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DENT 3005:Introduction to Pharmacology

Endocrine drugs: Diabetes

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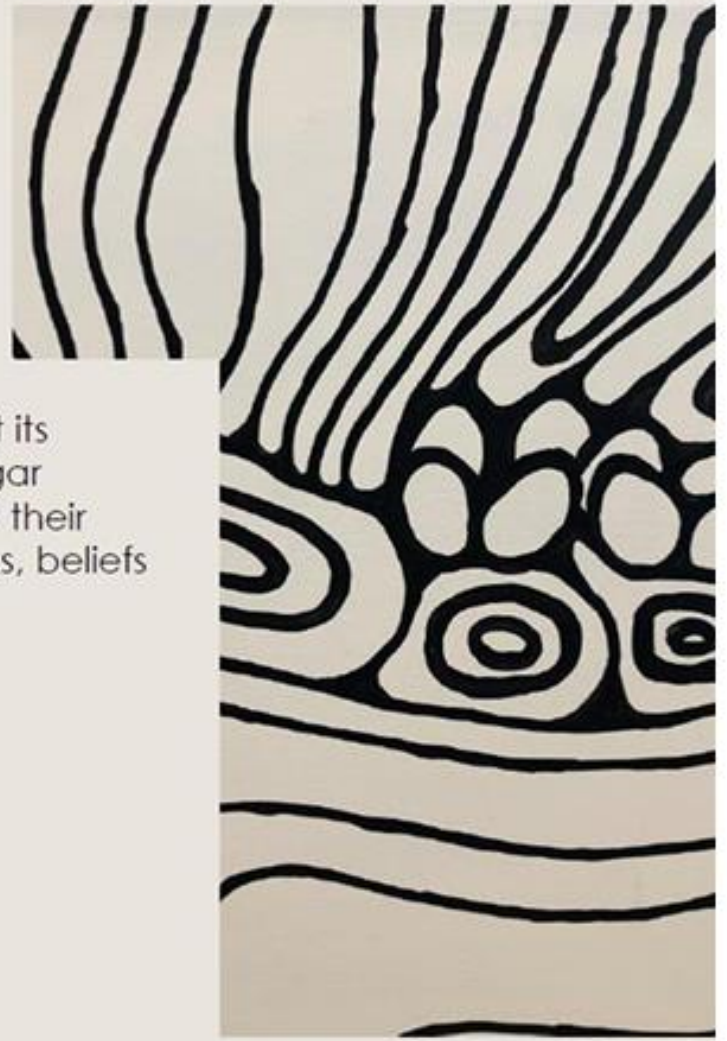
Acknowledgement of country

The University of Western Australia acknowledges that its campus is situated on Noongar land, and that Noongar people remain the spiritual and cultural custodians of their land, and continue to practise their values, languages, beliefs and knowledge.



Artist: Dr Richard Barry Walley OAM

Learning Outcomes

Learning objectives

1) Understand the different types of diabetes
2) Identify and differentiate between major classes of drugs for diabetes
3) Recognise oral and dental side effects of these drugs
4) Understand drugs interactions with dental medications
5) Understand the impact of diabetes on oral health
6) Applied knowledge to clinical scenarios

Diabetes Mellitus

- **Diabetes mellitus: high blood glucose**
  - Different to diabetes insipidus
  - Insulin: hormone made by pancreas helps bring glucose into cells
  - Diabetic patients: not enough insulin or insulin not effective → glucose cannot reach the cells
  - Complications: eyes, kidneys, nerves, heart, cancer
- **Types**
  - T1DM
  - T2DM
  - Insulin resistant
  - Gestational diabetes
  - Other

Classification of Diabetes

- **Type 1 DM**
- Autoimmune destruction of B-cells
- Young children & adults
- Life-long insulin therapy

- **Type 2 DM**
- Insulin resistance & B-cell dysfunction
- Pancreas loses ability to produce insulin
- Obesity, physical inactivity, genetic

- **Gestational**
- During pregnancy in women who did not have DM
- Increase risks of mother & child developing T2DM later

- **Other**
- Genetic defects of B-cell function
- Genetic defect in insulin action
- Disease of exocrine pancreas
- Endocrinopathies
- Many more

Other types (Rare) *(cont.)*

- **Diseases of the Exocrine Pancreas**
  - Conditions that damage the pancreas – *pancreatitis, cystic fibrosis, hemochromatosis, pancreatic cancer*
  - Exocrine pancreas – responsible for producing digestive enzymes; damage to this part – impairs insulin production
- **Endocrinopathies**
  - Hormonal disorders that affect endocrine system
  - E.g. *Cushing's syndrome (excess cortisol), acromegaly (excess growth hormone), hyperthyroidism*
  - Cause insulin resistance – leading to hyperglycemia
- **Drug/ Chemical- induced Diabetes**
  - Certain medications and chemicals can impair insulin secretion or action
  - E.g. *glucocorticoids (used in the treatment of inflammation), antipsychotics, immunosuppressants* – can cause hyperglycemia
  - α-interferons – used in the treatment of hepatitis, can lead to diabetes, in genetically predisposed individuals
- **Infection-Related Diabetes**
  - Some infections damage the pancreas or lead to insulin resistance
  - E.g. *Rubella, cytomegalovirus*
- **Uncommon forms of Immune-Mediated Diabetes**
  - Immune system attacks insulin or insulin-producing cells, different from Type-1 diabetes
  - E.g. stiff-man syndrome – antibodies attack insulin-producing cells in the pancreas
- **Other Genetic syndromes associated with Diabetes**
  - Certain genetic syndromes have a higher incidence of diabetes due to associated insulin resistance or β-cell dysfunction
  - E.g. *Down syndrome, Turner syndrome, Klinefelters syndrome, Prader-Willi syndrome*
- **Post-transplant Diabetes Mellitus (PTDM)**
  - Occur after organ transplantation – due to the use of immunosuppressive drugs like corticosteroids or calcineurin inhibitors
  - Cause insulin resistance or β-cell dysfunction

