

Health and wellness initiatives - Lunch and Learn

***‘Understanding the role and physiology of exercise and nutrition in preventing and managing diabetes’***

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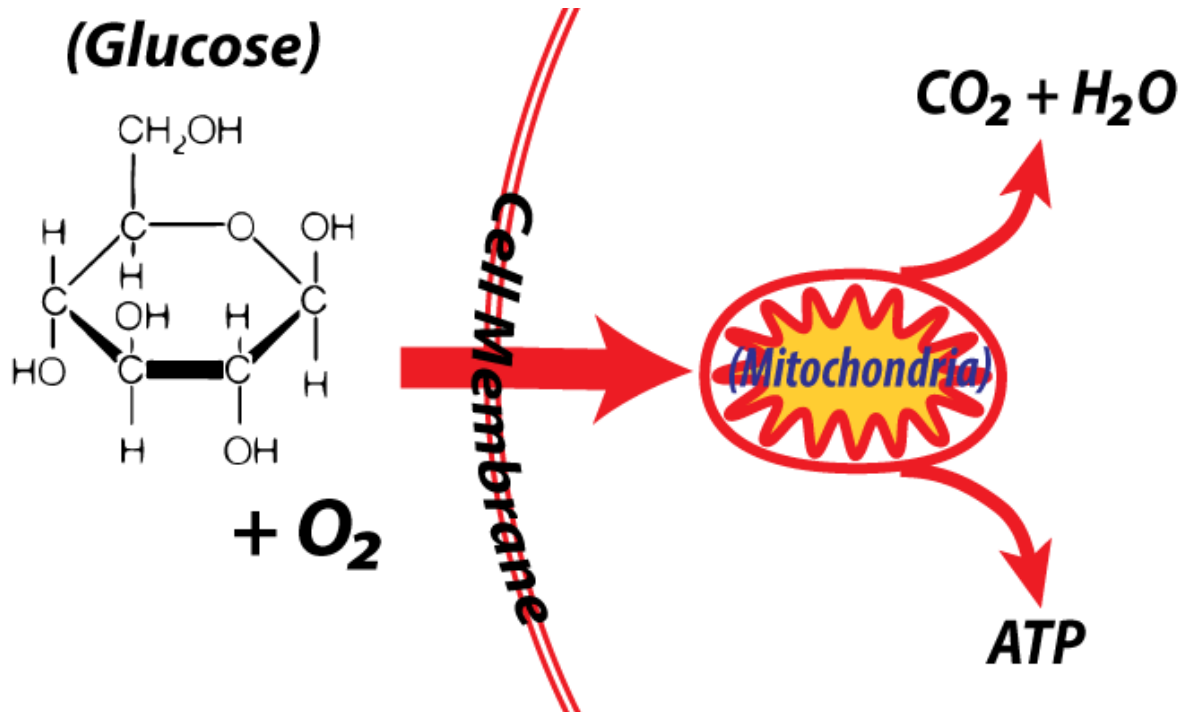
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# Carbohydrates

