., vasodilation, increased secretions, ciliary constriction (Aqueous humour drainage), smooth muscle contraction
	Side effects:	N/A
MUSCARINIC RECEPTOR ANTAGONISTS	**Examples:**	Atropine (Long acting), Hycosine, Homatropine (Short acting), Ipratropium (Quaternary - no CNS effects)
	Uses:	Anaesthesia - inhibit secretions & prevent vagal inhibition of the heart, opthalmology - dilate pupil & paralyse lens for examination, treatment of anticholinesterase poisoning, relief of smooth muscle spasm, anti-emetic, reduce Parkinson's tremor, incontinence
	Mechanism:	Reversible competition of muscarinic receptors
	Action:	Block secretions, tachycardia, pupil dilation, decreased GI motility, smooth muscle relaxation, CNS excitation, tremor suppression
	Side effects:	Tachycardia, urinary retention, blurred vision, increased intraocular pressure CNS effects: restlessness, disorientation/confusion, hallucinations, amnesia

AUTONOMIC GANGLIA

GANGLION AGONISTS	**Examples:**	Nicotine/ACh
	Uses:	Not used clinically
	Mechanism:	Activate nicotinic receptors
	Action:	Increase BP, tachycardia, decrease gastric motility, CNS stimulation, vasoconstriction, release of ADH
	Side effects:	Technically all actions, as usually undesirable
GANGLION BLOCKERS	**Examples:**	Hexamethonium, Trimetaphan, excess Nicotine
	Uses:	Reduce hypertension (Mainly in surgery)
	Mechanism:	Block sympathetic and parasympathetic transmission via nicotinic receptor antagonism
	Action:	Cardiovascular - decreased BP via vessel dilation, GI tract - decreased motility, genito-urinary - impaired micturition, erectile failure, inhibition of ejaculation, eyes - impaired accommodation
	Side effects:	Constipation, impotence, blurred vision

NEUROMUSCULAR JUNCTION

COMPETITIVE NMJ BLOCKERS	**Examples:**	Tubocurarine, Gallamine, Pancuronium
	Uses:	Muscle relaxation during surgery
	Mechanism:	Block ACh transmission by competing for nicotinic receptors - antagonism
	Action:	Muscle relaxation (No initial fasciculation),
	Side effects:	Hypotension, histamine release, antagonised by anticholinesterases, myasthenia gravis patients are sensitive, tetanic fade (Tetanic muscle response poorly sustained)
DEPOLARISING BLOCKERS	**Examples:**	Suxamethonium, Decamethonium
	Uses:	Muscle relaxation during surgery
	Mechanism:	Activate nicotinic receptors —> depolarisation & inactivation of sodium channels in muscle membrane, inhibiting action potentials
	Action:	Initial fasciculation, followed by muscle relaxation
	Side effects:	Hyperkalaemia, post-operative muscle pain, block may be enhanced by anticholinesterases, myasthenia gravis patients insensitive
ANTI-CHOLINESTERASES	**Examples:**	Edrophonium (Short acting), Neostigmine (Medium acting), Dyflos, Parathion (Long acting/irreversible)
	Uses:	Treatment of glaucoma & myasthenia gravis, reversing NMJ block (E.g. following anaesthesia), *insecticide
	Mechanism:	Hydroxylation of cholinesterase, inhibition of ACh breakdown - sustain cholinergic transmission
	Action:	Increased secretions & GI motility, restoration of NMJ activity, pupillary constriction (Decreased intraocular pressure)
	Side effects:	Muscle fasciculation, bradycardia, hypotension, bronchoconstriction, respiratory failure. TOXICITY - demyelination
CHOLINESTERASE REACTIVATORS	**Examples:**	Pralidoxime (All oxime compounds)
	Uses:	Treatment of organophosphate poisoning
	Mechanism:	Reactivation of cholinesterases by moving phosphate group
	Action:	ACh breakdown
	Side effects:	N/A

OTHER NMJ BLOCKERS	**Examples:**	1) Hemicholinium 2) Botulinium toxin 3) Streptomycin/other aminoglycoside antibiotics
	Uses:	Pre-anaesthetic - muscle relaxation, reduce amount of general anaesthetic needed
	Mechanism:	1) Inhibits choline uptake by cholinergic nerve terminals 2) Blocks ACh release (Long lasting) 3) Block calcium entry and therefore transmitter release
	Action:	Block neuromuscular transmission
	Side effects:	3) Weakness