Type 1 Diabetes Mellitus	Type 2 Diabetes Mellitus
Autoimmune-mediated β-cell destruction	No Autoimmune-mediated β-cell destruction; **Insulin resistance / Decline in Insulin production over time**
Autoantibodies like anti-GAD and Islet cell antibodies that attack pancreatic β-cells **present**	**Autoantibodies absent**
Genetic link	**Stronger genetic link**
Age of onset- younger (children/adolescents/young adults) than **25-30 years**	**Age of onset usually in adults over 40-45**, but seen in younger people due to obesity
Faster onset of symptoms & can be severe – excessive thirst, frequent urination, unintended weight loss, fatigue	**Slower onset of symptoms & maybe less noticeable**
Lifelong insulin therapy – as pancreas produce little to no insulin	**Diet control & oral hypoglycemic medications often sufficient for control**, Insulin therapy required if disease progresses
Patients often normal weight, or may experience weight loss before diagnosis	**Most patients are overweight/obese**
High risk of **diabetic ketoacidosis (DKA)** – life threatening	DKA is rare, but **hyperosmolar hyperglycemic state (HHS)** can occur

Glucose metabolism pathway

- The processes involved in the **utilization** and **regulation** of glucose
- Glucose: primary source of energy for cells, regulated by hormones like insulin & glucagon
- Stages
  - Digestion
  - Absorption
  - Glycolysis
  - Krebs cycle
  - Oxidative phosphorylation
  - Gluconeogenesis

Insulin

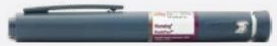
- Proinsulin synthesized in the β-cells of the pancreas
  - consists of insulin peptide and C- peptide
- In the β-cells, proinsulin is cleaved → active insulin and inactive C-peptide
- Active insulin peptide released into the bloodstream to regulate blood glucose levels
- Indication: Diabetes mellitus
  - **Not Diabetes insipidus
- Hypoglycaemia: most frequent & common serious adverse effect

RAPID-ACTING INSULIN

Onset ~5 minutes

Duration 4-5 hours

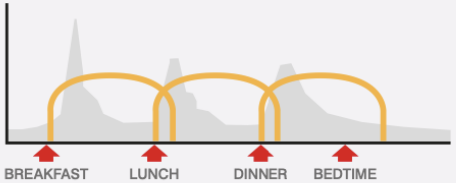

NOVORAPID®


HUMALOG®


APIDRA®


FIASP®
Ultra-rapid acting, can be given just after meal

SHORT-ACTING INSULIN



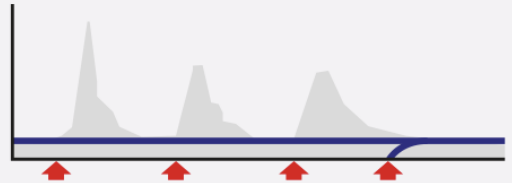
Onset 30 minutes

Duration Up to 6 hours


ACTRAPID®


HUMULIN R®

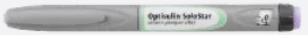
LONG-ACTING INSULIN



Onset 2-4 hours

Duration ~24 hours (longer for Toujeo)


TOUJEO®
300U/mL


OPTISULIN®

PREMIX INSULIN (HUMAN)

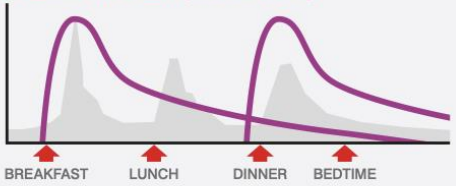
Onset 30 minutes

Duration 10-16 hours


MIXTARD 30®


MIXTARD 50®

PREMIX INSULIN (ANALOGUE)



Onset 5-15 minutes

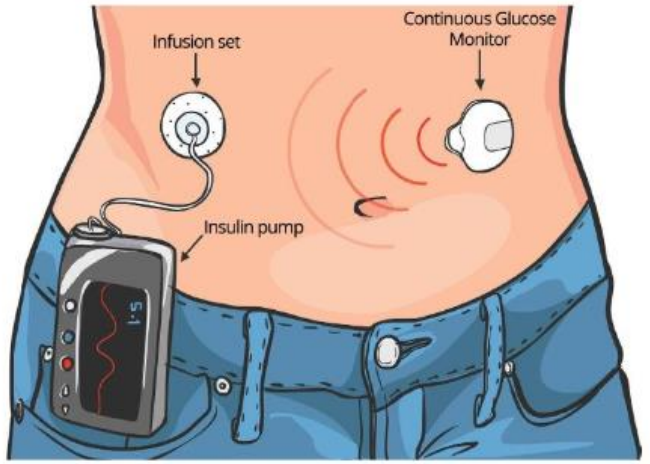
Duration 10-16 hours


NOVOMIX30®


HUMALOG MIX 25®


HUMALOG MIX 50®


RYZODEG 70®
degludec lasts >24 hours



Insulin type (brand®)	Activity[1]	Comments
Ultra-short-acting (analogues)		

faster-acting insulin aspart (Fiasp)	• *onset*: 5–15 minutes
	• *peak*: 0.5–1.5 hours
	• *duration*: 3–5 hours
		• give at start of meal, or up to 20 minutes after starting it
		• clear solution
		• do not mix with other insulins; inject separately
		• compared to standard insulin aspart:
		  ◦ marginally faster time to effect (but unclear if this is clinically meaningful)
		  ◦ may increase infusion site reactions and need for non-routine change of infusion pump

insulin aspart (NovoRapid)	• *onset*: 10–15 minutes • *peak*: 1–1.5 hours • *duration*: 3–5 hours	• give immediately before meals • clear solution
insulin lispro[2] (Humalog)		
insulin glulisine (Apidra)		