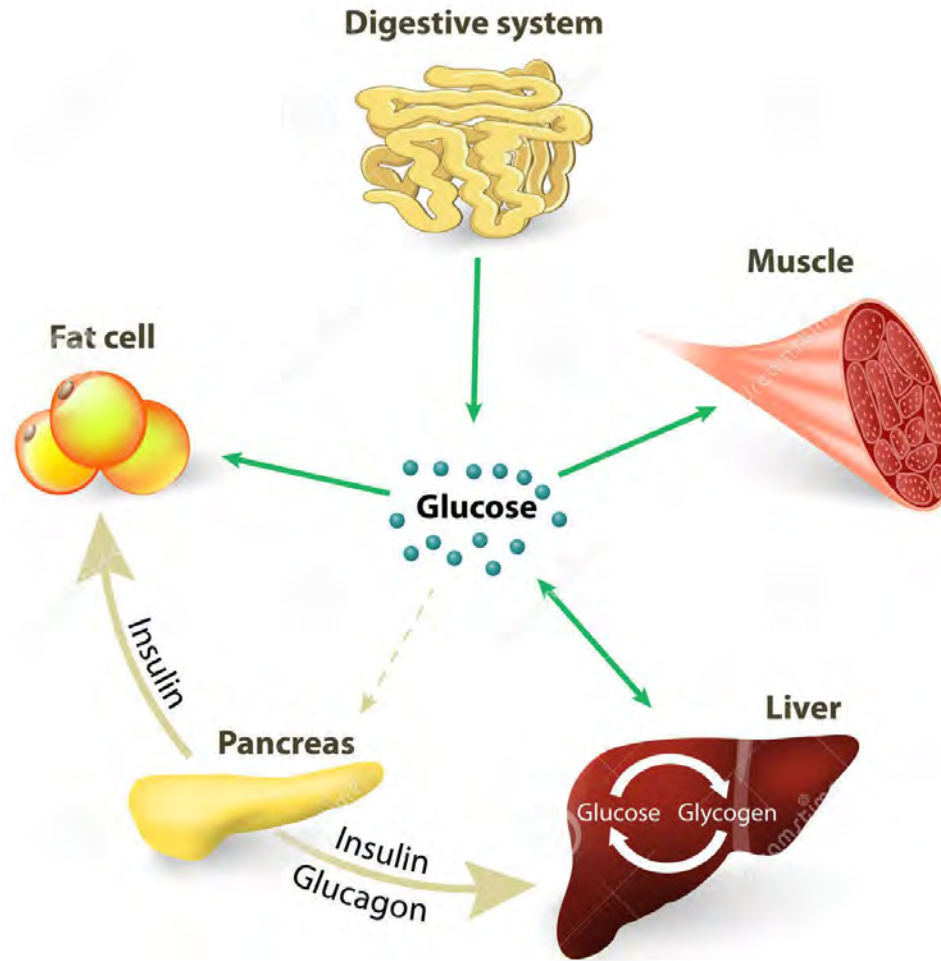


**Not all carbohydrates are “bad”**

# Carbohydrates: Glucose



# How is glucose processed by the body?



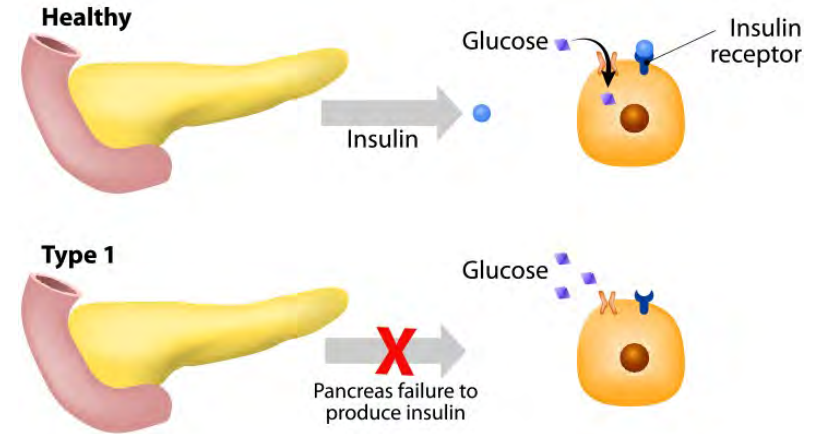
# Understanding diabetes

Diabetes is a serious metabolic condition whereby the body is unable to maintain healthy levels of sugars (glucose) in the blood.

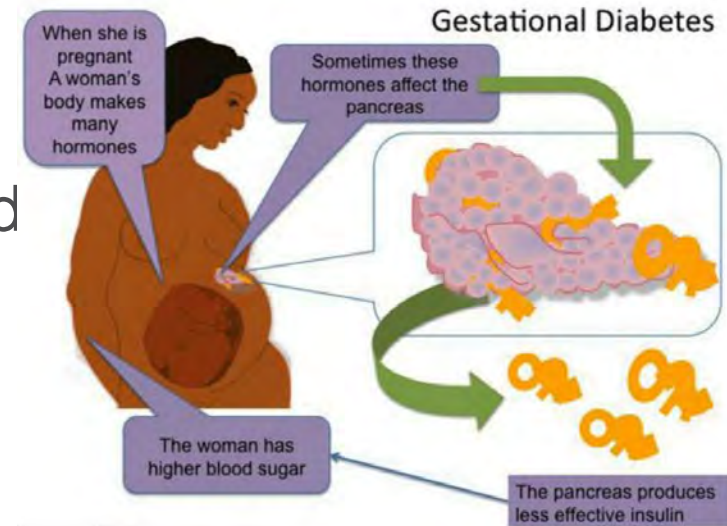


# Types of Diabetes

**Type 1 Diabetes (T1DM):** an autoimmune condition > no insulin produced



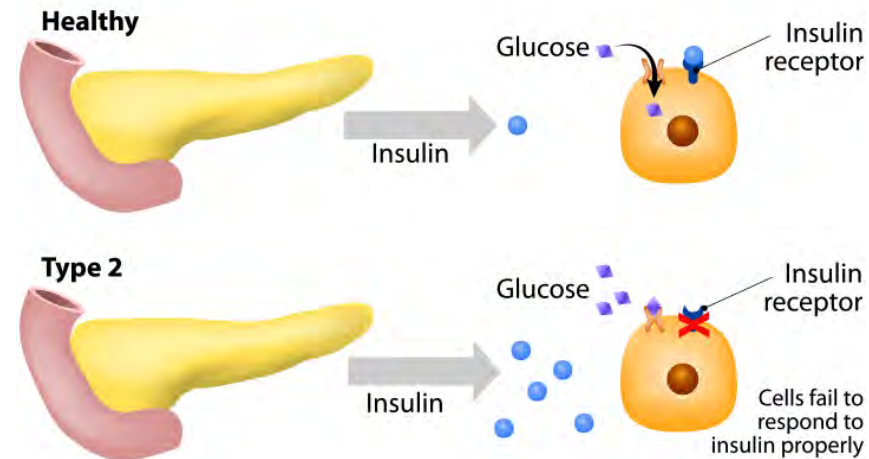
**Gestational Diabetes (GDM):** caused by insulin-blocking hormones produced by the placenta.