SYMPATHETIC NERVOUS SYSTEM

α-ADRENOCEPTOR AGONISTS	**Examples:**	1)Adrenaline, noradrenaline. 2) Phenylephrine(α1) 3) Clonidine(α2). 4) Dipivephrine(α2, adrenaline pro-drug), Brimonidine(α2)
	Uses:	1) Anaphylactic shock, cardiac arrest, prolong action of local anaesthetics 2) Nasal decongestant, 3) Anti-hypertensive 4) Treatment of open angle glaucoma
	Mechanism:	α1 - phospholipase C activation, IP3 & DAG formation, increase in calcium release. α2 - inhibit adenylate cyclase, decrease cAMP and decrease protein kinase A
	Action:	α1 - smooth muscle contraction, vasoconstriction, decrease GI motility, promote glycogenolysis α2 - inhibit noradrenaline and decrease lipolysis, decrease aqueous humour production
	Side effects:	Hypertension, reflex bradycardia
α-ADRENOCEPTOR ANTAGONISTS	**Examples:**	Phentolamine, Phenoxybenzamine, Prazosin(α1), Ergot alkaloids
	Uses:	Antihypertensives, treatment of phaeochromocytomas
	Mechanism:	Block α-adrenoceptor mediated effects by direct competition (Exception is Phenoxybenzamine - non-competitive and irreversible)
	Action:	Increased sympathetic drive (Indirect), Vasodilation, decreased BP
	Side effects:	Nasal stuffiness, reflex tachycardia, postural hypotension, sodium & water retention, miosis (Pupillary constriction)
β-ADRENOCEPTOR AGONISTS	**Examples:**	Adrenaline, Noradrenaline, Isoprenaline, Dobutamine(β1) Bisoprolol(β1), Salbutamol(β2), Salmeterol(β2).
	Uses:	Treatment of asthma, inhibition of preterm labour, treatment of acute congestive heart failure
	Mechanism:	Increase cAMP, activation of protein kinase A - protein phosphorylation. Prolonged opening of calcium channels in the heart (β1)
	Action:	Increase heart rate and contractile force (β1), vasodilation, smooth muscle relaxation, renin release, inhibition of histamine, increased glycogenolysis and lipolysis
	Side effects:	Hypokalaemia, tremor, hypotension, reflex tachycardia

β-ADRENOCEPTOR ANTAGONISTS	**Examples:**	Atenolol(β1), Propanolol, Metoprolol, Oxprenolol (Partial antagonist)
	Uses:	Treatment of angina, hypertension, heart failure, glaucoma, atrial dysrhythmias
	Mechanism:	Block β-adrenoceptor mediated effects by direct competition. Activation of baroreceptor reflex
	Action:	Decreased cardiac output and sympathetic activity. Decrease BP, vasoconstriction
	Side effects:	Bradycardia, cold extremities, bronchospasm (Contraindicated in asthmatic patients)
INDIRECTLY ACTING	**Examples:**	1) Carbidopa, Disulfriam, α-Methyl Dopa 2) Reserpine 3) Tyramine, Amphetamine 4) Clonidine, Guanethidine 5) Cocaine, Tricyclic Antidepressants, β-oestradiol 6) Phenelzine (Non-selective), Selegiline (MAO-B selective)
	Uses:	Treatment of hypertension, angina and glaucoma
	Mechanism:	1) Inhibits NA synthesis 2) Inhibits NA storage 3) Displaces NA from vesicles 4) Inhibits NA release 5) Inhibits NA uptake 6)Inhibits NA metabolism
	Action:	Decreased heart rate and cardiac output, reduced sympathetic drive to the heart, decreases production of aqueous humour
	Side effects:	Bronchoconstriction, bradycardia, cardiac failure

ANTIHYPERTENSIVES & ANTI-ANGINAS (Also see above)

THIAZIDE DIURETICS	**Examples:**	Benchroflumethiazide, metolazone
	Uses:	Long term control of hypertension
	Mechanism:	Increase sodium excretion —> water loss —> decreased blood volume —> decreased cardiac output —> decreased BP
	Action:	Long term, peripheral resistance is decreased after cardiac output and blood volume return to normal —> decreased BP
	Side effects:	Hypokalaemia, hyperglycaemia, gout, impotence
ATP-SENSITIVE K+ CHANNEL OPENERS	**Examples:**	Diazoxide, Minoxidil, Nicorandil
	Uses:	Hypertensive emergencies, treatment of severe hypertension
	Mechanism:	Block binding of ATP to K+ channels, keeping them open —> K+ influx —> hyperpolarisation —> closing of L-type Ca2+ channels
	Action:	Vasodilation —> fall in peripheral resistance —> decreased BP
	Side effects:	Hypertrichosis, acute hypotension