Short-acting		
neutral insulin[3] (Actrapid, Humulin R)	• *onset*: 30 minutes • *peak*: 2–3 hours • *duration*: 6–8 hours	• give within 30 minutes before meal • soluble insulin • clear solution
Long-acting		
isophane insulin (Humulin NPH, Protaphane)	• *onset*: 1–2.5 hours • *peak*: 4–12 hours • *duration*: 16–24 hours	• also known as intermediate-acting insulins • give once or twice daily • cloudy solution
Long-acting (analogues)		
insulin detemir (Levemir)	• *onset*: 1–2 hours • *peak*: 6–8 hours • *duration*: 12–24 hours	• give once or, more commonly, twice daily (effect often wears off before 24 hours) • clear solution • do not mix with other insulins; inject separately
insulin glargine 100 units/mL (Optisulin), 300 units/mL (Toujeo)	• *onset*: 1–2 hours (100 units/mL); 1–6 hours (300 units/mL) • *no peak* • *duration*: 24 hours (100 units/mL); 24–36 hours (300 units/mL)	• give once daily • provides a constant basal insulin level • do not mix with other insulins; inject separately • clear solution • the 2 strengths are **not** directly interchangeable

Mixed (short-acting with long-acting)		
neutral insulin with isophane (Humulin 30/70)	• *onset*: 0.5–1 hours • *peak*: 2–12 hours • *duration*: 16–24 hours	• give within 30 minutes before meal(s) • also known as biphasic insulins • give once or twice daily • cloudy solution
Mixed, analogues (ultra-short-acting with long-acting)		
insulin aspart with aspart protamine (NovoMix 30)	• *onset*: 10–15 minutes • *peak*: 1 hour • *duration*: 16–18 hours	• also known as biphasic insulins • give once or twice daily • give immediately before meal(s) • cloudy solution
insulin lispro with lispro protamine (Humalog Mix25, Humalog Mix50)		

insulin aspart with degludec (Ryzodeg)[4]	• *onset*: 10–15 minutes
	• *peak*: 1.25 hours
	• *duration*: >24 hours
		• also known as biphasic insulin
		• give once or twice daily
		• give immediately before largest carbohydrate meal(s)
		• clear solution
		• degludec is an ultra-long acting insulin:
		  ◦ it provides a constant basal insulin level
		  ◦ its glucose-lowering effect persists longer than that of insulin glargine

Metformin

- First line
- **MOA:** Reduces hepatic glucose production; increases peripheral utilisation of glucose
- **ADR:** taste disturbance
- No weight gain ☺

Generic name	Brand Name
Metformin IR	Diabex, Diaformin, Metex
Metformin MR	Diabex XR, Diaformin XR, Metex XR

Metformin combinations

Alogliptin with metformin

Dapagliflozin with metformin

Empagliflozin with metformin

Linagliptin with metformin

Metformin with glibenclamide

Saxagliptin with metformin

Sitagliptin with metformin

Vildagliptin with metformin

Sulfonylureas

- MOA: Increase pancreatic insulin secretion
- ADR: hypoglycaemia, weight gain
  - Taste alteration (metallic)

Generic name	Brand Name
Glibenclamide	Daonil
Gliclazide	Diamicron
Glimepiride	Glimepiride
Glipizide	Minidiab

Dipeptidyl peptidase 4 inhibitors

- Inhibit dipeptidyl peptidase-4 (DPP-4)
- ADR: headache, musculoskeletal pain
  - Hypoglycemia: combination w/ insulin or sulfonylurea

Dipeptidyl peptidase-4 inhibitors

- Alogliptin
- Alogliptin with metformin
- Linagliptin
- Linagliptin with metformin
- Saxagliptin
- Saxagliptin with dapagliflozin
- Saxagliptin with metformin
- Sitagliptin
- Sitagliptin with metformin
- Vildagliptin
- Vildagliptin with metformin

Glucagon like peptide 1 analogues

- Analogues of glucagon-like peptide-1 (an incretin)
- ADR: gastrointestinal sx, hypoglycaemia (+SU/insulin)

Generic name	Brand Name
Dulaglutide	Trulicity
Liraglutide	Saxenda
Semaglutide	Ozempic

Sodium-glucose co-transporter 2 inhibitors

- Inhibit sodium-glucose co-transporter 2, reducing glucose reabsorption in the kidney (and increasing its excretion in the urine)
- ADR: genital infections, polyuria, dysuria, UTI, dyslipidaemia, hypoglycaemia (+SU/insulin)

Generic name	Brand Name
Dapaglifozin +metformin	Forxiga Xigduo
Empaglifozin +linagliptin +metformin	Jardiance Glyxambi Jardiamet

Other drugs for diabetes

- **Acarbose**
  - Inhibiting alpha-glucosidase enzymes in the small intestine
  - ADR: flatulence, diarrhoea, abdominal pain and distension
- **Pioglitazone**
  - Agonist of peroxisome proliferator-activated receptor gamma
  - ADR: peripheral oedema, weight gain, headache, dizziness +++
- **Tirzepatide**
  - Agonist at glucose-dependent insulinotropic polypeptide and glucagon-like peptide-1 receptors
  - ADR: gastrointestinal sx, hypoglycaemia (+SU/insulin)

Figure 13.49 Management of hypoglycaemia in dental practice

If the patient is conscious and cooperative:

- Stop dental treatment.
- Give glucose if available:
  - adult: 15 g
  - child 5 years or younger, or up to 25 kg: 5 g
  - child 6 years or older, or more than 25 kg: 10 g
- If glucose is not available, give a fast-acting glucose-containing food or drink [NB1].
- If after 15 minutes the blood glucose concentration has not returned to normal or the symptoms have not improved, repeat the dose of glucose.
- If three or more portions of glucose are needed to restore the blood glucose concentration to normal, seek medical advice.
- If symptoms have improved, the patient should eat a longer-acting carbohydrate (eg sandwich, dried fruit, yoghurt) to prevent recurrence of hypoglycaemia.
- Keep the patient under observation until recovered. Do not allow them to drive home. Strongly advise medical review.