# Types of Diabetes

**Type 2 Diabetes (T2DM):** A lifestyle-related condition whereby the cells become resistant to the insulin the body produces

**Pre-diabetes:** Impaired Fasting Glucose (IFG) and/or Impaired Glucose Tolerance (IGT).





# Diabetes Classifications

Diagnosed with an Oral Glucose Tolerance Test (OGTT):

## Impaired Fasting Glucose (IFG)

- Fasting blood glucose level of 6.1mmol/L or more, but less than 7.0mmol/L; AND,
- Blood glucose level 2 hours after having the glucose drink of less than 7.8mmol/L

## Impaired Glucose Tolerance (IGT)

- Fasting blood glucose level is less than 7.0mmol/L; AND,
- Blood glucose level 2 hours after having the glucose drink is between 7.8mmol/L and 11.0mmol/L

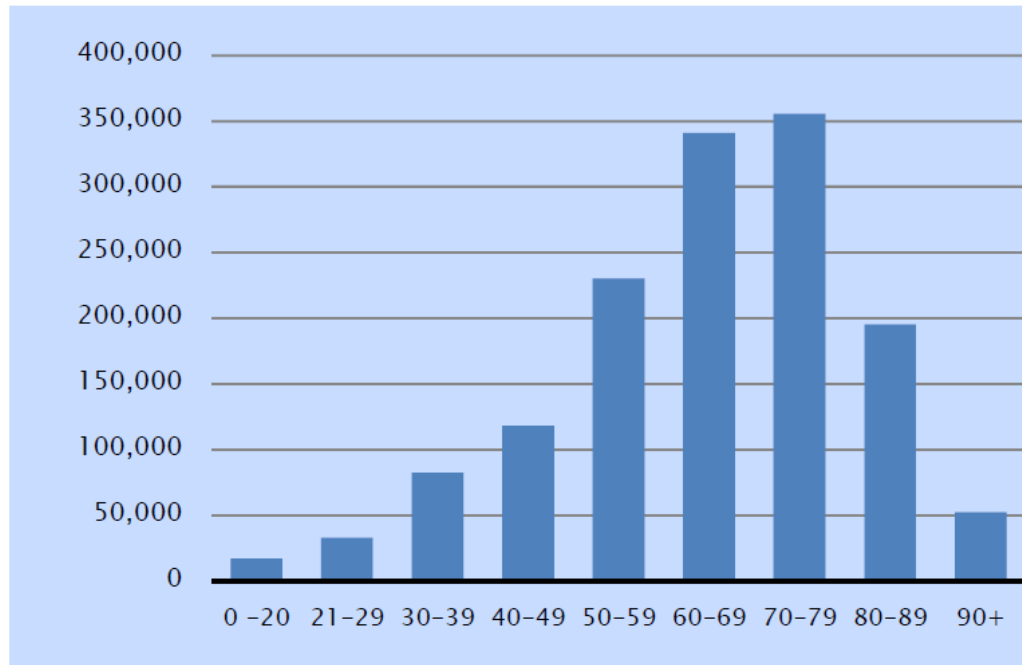
## Type 2 Diabetes Mellitus (T2DM)

- Blood glucose level 2 hours after having the glucose drink is 11.1mmol/L or higher

# Diabetes trends and statistics

- Approximately 1.4 million Australians are diagnosed with diabetes.