CALCIUM CHANNEL BLOCKERS	**Examples:**	Nifedipine (L-type selective), verapamil, diltiazem
	Uses:	Long term control of hypertension, angina and arrhythmias
	Mechanism:	Antagonise calcium channels, preventing calcium influx
	Action:	Vasodilation
	Side effects:	Facial flushing, headache, dizziness
ORGANIC NITRATES	**Examples:**	1) Sodium Nitroprusside 2) GTN (Short acting), ISMN (Long acting)
	Uses:	1) Severe hypertensive crises 2) Angina
	Mechanism:	Activate guanylate cyclase —> increase cGMP —> activation of protein kinase G —> phosphorylation of myosin light chains
	Action:	Relaxes vascular smooth muscle
	Side effects:	Headache, reflex tachycardia, nausea, vomiting, dizziness, increased CSF & intraocular pressure, methanemogloblinaemia
ANGIOTENSIN CONVERTING ENZYME (ACE) INHIBITORS	**Examples:**	Captopril, Enalpril, Ramapril
	Uses:	Long term control of hypertension, treatment of congestive heart failure
	Mechanism:	Inhibit the renin-angiotensin pathway - prevent the conversion of angiotensin I to angiotensin II. Prevent bradykinin breakdown
	Action:	Vasodilation
	Side effects:	Can cause precipitous decrease in BP in patients with renal impairment, cough, hypokalaemia
ANGIOTENSIN II AT1 RECEPTOR ANTAGONISTS	**Examples:**	Losartan
	Uses:	Long term control of hypertension, treatment of congestive heart failure
	Mechanism:	Competitive antagonist at AT1receptors
	Action:	Vasodilation
	Side effects:	Similar to ACE inhibitors, less likely to cause cough Still being evaluated.
RENIN INHIBITORS	**Examples:**	Aliskiren
	Uses:	Long term control of hypertension
	Mechanism:	Prevents the conversion of angiotensinogen to angiotensin I by binding to renin
	Action:	Vasodilation
	Side effects:	Dose-related GI effects (E.g. diarrhoea)

TREATMENT OF CONGESTIVE HEART FAILURE (Also see above)

LOOP DIURETICS	**Examples:**	Furosemide, Bumetanide
	Uses:	Treatment of hypertension, pulmonary oedema, hypercalcaemia & heart failure. Reduce peripheral and pulmonary oedema.
	Mechanism:	Inhibition of Na/K/Cl transporter on thick ascending loop of Helme —> loss of Na+ and Cl- —> water loss
	Action:	Reduce preload, vasodilation
	Side effects:	Hypokalaemia, alkalosis, gout, deafness
CARDIAC GLYCOSIDES	**Examples:**	Digoxin/Digitoxin
	Uses:	Treatment of congestive heart failure (Usually when associated with atrial arrhythmia)
	Mechanism:	Inhibits Na+/K+ ATPase, causes an accumulation of intracellular Na+ and Ca2+
	Action:	Increased force of cardiac contraction. Slowed A-V conduction. Decreased refractory period of atrial muscle (As they have more cholinergic innervation)
	Side effects:	Usually associated with excessive dosage, as they have a low therapeutic index. Anorexia, nausea, vomiting, diarrhoea, visual disturbances (Colour vision) cardiac arrhythmias
PHOSPHODIESTERASE (PDE) III INHIBITORS	**Examples:**	Milrione, Enoximone
	Uses:	Treatment of congestive heart failure
	Mechanism:	Increase intracellular levels of cAMP, increase Ca2+ influx
	Action:	Increase myocardial contractility
	Side effects:	Pro-dysryhthmic

TREATMENT OF ARRHYTHMIAS (Also see above)

CLASS Ia ANTI-DYSRYHTHMICS	**Examples:**	Quinidine, Disopyramide
	Uses:	Treatment of supraventricular and ventricular arrhythmias
	Mechanism:	Block voltage sensitive Na+ channels
	Action:	Slow conduction velocity, prolong repolarisation
	Side effects:	-