If the patient is drowsy, uncooperative or unconscious:

- Stop dental treatment.
- Call 000.
- If the patient is unconscious, start basic life support (for 'Basic life support flow chart', see Figure 13.43).

NB1: Examples of food and drink containing **15 g** of glucose include: 15 g of easily absorbed carbohydrate (eg 6 to 7 regular glucose jelly beans, 4 large glucose jelly beans); three teaspoons of sugar or honey; 125 mL of fruit juice (approximately one glass or a small popper or box); 150 mL of soft drink (not 'diet'); 100 mL of oral glucose solution (eg Lucozade).

Diabetes Dental implications

- Drug implications: not many
  - Hypoglycemic effects: learn management
  - Taste disturbance
- Lowered resistance to infections
- Routine dental visits
- Oral manifestations
  - Periodontal disease
  - Tooth decay
  - Oral candidiasis
  - Taste disturbances
  - Xerostomia
- Patient’s considerations
  - Blood glucose control
  - Hypoglycemia

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DENT 5003:Introduction to Pharmacology

Endocrine drugs: Thyroid disorders

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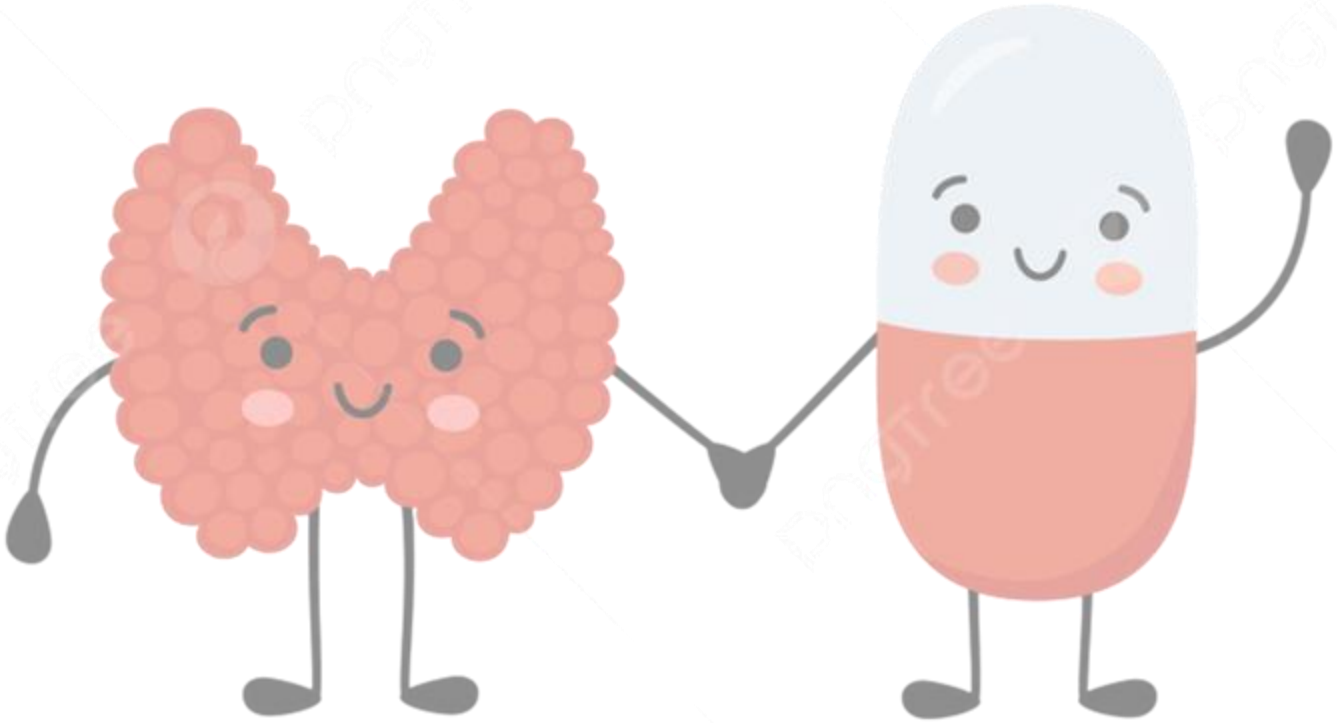
Learning Outcomes

Learning objectives

1) Broad understanding of the pituitary gland
2) Broad understanding of thyroid disorders
3) Understand implications of thyroid disorder in the dental setting
4) Identify drugs used for thyroid disorders and recognise oral and dental side effects of these drugs
5) Understand drugs interactions with dental medications
6) Applied knowledge to clinical scenarios