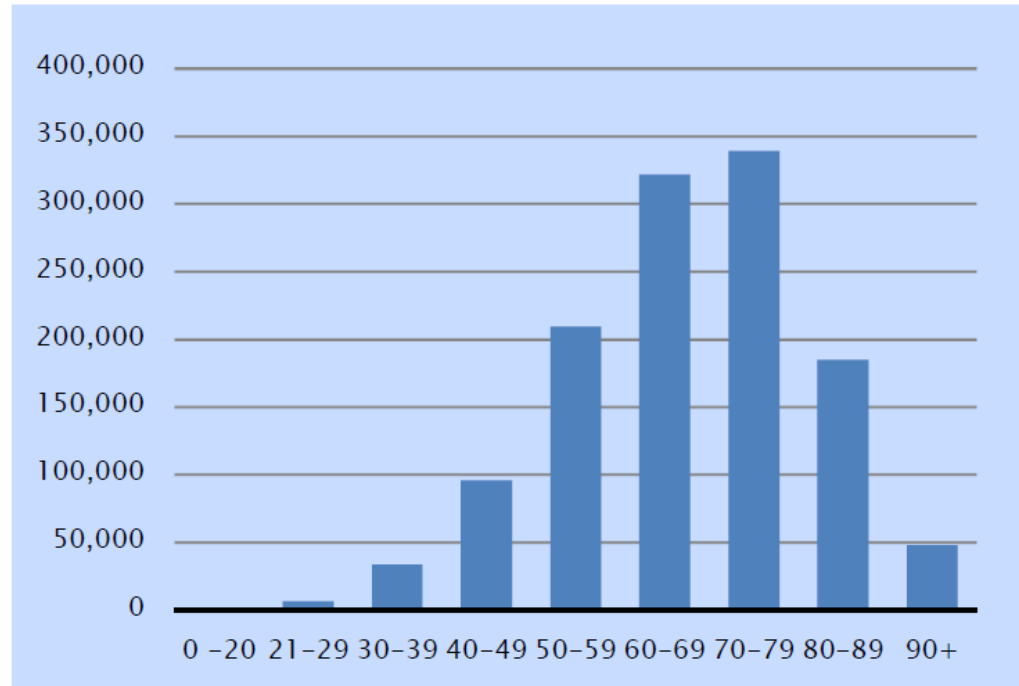
All people with diabetes by age group



# Type 2 Diabetes in Australia

People with type 2 diabetes by age group

Age Group	Number	%
0 – 20	1,085	< 1%
21 – 39	40,108	3%
40 – 59	305,182	25%
60 +	894,022	72%
<b>Total</b>	<b>1,240,397</b>	<b>100%</b>



# Type-2 Diabetes Risk Factors

- Older age
- Overweight
- Sedentary/physical inactivity
- High triglycerides
- Low high-density lipoprotein cholesterol
- High total cholesterol
- High blood pressure
- Family history of Type 2 diabetes and/or heart disease
- Aboriginal or Torres Strait Islander, Pacific Island, Indian subcontinent or Chinese cultural background
- Woman who have given birth to a child over 4.5 kgs (9 lbs), or had gestational diabetes when pregnant
- Women with Polycystic Ovarian Syndrome.

# Type 2 Diabetes Symptoms

- Being excessively thirsty
- Passing more urine
- Feeling tired and lethargic
- Always feeling hungry
- Having cuts that heal slowly
- Itching, skin infections
- Blurred vision
- Gradually putting on weight
- Mood swings
- Headaches
- Feeling dizzy
- Leg cramps

# Consequences of uncontrolled diabetes

## Hyperglycaemia

Occurs when blood sugar levels are too high

- Common causes include sickness, infection, stress, too much carbohydrate food at once, not enough insulin or diabetes tablets, other tablets or medicines.
- Symptoms include feeling excessively thirsty, frequently passing large volumes of urine, feeling tired, blurred vision, infections (e.g. thrush, cystitis, wound infections) and weight loss.

**If left untreated, this can become dangerous and lead to diabetic ketoacidosis in Type 1 diabetics.**

## Ketoacidosis

The body begins to burn fat for energy instead of glucose, due to the lack of insulin, which leads to ketones accumulating in the blood and urine.

- Symptoms include Rapid breathing, flushed cheeks, abdominal pain, sweet acetone (similar to paint thinner or nail polish remover) smell on the breath, vomiting and dehydration.

# Consequences of uncontrolled diabetes



# Managing the risk of diabetes through exercise and diet

**Type 2 diabetes = genetic predisposition + environment**

## Modifiable risk factors (e.g. environment/lifestyle)

Overweight

Sedentary/physical inactivity

High triglycerides

Low high-density lipoprotein cholesterol

High total cholesterol

High blood pressure

- Diet and exercise helps with normal weight maintenance, which lowers your risk of developing Type 2 diabetes



# Importance of diet/nutrition in the prevention and management of diabetes

- Choose nutritious food and drinks to meet your energy needs
- Each day, enjoy a wide variety of:
  - vegetables, legumes and beans;
  - fruit;
  - wholegrain and high fibre foods, such as rice, bread, pasta, oats;
  - lean meats and poultry, eggs, seeds and nuts; and,
  - reduced fat milk, yoghurt and cheese.
- Drink plenty of water, aim for 2L per day.
- Limit foods containing saturated fat, added salt, added sugars and alcohol



## Australian Guide to Healthy Eating

Enjoy a wide variety of nutritious foods from these five food groups every day.  
Drink plenty of water.



Use small amounts



Only sometimes and in small amounts



# Importance of diet/nutrition in the prevention and management of diabetes

- High salt intake = fluid retention and stiffens blood vessels and arteries
- This increases blood pressure and work of the heart