CLASS Ib ANTI-DYSRYHTHMICS	**Examples:**	Lidocaine
	Uses:	Treatment of ventricular tachycardia, particularly following infarction
	Mechanism:	Rapidly associate with and dissociate from Na+ channels (Brief block)
	Action:	Abort premature beats. Selectively block depolarised regions
	Side effects:	-
CLASS Ic ANTI-DYSRYHTHMICS	**Examples:**	Flecainide, Encainide
	Uses:	Treatment of atrial fibrillation and re-entrant ventricular dysarrhythmia
	Mechanism:	Slow association and disassociation from Na+ channels (Constant block)
	Action:	Reduce general excitability
	Side effects:	Flecainide can cause death in patients with heart failure
CLASS III ANTI-DYSRYHTHMICS	**Examples:**	Amiodarone, sotalol
	Uses:	Treatment of arrhythmias
	Mechanism:	K+ channel blocker
	Action:	Increase refractory period, prolong cardiac action potential
	Side effects:	Thyroid and pulmonary toxicity - long half life
ADENOSINE RECEPTOR AGONISTS (DYSRHYTHMIC)	**Examples:**	Adenosine
	Uses:	Treatment of paroxysmal supraventricular tachycardia
	Mechanism:	Activation of A1 receptors in cardiac muscle, inhibits Ca2+ influx, increases K+ permeability
	Action:	Slows AV transmission, prolongs refractory period
	Side effects:	Dyspnoea, headache, flushing, chest tightness

THE KIDNEY (Also see above)

ADH	**Examples:**	Vasopressin (ADH), Desmopressin
	Uses:	Treatment of diabetes insipidus
	Mechanism:	Binds to V2 receptors in collecting ducts, increases water reabsorption
	Action:	Antidiuresis
	Side effects:	Headaches, facial flushing, nausea. ADH may cause hypertension via V1 receptors in blood vessels
POTASSIUM SPARING DIURETICS	**Examples:**	1) Spironolactone 2) Amiloride, Triamterene
	Uses:	Treatment of Conn's syndrome, severe heart failure, liver disease with ascites
	Mechanism:	1) Antagonises aldosterone in kidney, increases Na+ excretion. 2) Blocks Na+ channels and decreases its permeability in distal nephron, increasing its excretion.
	Action:	Reduces K+ excretion. Increases water loss.
	Side effects:	Severe hyperkalaemia in patients with renal impairment/those taking ACE inhibitors
CARBONIC ANHYDRASE INHIBITORS	**Examples:**	Acetazolamide
	Uses:	Diuretic (Not clinically used), treat glaucoma, reduce CSF pressure
	Mechanism:	Inhibits carbonic anhydrase. Increases HCO3- excretion
	Action:	Diuresis
	Side effects:	Acidosis
OSMOTIC DIURETICS	**Examples:**	Mannitol
	Uses:	Treatment of cerebral oedema and high intraocular pressure
	Mechanism:	Filtered and excreted with an osmotic equivalent of water
	Action:	Water loss
	Side effects:	Hyponatremia

URINE ACIDIFICATION	**Examples:**	Ammonium chloride, ascorbic acid
	Uses:	Promote excretion/retention of drugs
	Mechanism:	Weak acid; excreted via homeostasis
	Action:	Makes urine more acidic
	Side effects:	-
URINE ALKALISATION	**Examples:**	Sodium bicarbonate, potassium citrate
	Uses:	Promote excretion/retention of drugs
	Mechanism:	Metabolised to bicarbonate. Cations are excreted with bicarbonate
	Action:	Makes urine more alkaline
	Side effects:	-

ANAESTHETICS

LOCAL ANAESTHETICS	**Examples:**	Lidocaine, prilocaine, bupivacaine*, benzocaine**, cocaine
	Uses:	Localised pain prevention. *Spinal anaesthesia (Epidural), **Surface anaesthesia only.
	Mechanism:	Penetrate nerves and block Na+ channels
	Action:	Prevent generation of action potentials
	Side effects:	Hypersensitivity, light-headedness. Toxicity - respiratory/cardiac depression
GENERAL ANAESTHETICS	**Examples:**	Inhaled - Nitrous oxide, halothane, isoflurane, enflurane, desflurane. IV - Thiopentone, Propofol
	Uses:	Depress excitable tissues in surgery
	Mechanism:	Bind to hydrophobic regions of proteins; GABA-A receptors (Enhance), glutamate receptors (Inhibit), ion channels.
	Action:	Cause unconsciousness, respiratory depression, decreased BP (Via myocardial depression and vasodilation)
	Side effects:	Nausea and vomiting upon regaining consciousness. Serious side effects include cardiac dysrhythmia, but are rare

