

Department of
Nutrition & Dietetics

Understanding Fats and Cholesterol



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What is Hyperlipidaemia and Blood Lipids?

High cholesterol (hyperlipidaemia) is a medical term for abnormally high levels of fats in the blood. It is one of the main risk factors for cardiovascular diseases such as heart disease and stroke. In Singapore, 19 people die from such diseases every day. It is therefore important to understand more about it and how to control it.

The two major types of lipids (fats) found in blood are cholesterol and triglycerides.

What is blood cholesterol?

Blood cholesterol is a waxy fat-like substance that is made by the liver. Cholesterol has many important jobs in your body, like helping build and repair cells. But if you have too much cholesterol, it can block your blood vessels and make it harder for blood to flow through.

The two main types of cholesterol are:

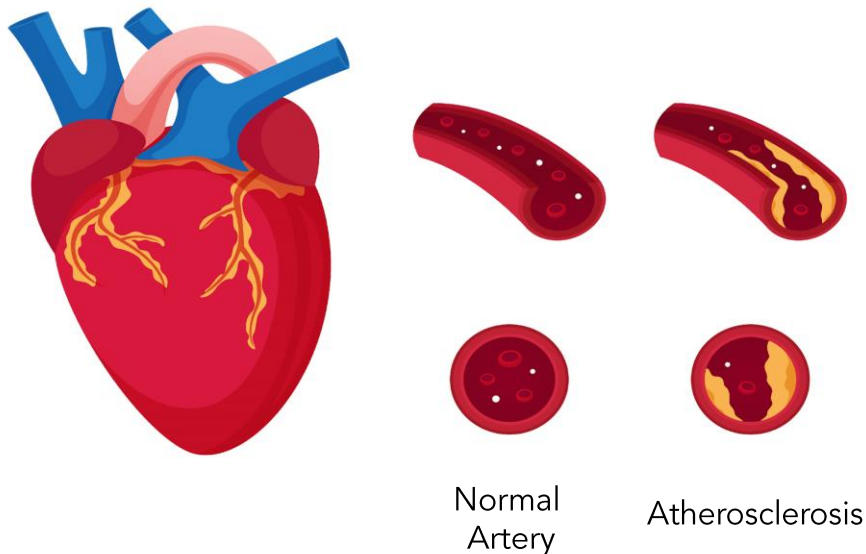
- **Low-density lipoprotein (LDL)** – also known as the “**bad**” cholesterol because it is responsible for the plaque (fat buildups) that block the arteries, increasing your risk of heart disease and stroke.
- **High-density lipoprotein (HDL)** – also known as the “**good**” cholesterol because it carries LDL cholesterol away from the arteries to be broken down, lowering the risk of heart disease and stroke.

What is Hyperlipidaemia and Blood Lipids?

What are triglycerides?

Triglycerides are a type of fats found in the blood that is also produced by the body.

A high triglycerides level combined with high LDL (bad) cholesterol or low HDL (good) cholesterol is linked with greater chance of buildup within the artery walls (i.e. atherosclerosis), which increases the risk of cardiovascular disease.



People with hyperlipidaemia often have no symptoms. Hence, it is recommended for all adults aged 40 years and above to check your cholesterol every 3 years if normal, or to check cholesterol as advised by your doctor.

What is an Optimal Blood Lipid Profile?

Your cholesterol target will vary according to your risk for developing cardiovascular diseases.

Lipid profile	Average adults (without known coronary risk factors)	Adults with heart disease / diabetes / other coronary risk factors)	Your results
Total cholesterol	<5.2 mmol/L	<4.1mmol/L	
LDL cholesterol	≤2.6 mmol/L	<1.8mmol/L	
HDL cholesterol	≥1.0 mmol/L	≥1.0mmol/L	
Triglycerides	<1.7mmol/L	<1.7mmol/L	

Sources:

1. Ministry of Health Singapore. 2016. *Lipids - MOH Clinical Practice Guidelines 2 / 2016*. <https://www.moh.gov.sg/docs/librariesprovider4/guidelines/moh-lipids-cpg--booklet.pdf>.
2. American Diabetes Association. 2023. "Standards of Care in Diabetes - 2023 Abridged for Primary Care Providers." *Clinical Diabetes* 41 (1): 4-31. <https://diabetesjournals.org/clinical/article/41/1/4/148029/Standards-of-Care-in-Diabetes-2023-Abridged-for>
3. HealthHub. 2023. *Healthy Eating For Lowering Cholesterol*. <https://www.healthhub.sg/live-healthy/healthy-eating-for-lowering-cholesterol>

What are the factors that put you at risk of cardiovascular diseases?