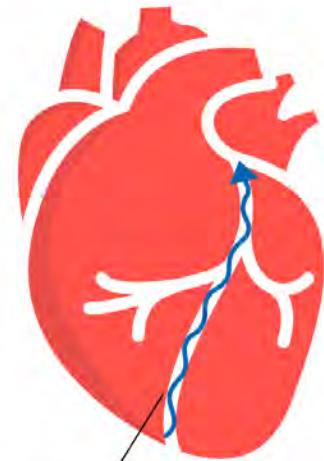


**No Hypertension**  
Heart Pumping Normally



Blood flows easily through vessels

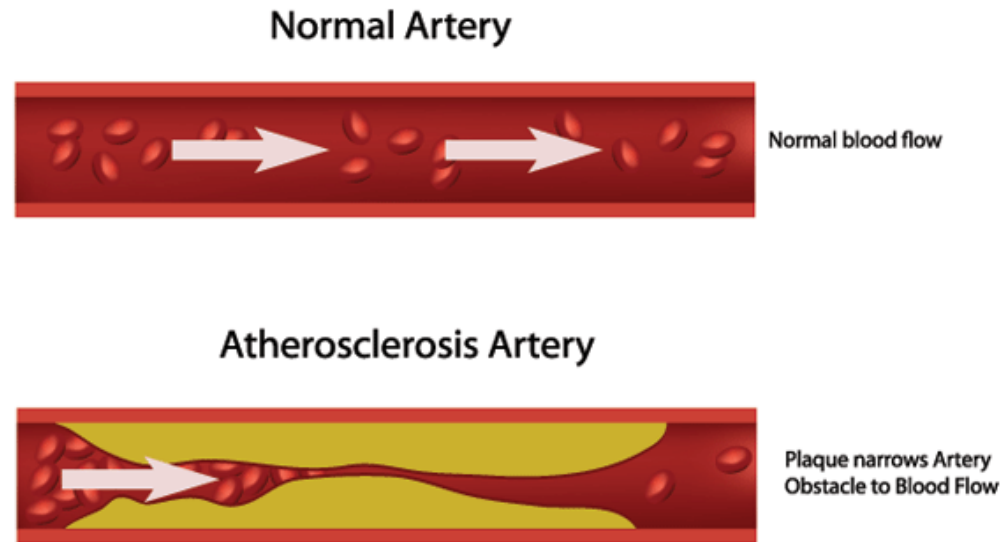
**Hypertension**  
Heart Pumping Harder



Blood may not flow easily through vessels

# Importance of diet/nutrition in the prevention and management of diabetes

- High fat intake (particularly saturated fats) = increased fat build up in the arteries and body

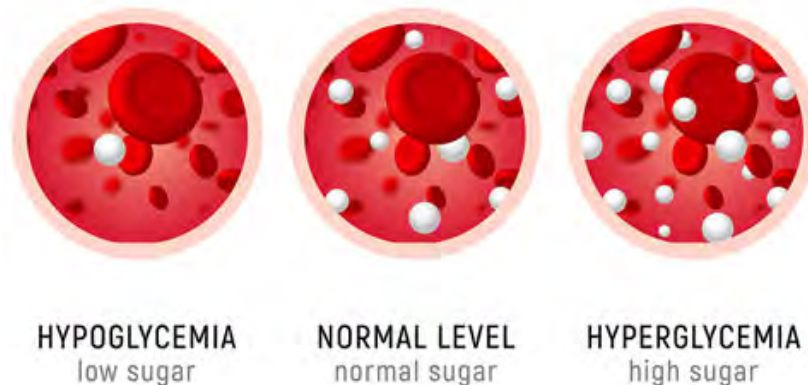


- This increases the work of the heart, risk of heart attack and stroke, as well as cancer and many other diseases

# Importance of diet/nutrition in the prevention and management of diabetes

- High sugar intake = stiffened/thicker blood vessels and arteries, inflammation and weight gain
- Increases work of heart and pancreas, leading to an increased risk of heart attack and stroke

## GLUCOSE LEVEL

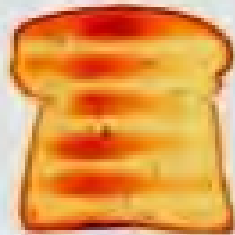


# Diabetes and the Glycaemic Index

## GLYCEMIC INDEX CHART

Low Glycemic (55 or Below)

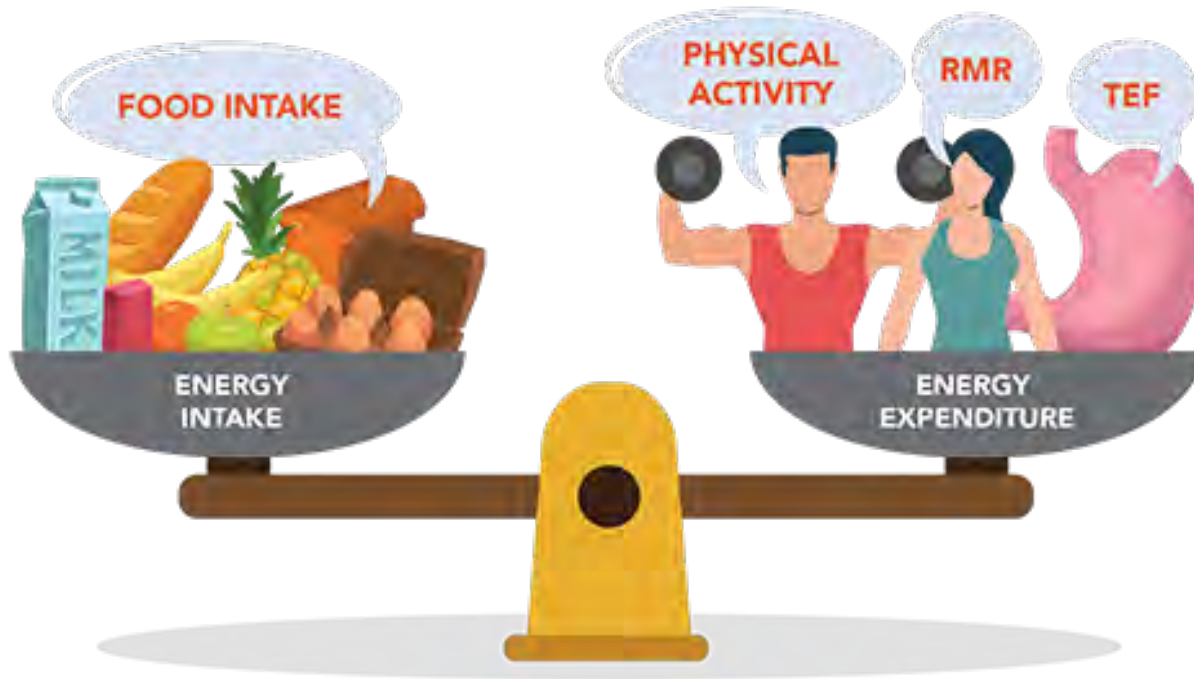
High Glycemic (70 or Higher)