ANALGESIA

OPIOIDS	**Examples:**	Morphine, Heroin (Metabolised to morphine), codeine, fentanyl, methadone, tramadol*
	Uses:	Pain relief
	Mechanism:	Bind to MU receptor, activate G-protein, open K+ channels, hyperpolarisation, inhibition of neurotransmitter release. *Also blocks re-uptake of neurotransmitter and 5-HT
	Action:	Analgesia, anxiety relief. Antagonised by Naloxone (Used to treat overdose)
	Side effects:	Nausea, constipation, dependence
NSAIDS	**Examples:**	Ibuprofen, Aspirin
	Uses:	Pain relief, anti-inflammatory
	Mechanism:	Block prostanoid (Inflammatory mediator) production via inhibition of cyclo-oxygenase. Decrease PGE formation, reducing sensory neural sensitisation.
	Action:	Decrease inflammation and therefore associated pain
	Side effects:	Indigestion, stomach ulcers
NMDA ANTAGONISTS	**Examples:**	Ketamine
	Uses:	Relief of severe pain
	Mechanism:	Blocks NDMA channels in spinal cord
	Action:	Blocks central sensitisation
	Side effects:	Also blocks NDMA receptors in brain - loss of memory and cognitive function
TRIPTANS	**Examples:**	Sumatriptan
	Uses:	Treatment of headaches
	Mechanism:	Blocks 5-HT receptors in cranial blood vessels
	Action:	Blood vessel constriction
	Side effects:	Migraine recurrence?

PARKINSON'S DISEASE (Also see Muscarinic Antagonists)

DOPAMINE PRECURSOR	**Examples:**	L-DOPA
	Uses:	Improve muscle rigidity and akinesia (& resting tremor to an extent)
	Mechanism:	Crosses blood-brain barrier. Converted to dopamine by DOPA decarboxylase
	Action:	Activates dopamine receptors
	Side effects:	Central: Dyskinesia, psychotic effects, decreased prolactin release, "on-off" effects. Peripheral: Hypotension, nausea
DOPA DECARBOXYLASE INHIBITORS	**Examples:**	Carbidopa
	Uses:	L-DOPA adjunct
	Mechanism:	Inhibits DOPA-decarboxylase - prevents peripheral dopamine formation
	Action:	Prevents peripheral side effects
MAO-B INHIBITORS	**Examples:**	Selegiline
	Uses:	L-DOPA adjunct
	Mechanism:	Inhibits monoamine oxidase
	Action:	Reduces dopamine breakdown in the CNS
DOPAMINE RECEPTOR AGONISTS	**Examples:**	Bromocriptine (D2), Apomorphine (D1&D2)
	Uses:	Useful in older patients/where L-DOPA is no longer effective
	Mechanism:	Activates dopamine receptors
	Action:	Reduces symptoms of Parkinson's disease
	Side effects:	Domperidone (A D2 antagonist and anti-emetic) must be taken with these drugs - does not cross the blood-brain barrier

OTHER MOVEMENT DISORDERS

DOPAMINE ANTAGONISTS	**Huntingdon's Chorea**	Uncontrolled movement as a result of a loss of striated neurones and therefore a lack of inhibition of dopamine neurones. Treated with dopamine antagonists.
	Tics	Sudden, stereotyped movements of unknown origin. Improved with the administration of dopamine antagonists.

SCHIZOPHRENIA

TYPICAL NEUROLEPTICS	**Examples:**	Chlorpromazine, Thioridazine, Flupenthixol, Haloperidol
	Uses:	Relieve positive symptoms of schizophrenia
	Mechanism:	Antagonise D2 receptors. Flupenthixol also antagonises histamine, muscarinic and α1 receptors
	Action:	Reduce dopaminergic transmission in the brain
	Side effects:	Extrapyramidal - dystonia, akathisia. Tardive dyskinesia, hyperprolactinaemia, pseudo-parkinsonism, aplastic anaemia.
ATYPICAL NEUROLEPTICS	**Examples:**	1)Clozapine, Olanzepine, Quetiapine 2) Risperidone
	Uses:	Relieve both positive and negative symptoms of schizophrenia
	Mechanism:	1) Antagonise 5-HT2A/2C receptors. 2) Weak partial agonists at 5-HT1A receptors. Muscarinic and α2 antagonists.
	Action:	1) Anti-psychotic action. 2) Increased dopamine release from neurones projecting to frontal cortex thought to relieve -ve symptoms
	Side effects:	Marked dribbling, weight gain, prolonged cardiac QT interval, agranulocytosis (Clozapine)
3RD GENERATION ANTI-PSYCHOTIC	**Examples:**	Aripiprazole
	Uses:	Improved control of symptoms of schizophrenia
	Mechanism:	1) D2 antagonists, 5-HT2A antagonist. 2) Weak 5-HT1A partial agonist - increased dopamine production.
	Action:	1) Anti-psychotic action. 2) Relief of negative symptoms
	Side effects:	Hypercholesterolaemia, hyperprolactinaemia