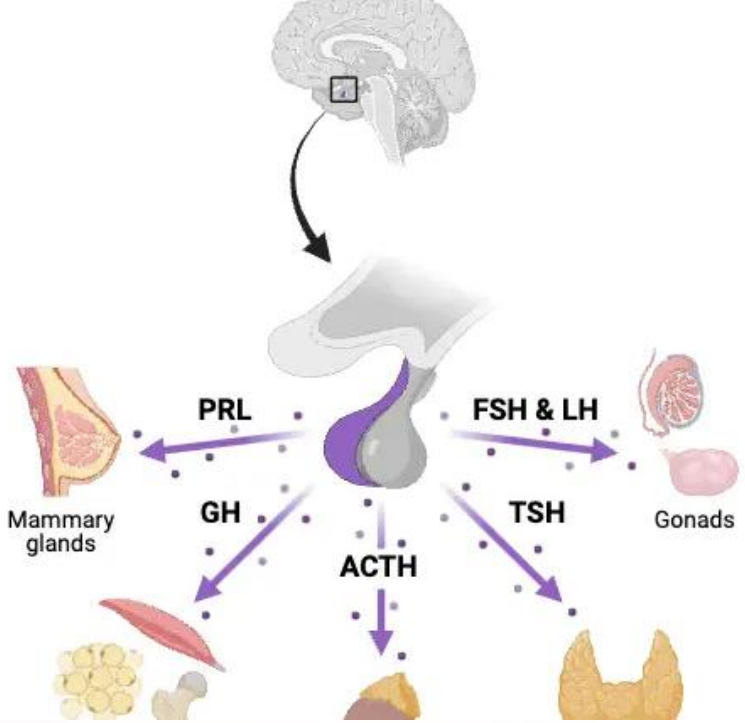


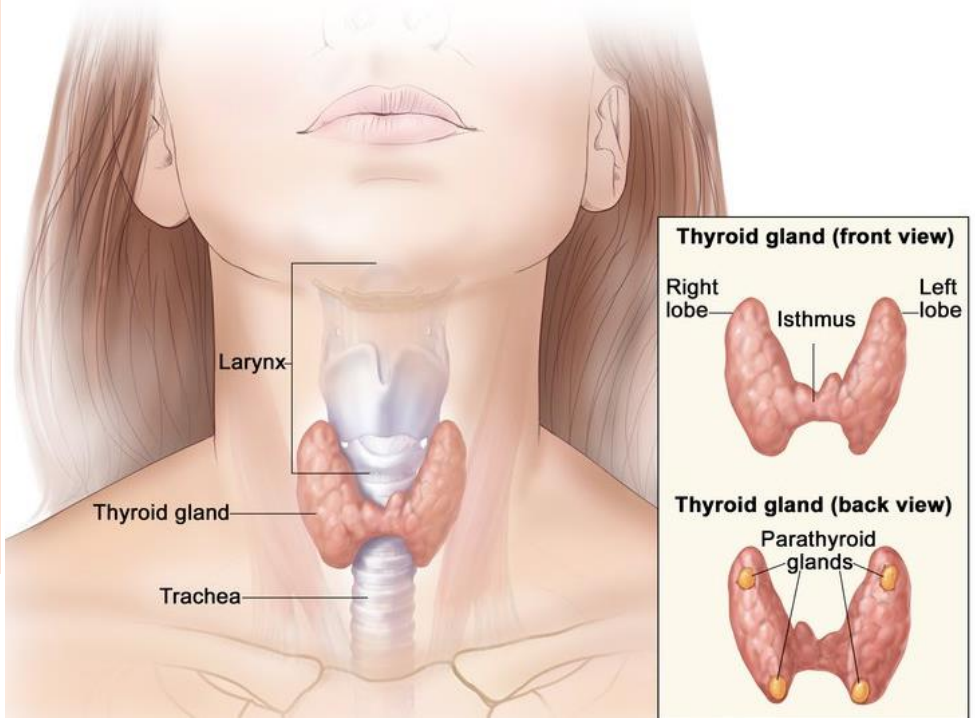
The pituitary gland

- *RECAP → A major endocrine gland!*
  - *Produces a wide variety or hormones that travels to regulate other glands & organs in the body*
- *Anterior lobe: GH, ACTH, TSH, FSH, LH*
- *Posterior lobe: ADH, oxytocin*

The thyroid gland

- Regulates key metabolic processes
- Produces two main hormones
  - **Triiodothyronine (T3)**
  - **Thyroxine (T4)**
- Controlled by **Thyroid-Stimulating Hormone (TSH)** from the anterior pituitary gland!
- Proper thyroid function is crucial for metabolic balance and overall health





Thyroid disorders

- Thyroid disorders can be overactive (hyperthyroidism) or underactive (hypothyroidism)
- TSH elevation → hypothyroidism
- Rationale for treatment: relieve sx, restore & maintain euthyroid state
  - Hypothyroidism: maintain normal growth & intellectual development in children

	Hypothyroidism	Hyperthyroidism
Drug Therapy	Thyroid hormones (Levothyroxine, liothyronine)	Antithyroid drugs Levothyroxine Iodine Beta blockers: short term sx relief

	Hypothyroidism	Hyperthyroidism
Symptoms	• Tiredness and low energy levels • Weight gain • Constipation • Dry, coarse skin • Puffy face • Hair loss • Slowed heart rate • Muscle aches and weakness • Depression • Problems with concentration • Intolerance to cold	• Rapid or irregular heartbeat • Unexplained weight loss • Increased appetite • Anxiety and irritability • Sleep problems • Sweating • Fine, brittle hair • Diarrhea • Sensitivity to heat • Weak/less frequent menstrual period
Causes	• The immune system attacking the thyroid gland • Damage to the thyroid during treatment for an overactive thyroid or thyroid cancer	• Graves' disease • Toxic nodular goitre • Thyroiditis • Post-partum thyroiditis • Taking too much thyroid medicine • Having too much iodine in your system

Drugs for thyroid disorders

- **Thyroid hormones**
  - Levothyroxine T_4: hypothyroidism, block-replacement regimen in hyperthyroidism
  - Liothyronine: severe hypothyroidism
- **Anti-thyroid drugs:** block thyroid hormone synthesis
  - Carbimazole
  - Propylthiouracil: inH T4→T3 conversion
- **Iodine**
  - Transiently inhibits thyroid hormone release
  - Indication: short-term use before surgery for graves disease

Generic name	Brand Name
Levothyroxine	Eutroxisg, Thyroxine Oroxine
Liothyronine	Tertroxin
Carbimazole	Neo-mercazole, Thirazol
Propylthiouracil	PTU
Iodine	Iodine sol aq

Thyroid drugs Dental implications

- **Levothyroxine & Liothyronine**
  - ADR associated w/ excessive dosages, corresponds to sx of hyperthyroidism
  - Manage accordingly