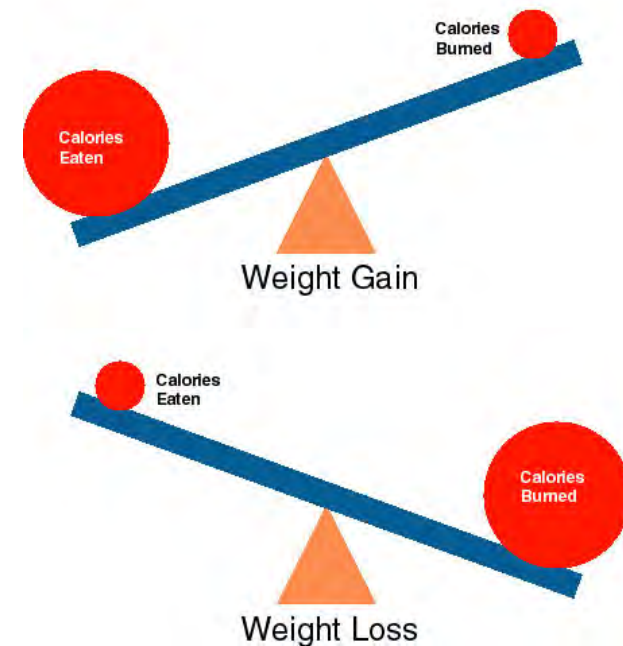
SNACKS	G.I.	STARCH	G.I.	VEGETABLES	G.I.	FRUITS	G.I.	DAIRY	G.I.
Pizza	33	Bagel, Plain	33	Broccoli	10	Cherries	22	Yogurt, Plain	14
Chocolate Bar	49	White Rice	38	Pepper	10	Apple	38	Yogurt, Low Fat	14
Pound Cake	54	White Spaghetti	38	Lettuce	10	Orange	43	Whole Milk	30
Popcorn	55	Sweet Potato	44	Mushrooms	10	Grapes	46	Soy Milk	31
Energy Bar	58	White Bread	49	Onions	10	Kiwi	52	Skim Milk	32
Soda	72	Brown Rice	55	Green Peas	48	Banana	56	Chocolate Milk	35
Doughnut	76	Pancakes	67	Carrots	49	Pineapple	66	Yogurt, Fruit	36
Jelly Beans	80	Wheat Bread	80	Beets	64	Watermelon	72	Custard	43
Pretzels	83	Baked Potato	85	Onions	75	Dates	103	Ice Cream	60

Glycemic Index values obtained from [www.longjournal.com](http://www.longjournal.com), [www.rubiklifedate.com](http://www.rubiklifedate.com) and [www.diabetesnet.com](http://www.diabetesnet.com)

# Understanding energy balance for people with diabetes



**Weight maintenance**



# How much energy do I need?

## Calculating Resting Metabolic Rate (RMR):

### Males:

$$278 + (57.5 \times \text{weight in kg}) + (20.9 \times \text{height in cm}) - (28.3 \times \text{age in years})$$

### Females:

$$2741 + (40 \times \text{weight in kg}) + (7.7 \times \text{height in cm}) - (19.6 \times \text{age in years})$$

**Sedentary:** RMR + 30% RMR

**Moderately active:** RMR + 50% RMR

**Vigorously active:** RMR + 100%

# Example: How much energy do I need?

**Sedentary 33yo female, 165cm, 67kg**

**Females:**  $2741 + (40 \times \text{weight}) + (7.7 \times \text{height}) - (19.6 \times \text{age})$

**Resting Metabolic rate** =  $2741 + (40 \times 67) + (7.7 \times 165) - (19.6 \times 33)$

**Resting Metabolic rate = 6044kJ**

**Sedentary:**  $\text{RMR} + 30\% \text{ RMR}$

$6044 + (6044 \times 30\%) = 6044 + 1813$

**Estimated Total Energy Expenditure = 7857kJ**



# Diet/nutrition and Diabetes

There is no “One Size Fits All” approach when it comes to diets. Speak to a Dietitian for personalised advise and support:

- [The Dietitians Association of Australia](#) or call 1800 812 942
  - NDSS Helpline on 1800 637 700.