ANTI-DEPRESSANTS

MAO INHIBITORS	**Examples:**	Phenelzine (Non-selective), Maclobemide (MAO-B selective)
	Mechanism:	Inhibits monoamine oxidase. Intra-neuronal accumulation of noradrenaline and 5-HT. Increased amount of transmitter available for release.
	Action:	Increased monoaminergic transmission
	Side effects:	“The Cheese Reaction,” postural hypotension, sympathetic and CNS effects

TRICYCLIC ANTIDEPRESSANT (UPTAKE INHIBITORS)	**Examples:**	Imipramine, Clomipramine
	Mechanism:	Block re-uptake of noradrenaline. Clomipramine also blocks 5-HT
	Action:	Prevents inactivation of noradrenaline
	Side effects:	Anti-muscarinic activity, postural hypotension, convulsions, confusion
SELECTIVE UPTAKE BLOCKERS	**Examples:**	1) Maprotiline 2) Fluoxetine
	Mechanism:	1) Noradrenaline uptake blocker 2) SSRI
	Action:	1) Prevent inactivation of noradrenaline 2) Prevent inactivation of 5-HT
	Side effects:	Severe serotonin toxicity if given with MAO inhibitor - fatal
SNRIs	**Examples:**	Venlafaxine
	Mechanism:	Inhibit re-uptake of both 5-HT and noradrenaline
	Action:	Prevent inactivation of 5-HT and noradrenaline
	Side effects:	Fewer side effects as do not have anti-muscarinc activity
ATYPICAL ANTIDEPRESSANT	**Examples:**	Miaserin, Mirtazepine
	Mechanism:	α2 antagonists. Prevent feedback inhibition of noradrenaline release. Also bind to 5-HT receptors
	Action:	Prevent inactivation of 5-HT and noradrenaline
	Side effects:	Hepato and renal toxicity, postural hypotension
OTHER ANTIDEPRESSANT	**Examples:**	Trazodone
	Mechanism:	5-HT re-uptake inhibitor. 5-HT2 receptor antagonist
	Action:	Prevents inactivation of 5-HT
	Side effects:	Postural hypotension

ANTI-EPILEPTICS

Na+ CHANNEL INHIBITORS	**Examples:**	Carbamazepine, Phenytoin
	Uses:	Carbamazepine used to treat partial seizures
	Mechanism:	Inhibits Na+ channels in hyper-excitable cells
	Action:	Reduces cell excitability and firing
	Side effects:	Sedation, ataxia, changes in oral contraceptive metabolism
Ca2+ CHANNEL INHIBITOR	**Examples:**	Ethosuximide
	Uses:	Treatment of absence seizures
	Mechanism:	Inhibit Ca2+ channels in excitable cells
	Action:	Reduces cell excitability and firing
	Side effects:	Sedation, ataxia, changes in oral contraceptive metabolism
GENERAL ANTI-EPILEPTIC	**Examples:**	Valproate
	Uses:	Can be used in most forms of epilepsy
	Mechanism:	Inhibits GABA metabolism. Blocks Na+ channels in hyper-excitable cells
	Action:	Reduces cell excitability and firing
	Side effects:	Sedation, ataxia, changes in oral contraceptive metabolism
GABA-A RECEPTOR MODIFIERS	**Examples:**	Clonazepam, Diazepam
	Uses:	Clonazepam used to treat status epilepticus
	Mechanism:	Allosteric modification of GABA-A receptors
	Action:	Reduces cell excitability and firing
	Side effects:	Tolerance likely - used in emergencies. Sedation, ataxia, changes in oral contraceptive metabolism.

DIABETES & OBESITY

SULPHONYLUREAS	**Examples:**	Tolbutamine (Short acting), Glibenclamide (Long acting)
	Uses:	Treatment of type II diabetes mellitus
	Mechanism:	Block ATP-sensitive K+ channels. β-cells depolarise. Ca2+ channels open; influx
	Action:	Stimulation of insulin release
	Side effects:	Hypoglycaemia, increased appetite - weight gain
BIGUANIDES	**Examples:**	Metformin
	Uses:	Treatment of type II diabetes mellitus
	Mechanism:	Increase glucose uptake by tissues
	Action:	Suppress appetite. Decrease plasma LDLs
	Side effects:	Lactic acidosis, decreased vitamin B12 absorption
THIAZOLENEDIONES	**Examples:**	Piaglitazone
	Uses:	Treatment of type II diabetes mellitus
	Mechanism:	Activate PPARɣ receptors
	Action:	Sensitise peripheral tissues to insulin
	Side effects:	-
OBESITY TREATMENTS	**Examples:**	1) d-Amphetamine 2) Sibutramine 3) Orlisat 4) Liragutide
	Uses:	Reduce weight in obese patients
	Mechanism:	1) Competitive inhibition of NA re-uptake. 2) Inhibits NA & 5-HT re-uptake. 3) Inhibits pancreatic lipase. 4) GLP1 agonist.
	Action:	1)& 2) Prevents breakdown & reduces food intake. 3) Prevents fat breakdown - excreted instead. 4) Promotes insulin release.
	Side effects:	1) Dependance. 2) Sympathetic effects. 3) Faecal fat; patients must adhere to low fat diet.