Non-modifiable risk factors (Factors that you cannot change)	Modifiable risk factors (Factors that you can change)
<ul style="list-style-type: none"> • Age • Family history • Gender 	<ul style="list-style-type: none"> • High blood cholesterol • High blood pressure • Overweight/obesity • Smoking • Stress • Physical inactivity • Unhealthy diet

Hence, by reducing the modifiable risk factors, you can reduce your risk of having a heart attack or stroke.

How to Lower Your Cholesterol And Triglycerides Level?



1. Maintaining a healthy bodyweight

- Aim for weight reduction if your BMI is above 23 kg/m²
- Watch your meal portion size by following My Healthy Plate
- Limit snacking or choose healthier snacks if needed
- Increase physical activity by working towards at least 30 minutes of moderate-intensity activity[^], five days per week



[^]Moderate-intensity activity should make your heartbeat and breathing slightly faster than normal. During the activity you may have enough breath to talk but not able to sing.

2. Eating a healthy, balanced meal

- Remove any visible fat and skin
- Use mostly reduced-fat or low-fat dairy products
- Choose lean meat, fish, or plant-based protein
- Choose healthier cooking oils, instead of using animal fats, palm oil, or coconut oil
- Limit dietary cholesterol intake to less than 200mg daily
- Drink water to quench thirst, and limit sugar sweetened beverages and alcohol
- When preparing meals, snacks or drinks, use pepper, herbs, spices or fruits to add flavour rather than using salt or sugar
- Aim for two serves of fruits and two serves of colourful non-starchy vegetables everyday
- Choose wholegrain foods such as brown rice, wholemeal/wholegrain bread instead of refined grains, whenever possible



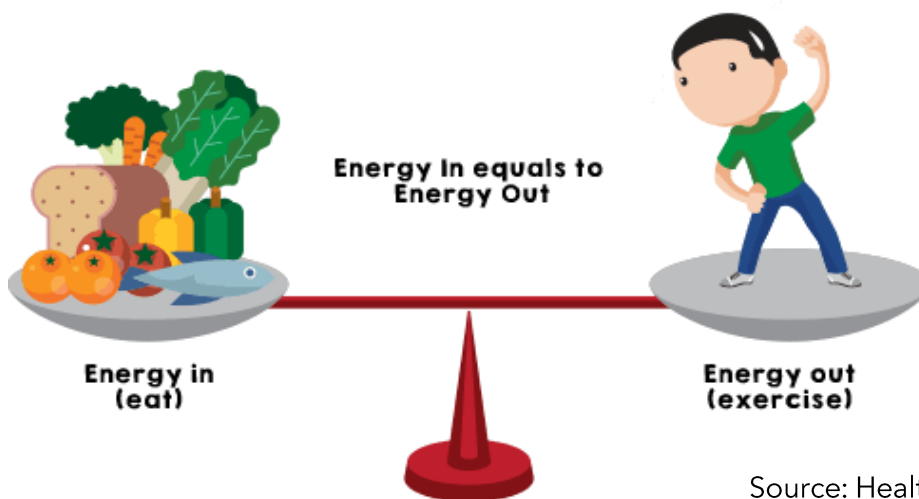
Maintaining a Healthy Body Weight

Body mass index (BMI) estimates the amount of body fat, by using your weight and height to determine your weight category.

$$\text{Body Mass Index (BMI)} = \frac{\text{Weight (kg)}}{\text{Height (m)} \times \text{Height (m)}}$$

If your BMI is $> 23\text{kg/m}^2$, you should reduce your weight to lower your health risk. **Sustainable weight loss of 0.5kg to 1kg per week is recommended.** This can be achieved by making lifestyle changes.

Health risk	BMI (kg/m^2)
Risk of nutritional deficiency	<18.5
Low risk (healthy range)	18.5-22.9
Moderate risk	23-27.4
High risk	≥ 27.5



Source: HealthHub, 2021

We will be able to maintain our weight when the amount of energy from food is the same as the amount being used up. Hence, weight loss can more likely be achieved when the amount of energy from food is less than the amount used.

Follow My Healthy Plate

My Healthy Plate is a visual guide for creating balanced and healthy meals. It shows you what to eat in the right amounts for each meal, so that you can plan your portions accordingly.