Thyroid disorder Dental implications

- **Hypothyroidism**
  - Affects younger population
  - Delayed eruption of primary and permanent teeth
  - Malocclusion (misalignment of teeth)
  - Skeletal growth retardation
  - Tongue enlargement (**macroglossia**) and scalloping
- **Hyperthyroidism**
  - **Osteoporosis of the alveolar bone** → tooth mobility, complications with extractions, increased risk of periodontal disease
  - Higher incidence of **dental caries** and **periodontal disease**
  - Accelerated **development of jaws and teeth** in children
  - **Early eruption** of permanent teeth / **Early loss** of deciduous teeth
  - Gingival changes: **inflammation, enlargement, tenderness**

THE UNIVERSITY OF WESTERN AUSTRALIA

DENT 3005:Introduction to Pharmacology

Endocrine drugs: Adrenal insufficiency

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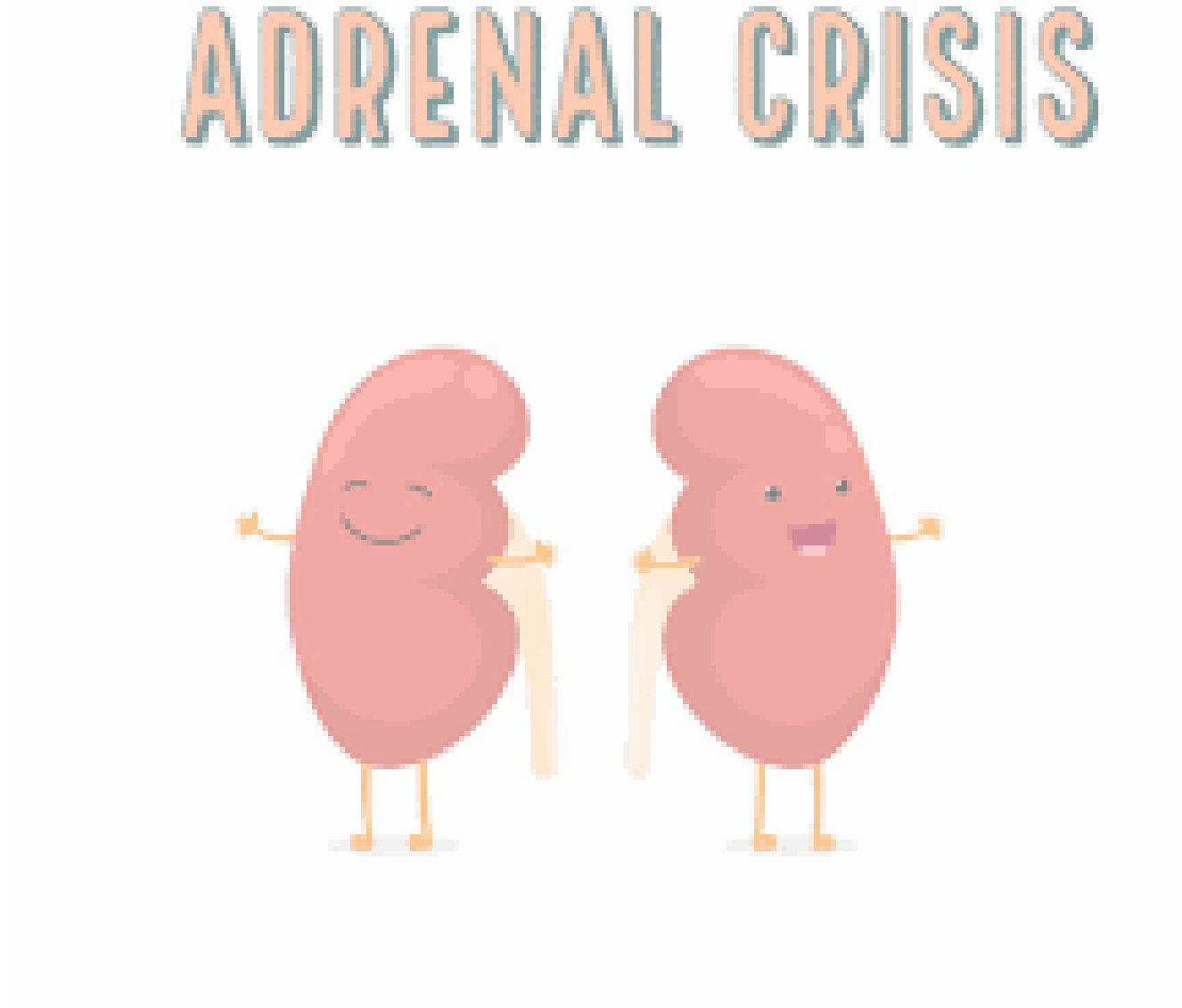
Learning Outcomes