INFLAMMATION (Also see above)

STEROIDS	**Examples:**	Hydrocortisone, prednisolone, betamethosome
	Uses:	Reducing inflammation (& associated oedema and pain), asthma
	Mechanism:	Bind glucocorticoid receptor. Loss of hsp complex. Receptor enters nucleus and binds glucocorticoid regulatory element. Inhibits cyclo-oxygenase.
	Action:	Transcription of anti-inflammatory proteins. Suppression of pro-inflammatory gene transcription. Decreases cyclo-oxygenase products.
	Side effects:	Suppression of hypothalamic/pituitary/adrenal function. Immunosuppression. Salt & water retention.
ANTI-TNFα ANTIBODIES	**Examples:**	Infliximab, Adalimumab
	Uses:	Reduce inflammation
	Mechanism:	Prevent TNFα from binding to its receptors
	Action:	Prevent inflammation
IMMUNO-SUPPRESSANTS	**Examples:**	Leflunomide, ciclosporin, methotrexate
	Uses:	Reduce inflammation
	Mechanism:	Suppress immune response
	Action:	Decrease inflammatory mediators
	Side effects:	Decreased immune system
HISTAMINE RECEPTOR ANTAGONISTS (ANTI-HISTAMINES)	**Examples:**	H1 - Astemizole, terfenadine, ceterizine. H2 - Cimetidine, ranatidine. H3 - Thioperamide
	Uses:	H1 - Treat allergies. H2 - treat GI conditions (E.g. gastric ulcers). H3 - Undergoing trials
	Mechanism:	Inverse agonists at histamine receptors
	Action:	H1 - Smooth muscle relaxation (Except arterial). Reduced secretions. Reduced pain (Decreased stimulation of C-fibres). H2 - Reduced acid secretion
OTHER	**Examples:**	Auranofin
	Uses:	Anti-rheumatic drug
	Mechanism:	Unknown
	Action:	Reduces IL-1 & TNFα

THROMBOSIS

ANTI-COAGULANTS	**Examples:**	1) Heparin, Dalteparin (Low molecular weight heparin - longer duration of action) 2) Warfarin
	Uses:	Reduce thrombus formation
	Mechanism:	1) Inactivates thrombin 2) Interferes with vitamin K reduction
	Action:	Reduce blood coagulation
	Side effects:	Haemorrhage
FIBRINOLYTICS	**Examples:**	Streptokinase, Urokinase, Tissue Plasminogen Activator (TPA)
	Uses:	Reduce thromboses
	Mechanism:	Activate plasminogen
	Action:	Encourage breakdown of fibrin
	Side effects:	Bleeding
ANTI-FIBRINOLYTICS	**Examples:**	1) Tranexamic acid, Aminocaproic acid (Less potent) 2) Aprotinin
	Uses:	Reduce bleeding
	Mechanism:	1) Inhibition of plasminogen activation 2) Inhibits proteolytic enzymes
	Action:	Promote blood coagulation
	Side effects:	Thrombosis

ASTHMA (Also see above)

ANTI-ALLERGY DRUGS	**Examples:**	Cromoglycate, Nedocromil
	Uses:	Prevent asthma attacks
	Mechanism:	Unknown. Possibly inhibit release of inflammatory mediators or inhibit bronchoconstrictor reflexes
	Action:	Prevent inflammation or bronchoconstriction

METHYLXANTHINES	**Examples:**	Theobromine, Theophylline
	Uses:	Asthma
	Mechanism:	Inhibit cAMP & cGMP phosphodiesterases, preventing their catabolism. Competitive antagonism of adenosine.
	Action:	Smooth muscle relaxation, bronchodilation.
	Side effects:	Tachycardia and arrhythmia (+ve inotropic & chronotropic effect), tremor
LEUKOTRIENE RECEPTOR ANTAGONISTS	**Examples:**	Montelukast
	Uses:	Asthma
	Mechanism:	Antagonise action of LTD4