# Importance of exercise in the prevention and management of diabetes

There are numerous benefits of exercise for people with diabetes, including:

- Insulin to work better, which will improve your diabetes management
- Maintain a healthy weight
- Lower your blood pressure
- Reduce your risk of heart disease
- Reduce stress

**Exercise helps to both manage and reduce the risk of developing diabetes**

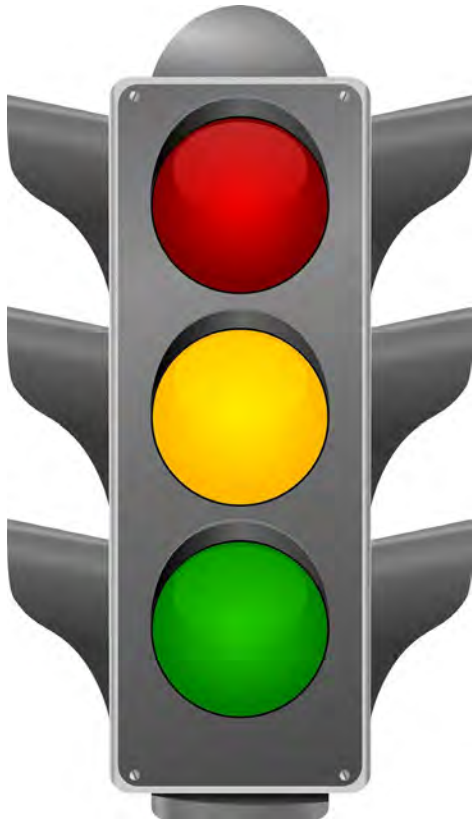
# Role of an AEP in diabetes management

- Assessment and evaluation of your body
- Deliver and prescribe a personalised exercise program (based on your assessment)
- Supervision
- Monitoring of blood glucose levels
- Monitoring for complications
- Teach you how to manage your condition and exercise independently

# What an Exercise Physiology initial assessment involves

- Exercise test on a treadmill or stationary bicycle
- Monitoring of heart rate and rhythm
- Blood glucose monitoring
- Blood pressure monitoring
- Body mass index/body composition
- *Plus, other assessments as indicated by your medical history and goals (i.e. strength, flexibility, questionnaires)*

# When am I okay to exercise with Type 2 Diabetes?



## Start of Exercise

**<4.0mmol/L:** aim to increase BGL  $\geq 5.5$ mmol/L followed by low-moderate intensity exercise

DO NOT exercise alone

**>15mmol/L:** DO NOT exercise if feeling unwell, tired, weak, thirsty and/or frequently urinating.

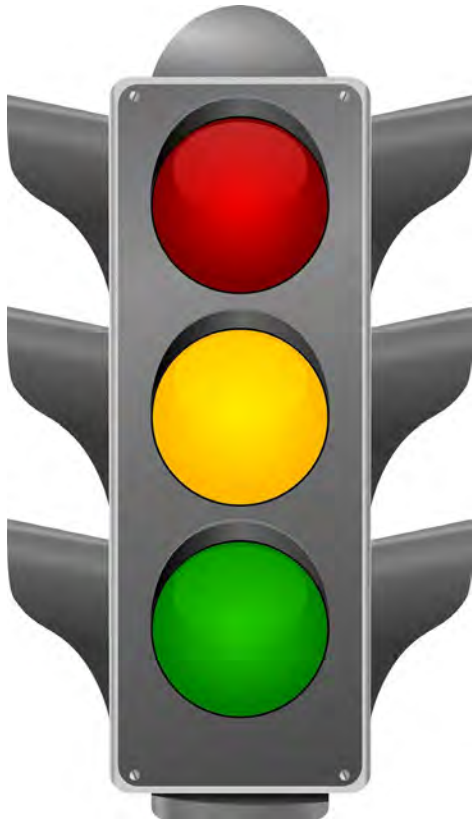
**BGL 4.0-5.4mmol/L:** consume high GI carbs & wait until BGLs  $\geq 5.5$ mmol/L if new to exercise

**BGL >15.0mmol/L:** Okay to exercise if feeling well. Low intensity exercise okay if medication was missed.

**BGL 5.5-15.0mmol/L**

Have carbs if exercising >60 mins

# When am I okay to exercise with Type 2 Diabetes?



## During Exercise

**<4.0mmol/L: STOP EXERCISE IMMEDIATELY-  
Hypoglycaemia**

Consume High GI carbs, followed by low GI carbs  
Go to GP is occurring frequently

**BGL <5.5mmol/L:** consume carbs if next meal not within next 30 mins (1 serve = low-intensity exercise, 2 serves = moderate intensity exercise, 4 serves = high intensity exercise)

**BGL > pre-exercise levels:** ensure meds were not missed. Monitor- likely to rise if eaten within last 90 mins or with high intensity exercise.