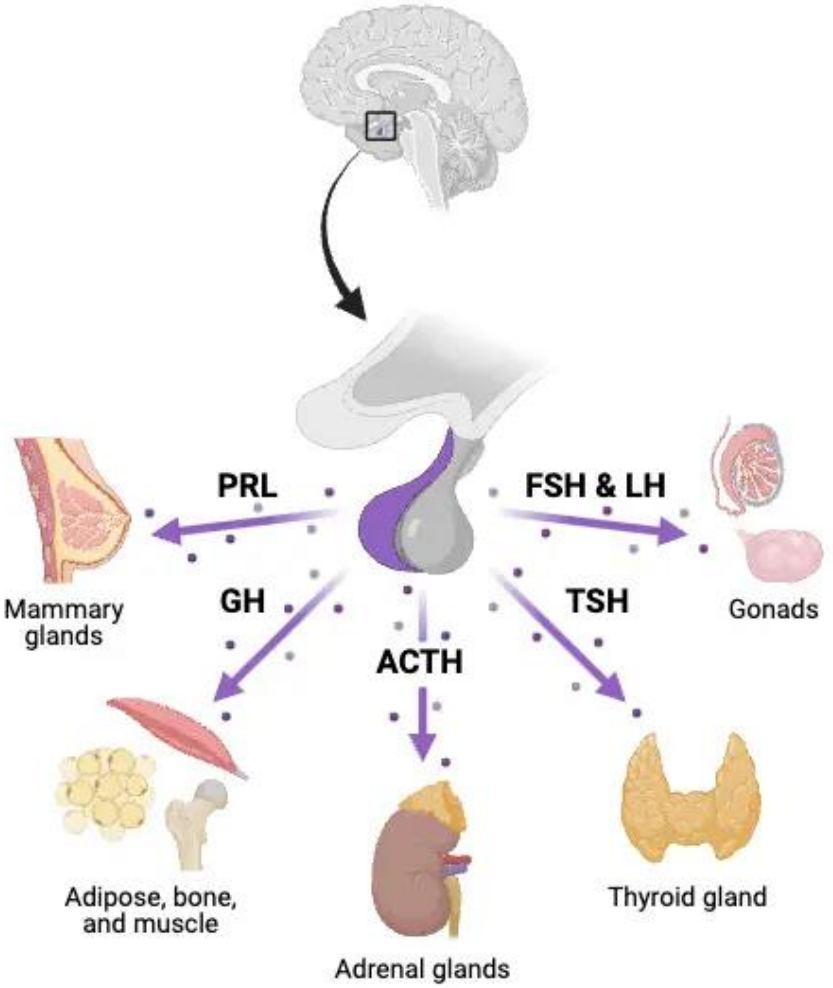
Learning objectives

1) Broad understanding of the pituitary gland ☺
2) Broad understanding of adrenal insufficiency
3) Identify drugs used for adrenal insufficiency and recognise oral and dental side effects of these drugs
4) Understand drugs interactions with dental medications
5) Broad understanding of other endocrine drugs
6) Applied knowledge to clinical scenarios



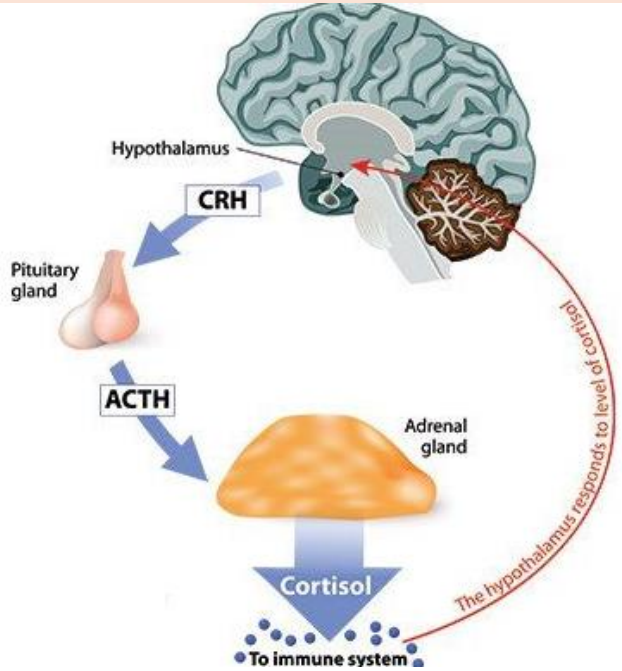
The pituitary Gland

- A teenie tiny gland at the base of the brain: small but mighty!
- A major endocrine gland!
  - Produces a wide variety or hormones that travels to regulate other glands & organs in the body
- Anterior lobe: GH, ACTH, TSH, FSH, LH
- Posterior lobe: ADH, oxytocin



Adrenal Insufficiency

- Adrenal insufficiency: insufficient production of cortisol & aldosterone
- Hypothalamus releases CRH → anterior pituitary release ACTH → adrenal gland to produce cortisol
- Function of cortisol
  - Regulate blood pressure, blood glucose, body's response to stress
  - Too much → Cushing's
  - Too little → Addison's or hypopituitarism



Symptoms
Extreme fatigue Muscle weakness Loss of appetite and weight loss Low blood pressure Nausea and vomiting Abdominal pain Hyperpigmentation (darkening of skin) in some cases Salt cravings

Drugs for adrenal insufficiency

- Corticosteroids ☺ replacement therapy
- **Hydrocortisone & cortisone preferred:** glucocorticoid replacement
- **Fludrocortisone:** mineralocorticoid replacement w/ one of the above
- Monitor adverse effect & titrate dose accordingly
- Increase dose during intercurrent illness & periods of stress
    - Major stress req parenteral administration

Generic name	Brand Name
Cortisone	Cortate
Fludrocortisone	Florinef
Hydrocortisone	Hysone, Solu-Cortef inj

Corticosteroids ADRs

- Infection
- Delayed wound healing
- Steroid rosacea
- Perioral dermatitis
- Skin atrophy
- Bruising
- Acne
- Facial flushing
- Pupura
- Depigmentation
- Telangiecstasia
- Steroid induced crushing's

Adrenal insufficiency

Dental implications

- **Immunosuppression**
- **Adrenocortical suppression**
  - Dose & duration varies btw patients
  - Oral pred 10mg od >3wks → suppression
  - High dose inhaled, topical or intra-articular → suppression
  - Risks: Addisonian Crisis!
  - Plan morning appointments
  - Ensure patient is looked after for remainder of day
  - Seek urgent medical attention: sx of acute adrenal insufficiency

Adrenal insufficiency

Dental management

- **Non-invasive procedures: examination, impressions, diagnostic radiographs**
  - Advise patient to take usual dose of their corticosteroid
- **Invasive procedure <1hr (outpatient setting)**
  - Scale, restorative, extraction, debridement, implant
  - Patient at risks of suppression: req increase corticosteroid dose
  - Consult their medical GP for dosing strategy
  - Start dose on morning of procedure
- **Invasive procedure >1hr or requiring sedation, GA or fasting**
  - DEFER & REFER!!!

