Insulin Management

By Susan Henry Diabetes Specialist Nurse
The Discovery of Insulin

- 1921 - Banting & Best University Of Toronto
  Discovered hormone insulin in pancreatic extract
  of dog

- Marjorie the dog was injected with chilled
  of dog pancreas

- 14 year old boy called Leonard Thompson was
  the first patient to receive insulin injections for
  type 1 diabetes

- 1923 Nobel prize for discovery of insulin
Leonard Thompson 14 year old boy First patient treated with insulin 11\textsuperscript{th} January 1922 lived for another 13 years before dying of pneumonia aged 27 years
Insulin Treatment

• Type 1 diabetes – At diagnosis
• People with type 2 diabetes require insulin as the beta cells declined
• People with type 2 diabetes often use insulin in combination with oral therapies
Normal Insulin Secretion

Physiologic Blood Insulin Secretion Profile

Plasma Insulin (μU/mL)

Breakfast Lunch Dinner

Time

Insulin types

- Short Acting
- Rapid Acting
- Intermediate Acting
- Long Acting
- Mixtures
Short-Acting Insulin (Soluble)

- Mimics the short burst of insulin which is produced by people who do not have diabetes when someone has a meal containing carbohydrates

- Given 30 minutes before meals

- Given with background insulin (basal) – which could be an intermediate insulin or long acting insulin analogue
Short-acting (Soluble) Insulin

- E.g. Actrapid, Humulin S, Insuman Rapid
- Onset 30-45 minutes
- Duration 5-8 hours
- To correct hyperglycaemia
- Actrapid used for Variable/fixed rate insulin infusions
Rapid Acting Analogues

- Onset 15 minutes (e.g. Apidra, Humalog, Novorapid)
- Duration 4 hours
- Can be injected up to 15 minutes before meals, or just before eating
- Fewer hypoglycaemic events
- May be more effective in reducing post prandial hyperglycaemia than soluble insulin
- Used pre-meals with intermediate or long acting background insulin (multiple injection therapy)
Intermediate Acting Insulin

- This is basal/background Insulin

- Function is to supply a steady supply of background insulin to keep blood glucose levels steady in between meals and overnight. This mimics the steady and continuous supply of insulin produced by people who do not have diabetes.

- Normally given before breakfast/before bed or both

- In type 2 diabetes can be added onto oral therapy
Intermediate acting Insulin

- E.g. Insulatard, Humulin I, Insuman Basal
- Onset of action 2 hours
- Peak action 4-6 hours
- Duration of action up to 14 hours
- Can be used daily/twice daily on its own with oral therapy or in combination with analogue or short acting insulin
- Cloudy insulins need to mix well before use
Long Acting Insulin Analogues

Background Insulin/Basal Insulin

- Lantus & Levermir
- Onset – Up to 2 hours
- Clear insulin
- No distinct peak
- Action time 16-24 hours
- Levermir can be given twice daily
- Associated with lower risk of nocturnal hypos
Newer Longer Acting Insulin Analogues

• Tresiba (Degludec) – 100units/ml available in 3ml cartridge pen or pre-filled pen

• Tresiba – (Degludec) – 200units/ml available in pre-filled pen only delivers same dose in half the volume. Dose counter shows number of units irrespective of strength

• Basal Insulin lasting up to 42 hours – given once daily

• Can be used with oral therapy in type 2 diabetes, or basal bolus regime in type 1 & 2
Delivery Devices for Insulin

Pre filled pen

Cartridge pen

Insulin
Syringe &
Vial
Toujeo

- Basal/Background Insulin
- Can be used in combination with oral medication (type 2 diabetes) or basal bolus regime
- Insulin Glargine 300units/1ml- high strength insulin
- Dose counter shows number of units irrespective of strength and dose dialled
- Dose dialled is the dose administered and is the same as U100 insulin dose, but the volume of fluid is less
- Given once daily before breakfast or before bed
- Duration 24 hours or more
Insulin Regimes Basal only – Type 2

• Added into oral medications

• Can be good starting point if anxious about commencing insulin

• Simple to use and titrate

• Less blood glucose monitoring required

• Does not address meal time blood glucose
Mixed Insulin – Human

- Combination of Mealtime and intermediate acting insulin
- This is a mixture of soluble insulin with intermediate/isophane
- Given 20-30 minutes before breakfast and Evening Meal
- Humulin M3 – 30% soluble 70% Isophane insulin
  Duration up to 14 hours
- Generally used twice daily
- Suits people with regular lifestyle pattern
- Mixtures – cloudy insulin, re-suspend before use
Mixed Insulin – Analogue

- Examples are Novomix 30, Humalog Mix 25, Humalog Mix 50
- Given up to 15 minutes before food
- Cloudy insulin – re suspend before use
- Onset of action 5-15 minutes
- Duration up to 14 hours
- Usually given twice a day but Humalog Mix 50 can be given 3 times a day
Multiple Injection Therapy

- Produces an insulin profile that is closest to natural insulin production by the body
- Short acting soluble or rapid acting analogue insulin before meals, intermediate or long acting insulin usually before bed
- Offers greater flexibility for people with irregular lifestyle pattern
Preparing Insulin Injection

- Clean needle with every time – 4, 5 or 6mm needles
- Rock & Roll 10 times each for cloudy insulin only
- 2 unit air shot before every injection
- Injection technique
- Timing of insulin Injection in relation to meals – if giving quick acting or mixed insulin
Injection Sites
Side Effects Of Insulin

- **Hypoglycaemia** – Blood glucose drops below 4mmols. Very common side effect.

- **Mild allergic reactions** – Swelling, itching, and redness around injection site can be due to Preservative in Insulin

- **Lipohypertrophy** – Advice about site rotation when starting on insulin and check injection sites regularly.

- **Weight gain**
Lipohypertrophy

Injecting into same area repeatedly – caused erratic absorption of insulin
Storage Of Insulin

- Before use Spare insulin should be stored in fridge (2-8°C) Do not freeze or put near freezer compartment

- Insulin in use can be stored out of fridge at room temperature which makes it more comfortable to inject

- Must be used within 4 weeks

- Check pack for expiry date

- Don’t expose insulin to sunlight or high temperatures.
Pump Therapy

- Mimics normal pancreatic function by delivering Fast Acting insulin in 2 ways
  - Basal Rate
  - Bolus Doses
- Delivering a constant supply of insulin so do not need long acting insulin
- Allows more flexibility
- Improves quality of life
- Type 1 patients only and NICE set criteria for pump therapy
Insulin Pump Therapy
Blood glucose Monitoring

Individual Assessment based on:

- Number of injections
- Driving
- Occupation
- Awareness of hypoglycaemia
- Exercise
- Diabetes Control
DVLA Regulations – Insulin treated patients with Group 1 entitlement

- Must notify DVLA when started on insulin
- Must have awareness of hypoglycaemia
- If had 2 or more episodes of severe hypoglycaemia within the last 12 months whilst awake - completely dependant on another person to treat the hypo
- Experience disabling hypoglycaemia whilst driving
- There must be appropriate blood glucose monitoring
- You have other medical conditions or changes to existing medical conditions which could affect your ability to drive safely, for example problems with vision, circulation or sensation (peripheral neuropathy)