**BGL >5.5mmol/L**

Safe to resume/continue with exercise

# When am I okay to exercise with Type 2 Diabetes?

## Guidelines for after exercise

- Increased risk of hypoglycaemia for at least 12 hours after exercise
- If post-exercise hypoglycaemia occurs, treat then monitor BGL every 2 hours for up to 6 hours post exercise
- Monitor BGLs more in extreme temperature or is changing exercise intensity
- If exercising in the afternoon, monitor for risk of night-time hypoglycaemia
- If night-time hypoglycaemia occurs, check BGLs before sleep, once during the night and immediately upon waking
- If BGLs  $<7.0$ mmol/L before bed, consume carbs
- Adjustment in insulin with a post-exercise meal may be required

# Aerobic Training guidelines for diabetes

## Frequency:

3-7 days/week

## Intensity:

Low-moderate (talk test), progress to RPE 3-5/10

*\*Seek AEP guidance for higher intensity*

## Time:

At least 30 minutes per session,  
150-300 minutes/week

## Type:

Large muscle groups (e.g. walking, cycling, swimming, jogging)

Rate of Perceived Exertion	
Modified scale	Effort
0	Rest
1	Very easy (Converse with no effort)
2-3	Easy
4-5	Moderate (Converse with some effort)
6	Moderately difficult
7	Difficult (Converse with much effort)
8	Very difficult
9-10	Peak effort (No talking zone)



# Resistance Training guidelines for diabetes

## Frequency:

2-3 days per week (non-consecutive days)

## Intensity:

1-3 sets of 8-15 reps

50-80% 1-RM (moderate-hard)\*\*

*\*\*If retinopathy is not present*

## Time:

20-30 minutes/ session

5-10 exercises

## Type:

Major muscle groups using free weights, body weight, machines and elastic bands

Rate of Perceived Exertion	
Modified scale	Effort
0	Rest
1	Very easy (Converse with no effort)
2-3	Easy
4-5	Moderate (Converse with some effort)
6	Moderately difficult
7	Difficult (Converse with much effort)
8	Very difficult
9-10	Peak effort (No talking zone)

# Exercising with Diabetes: considerations for exercise

## Hypoglycaemia

- Occurs when a person's blood sugar drops too low.
- Hypoglycaemia may be delayed for 12 hours or more after exercise
- Early symptoms include shaking, trembling or weakness, sweating, paleness, light headedness, headache, mood change, pins and needles around mouth or hunger
- If experiencing early symptoms, eat a fast acting carbohydrate, followed by a long acting carbohydrate

### **How to avoid a hypoglycaemic event:**

- Monitor blood glucose levels 2-3 times BEFORE commencing exercise
- Monitor blood glucose levels every 30 minutes during exercise
- Monitor blood glucose levels after exercise

# Exercising with Diabetes: considerations for exercise

- Wear loose fitting clothing
- Keep hydrated
- Avoid exercising in extreme temperatures
- Check your feet before and after exercise for wounds, sores and/or ulcers
- Wear comfortable and appropriate footwear
- Have carbohydrates with you during exercise (i.e. jelly beans and a sandwich)

# Exercising with Diabetes: considerations for exercise

- Monitor blood glucose levels before, during and after exercise to ensure you are eating enough carbohydrates\*

\*Insulin may need to be adjusted when regular exercise has commenced

- Avoid strenuous exercise if you are not used to it or you are unsupervised
- Exercise in the morning before breakfast is considered safest
- Recommended NOT to exercise before bed
- Don't exercise during peak insulin action

# Exercising with Diabetes: considerations for exercise

- Active and long cool-down period after exercise
- If you have retinopathy, avoid high intensity exercise, resistance training, jumping or activities that require you to put your head down
- Avoid injecting insulin into exercising limbs
- Exercise with a partner or under supervision



# Health & Clinical Exercise Physiology Centre

## The student-led clinic is open:

Tuesday 1.00pm – 4.00pm

Wednesday 2.00pm – 5.00pm

Thursday 8.30am – 11.30am

Call Kara on **03 5327 9172** or email at

**[healthsciences.rehab@federation.edu.au](mailto:healthsciences.rehab@federation.edu.au)** for initial

assessment appointments

# Starting in Semester 1, 2022

## **Monday afternoons (2.30-3.30pm\* from Weeks 1-12):** Diabetes Group Exercise Class

- Conducted in the Health & Clinical Exercise Physiology Clinic (\$7 per class)
- \*Clients MUST have an initial assessment before being able to commence in the class

## **Wednesday afternoons (Weeks 5-10, individual sessions run every hour between 1.30-4.30pm):** 6-week individual exercise program.

- Student-led, as part of the Exercise Physiology for Cardiopulmonary and Metabolic Conditions Course
- Voluntary (FREE) for people with diagnosed diabetes OR cardiovascular disease
- Exercise initial assessment
- 4-week individual supervised exercise program (1 hour per session)
- 2-week home exercise program (over mid-semester break)
- Exercise re-assessment

**Contact Jacqui if interested on 03 5327 6933 or [j.pengelly@federation.edu.au](mailto:j.pengelly@federation.edu.au)**

# Phone/Tablet Apps

## Exercise:

MyFitnessPal



mapmywalk



Calorie King



## Diet

FoodSwitch



Carbs & Cals



The snack app



## Diabetes:

Glucose buddy



Emojifit



OnTrackDiabetes