Other endocrine drugs

- **Drugs for other endocrine disorders**
  - **Androgens**
    - Testosterone (men)
    - Testosterone (women)
  - **Antidiuretic hormone agonists and antagonists**
    - Argipressin
    - Demeclocycline
    - Desmopressin (endocrine)
    - Terlipressin
  - **Growth hormone**
    - Somatrogon
    - Somatropin
  - **Nonselective alpha-blockers**
    - Phenoxybenzamine
    - Phentolamine
  - **Somatostatin analogues**
    - Lanreotide
    - Octreotide

Other endocrine drugs: testosterone

- **Androgens aka anabolic steroids:** testosterone
  - **Men:** Confirmed androgen deficiency in men due to hypothalamic-pituitary or testicular disorder, Male delayed puberty (seek specialist advice)
  - **Women:** Postmenopausal low libido with associated distress (hypoactive sexual desire dysfunction) when other measures (eg education, addressing modifiable biopsychosocial **factors) have failed**
- **Misuse:** athletes to increase muscle mass BUT serious adverse effects!
  - Aggressive behaviour, psychological dependence, withdrawal symptoms, sodium and water retention, oedema
  - Men: Testicular atrophy, impotence or priapism
  - Women: amenorrhoea, clitoral enlargement, voice change, virilisation or hirsutism
- **Men:** Androforte, Testogel, Testavan, Reandron 1000, Primiteston Depot, Sustanon inj
- **Women:** Androfeme

Anti-diuretic hormones agonists & antagonists

	Argipressin aka ADH/vasopressin	Demeclocycline (tetracycline AB)	Desmopressin	Terlipressin aka triglycyl-lysine-vasopressin
MOA	Increase tubular reabsorption of water, vasoconstrict	Antagonises the effect of antidiuretic hormone on renal tubules, promoting excretion of free water	Increases tubular reabsorption of water; increases factor VIII and von Willebrand's factor coagulation activity.	Vasoconstrictor
Indication	Central diabetes insipidus	Persistent marked SIADH resistant to fluid restriction and high salt intake	Central diabetes insipidus Nocturnal enuresis Nocturia due to idiopathic nocturnal polyuria Control of bleeding in patients with mild or moderate haemophilia and type I von Willebrand's disease	Bleeding oesophageal varices Type 1 hepatorenal syndrome
Brand	Pitressin inj	Only available through SAS	Minirin, Octostim	Glypressin inj, Terlipressin inj

Growth hormones

- MOA: Promotes growth of skeletal, muscular and other tissues; stimulates protein synthesis and influences fat, carbohydrate and mineral metabolism.
- Indications: As detailed in the **PBS Growth Hormone Program**

Non-selective alpha blockers

- MOA: Block the effects of adrenaline and noradrenaline at $alpha_1$ and $alpha_2$ receptors
- Indications: Phaeochromocytoma

Somatostatin analogues

- MOA: Inhibit release of growth hormone and of various peptides of the gastro-entero-pancreatic endocrine system
- Indications: Acromegaly, relief of symptoms associated with gastro-entero-pancreatic neuroendocrine tumours

Generic name	Brand Name
Growth hormones	
Somatrogon	Ngenla inj
Somatropin	Saizen inj
NSABs	
Phenoxybenzamine	Dibenyline
Phentolamine	Only thru SAS
Somatostatin analogues	
Lanreotide	Mytolac inj
Octreotide	Sandostatin inj

Other Dental implications

- **Androgens: worsening of sleep apnea**
- **Demeclocycline (applies for all tetracyclines)**
  - Children: teeth discolouration, enamel dysplasia
  - Pregnancy: discoloration od deciduous teeth in babies
- **Terlipressin: drug interaction w/ erythromycin**
  - May trigger irregular beating of heart
- **Growth hormones: watch for limping**
  - May indicate development of a slipped capital epiphysis → direct patient to see their MGP
- **Non-selective alpha blockers: orthostatic hypotension, dizziness, drowsiness**

THE UNIVERSITY OF WESTERN AUSTRALIA

DENT 3005:Introduction to Pharmacology

Endocrine Drugs: Drugs for Infertility

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Learning Outcomes

Learning objectives

1) Broad understanding of drugs for infertility and their dental implications
2) Understand drugs interactions with dental medications
3) Applied knowledge to clinical scenarios

Drugs for infertility

- Highly specialist tx
- Clomiphene: 1st line for anovulatory infertility
  - Letrozole accepted (aromatase inH) main indication for hormone receptor +ve breast cancer
- Metformin: may be added in PCOS
- Assisted reproductive technology (IVF) may include GnRH agonists
- Progesterone: used for luteal phase support in assisted conception cycle

GnRH agonists

- AKA LH releasing hormone agonists
- MOA: GnRH initially stimulates synthesis of FSH and LH
- **Indications**
  - Endometriosis
  - Uterine fibroids
  - Endometrial thinning before endometrial ablation
  - Pituitary down-regulation to prepare for controlled ovarian stimulation
  - Central precocious puberty
  - Prostate cancer
  - Breast cancer

Generic name	Brand Name
Goserelin	Zoladex inj
Leuprorelin	Eligard inj, Lucrin depot
Nafarelin	Synarel nasal spray
Triptorelin	Decapeptyl inj Dephereline inj

Other drugs for infertility

- **Clomiphene**
  - **MOA:** Competitively antagonises estrogen receptors in the hypothalamus
  - **Indication:** anovulatory infertility
- **ADR (dental implications)**
  - Clomiphene: dizziness
  - Letrozole: vertigo, dry mouth
  - Metformin: see diabetes lecture

Generic name
Clomiphene
Letrozole
Metformin
Progesterone

Infertility drugs Dental implications

- **Hormonal changes**
  - Infertility medications can cause hormonal imbalances, which can affect the tissues in the mouth, making them more susceptible to inflammation and gum disease
  - Some patients are not comfortable taking intraoral radiographs, patient education is important but routine radiographs may have to be deferred especially if the patient has gone through a lot of difficulty to conceive they are most likely going to be extremely worried a lot of things
- **Triptorelin and letrozole:** dry mouth
- **Clomiphene:** Watch out for dizziness & light headedness

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