FERTILITY

GnRH	**Examples:**	Gonadorelin
	Uses:	Pulsatile dosing - stimulate ovulation OR Continuous dosing - treat endometriosis, precocious puberty and sex-hormone-dependent tumours
	Action:	Simulates effects of GnRH. Pulsatile dosing - stimulates LH/FSH production. Continuous dosing - inhibits LH/FSH production
GONADATROPHINS	**Examples:**	Human chorionic gonadotrophin, menotrophin
	Uses:	Treat female infertility (Due to pituitary insufficiency). Treat cryptorchidism (Undescended testis)
	Action:	Simulates effects of gonadotrophins
OESTROGENS	**Examples:**	Ethinyloestradiol, mestranol
	Uses:	HRT, oral contraceptives, hormone-dependent tumours, menopausal symptoms
	Action:	Simulates effects of oestrogens
OESTROGEN ANTAGONISTS	**Examples:**	1) Clomiphene 2) Tamoxifen
	Uses:	1) Induce ovulation 2) Breast cancer?
	Action:	Antagonise oestrogen receptors. Tamoxifen acts on peripheral oestrogen receptors

PROGESTOGENS	**Examples:**	Progesterone (Injection only), Norethisterone (Oral), Danazol
	Uses:	Contraceptives
	Action:	Simulate effects of progesterone. Danazol inhibits gonadotrophin secretion
ANDROGENS	**Examples:**	Testosterone, Fluoxymesterone, Nandrolone
	Uses:	HRT, treatment of certain tumours
	Action:	Simulate effects of androgens

ANTI-VIRALS

INHIBITORS OF ATTACHMENT TO/ PENETRATION OF HOST CELL	**Examples:**	Amatidine
	Uses:	Influenza A
INHIBITION OF REVERSE TRANSCRIPTASE	**Examples:**	DDC, AZT (Zidovudine), DDL, 3TC (Lamivudine)
	Uses:	HIV
INHIBITION OF DNA POLYMERASE	**Examples:**	1) Iodoxuridine 2) Acyclovir, Vidaribine 3)Ganciclovir
	Uses:	1) HSV 2) HSV & Varicella-Zoster viruses 3) CMV retinitis
INHIBITION OF PROTEIN TRANSLATION & VIRUS ASSEMBLY	**Examples:**	Interferons
INHIBITION OF VIRAL RELEASE	**Examples:**	Oseltamavir, Zanamavir
	Uses:	Influenza A

ANTIBIOTICS

PENICILLINS	**Examples:**	Benzylpenicillin, Flucloxacillin (Basically anything ending in -cillin)
	Uses:	Broad spectrum. Gram positive bacteria.
	Mechanism:	Act on peptidoglycan. Inhibit transpeptidase.

β-LACTAMS	**Examples:**	Penams, Cephalosporins, Monobactams, Carbapenams (Broad antibiotic class)
	Uses:	Broad spectrum. Usually given with a β-lactamase inhibitor such as clavulanic acid
	Mechanism:	Act on peptidoglycan. Prevent cross-linking.
TETRACYCLINES	**Examples:**	Tetracycline, Doxycycline
	Uses:	Broad spectrum
	Mechanism:	Inhibit protein synthesis. Prevent binding of tRNA to amino acids.
ANTI-METABOLITES	**Examples:**	Trimethroprim, Sulphonamides
	Uses:	Broad spectrum
	Mechanism:	Prevent DNA replication. Decrease nucleotide generation.
QUINOLONES	**Examples:**	Levofloxacin, Trovafloxacin
	Uses:	Broad spectrum
	Mechanism:	Prevent DNA replication
COMPLEX GLYCOPEPTIDES	**Examples:**	Vancomycin
	Uses:	Gram positive bacteria
	Mechanism:	Acts on peptidoglycan. Prevents incorporation of NAM & NAG peptide subunits
MACROLIDES	**Examples:**	Erythromycin
	Uses:	Gram positive bacteria
	Mechanism:	Inhibit protein synthesis. Prevent translocation along ribosomes
AMINOGLYCOSIDES	**Examples:**	Entamicin, Tobramycin, Streptomycin, Neomycin
	Uses:	Gram negative bacteria
	Mechanism:	Inhibit protein synthesis. Prevent codon-anticodon recognition of tRNA
POLYMYXINS	**Examples:**	Polymyxin B
	Uses:	Gram negative bacteria
	Mechanism:	Act on cell membrane/envelope. Allow free acces through (“Puncture”)