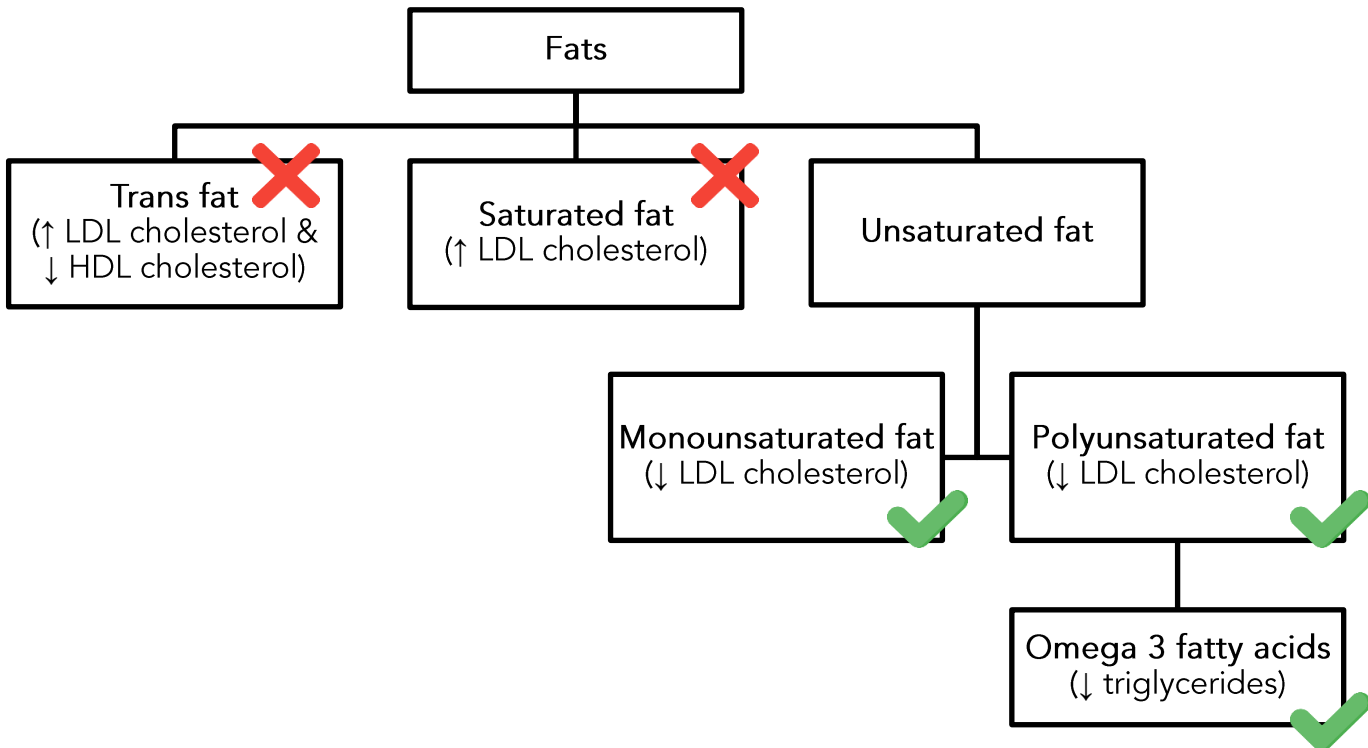
- ✓ Fill half your plate with fruit and vegetables.
- ✓ Fill a quarter with wholegrains.
- ✓ Fill a quarter with lean meat and others.
- ✓ Aim for 2 servings of fish a week
- ✓ Use healthier oils, refer to page 11-12
- ✓ Choose water always



Source: HealthHub, 2021

Reduce Unhealthy Fat intake

There are 4 types of dietary fats – trans fat, saturated fat, polyunsaturated fat and monounsaturated fat.



Unhealthy saturated and trans fat should be limited as excessive consumption can increase LDL (bad) cholesterol and therefore increase your risk of heart disease and stroke.

Replace unhealthy fats with the use of **healthy unsaturated fats**. This may help improve your overall heart health. However, you need to be mindful of the portion. Too much fat, even good fats still comes with the calories!

Your total daily fat intake should not exceed 1/3 of your total energy intake or total fat intake should not be more than 50-60g per day (10-12 teaspoons of oil).

Reducing saturated fat and trans fat in the diet

Common sources 	Tips to reduce unhealthy fat intake
<ul style="list-style-type: none"> • Pies, pastries, cakes, chocolates, cream-filled biscuits 	<ul style="list-style-type: none"> • Choose healthier snacks, refer to page 18-19
<ul style="list-style-type: none"> • Palm oil (e.g. common in processed foods, deep-fried food, hawker food) 	<ul style="list-style-type: none"> • Use healthier cooking methods: steam, stir-fry, bake, grill, boil or microwave
<ul style="list-style-type: none"> • Hard margarine, vegetable shortening, butter 	<ul style="list-style-type: none"> • Use soft margarine instead of hard margarine or butter
<ul style="list-style-type: none"> • Regular mayonnaise, creamy salad dressing (e.g. Thousand island, Ranch) 	<ul style="list-style-type: none"> • Choose reduced fat mayonnaise, olive oil or vinegar as salad dressing
<ul style="list-style-type: none"> • Full-fat dairy products (e.g. milk, yogurt, cheese) 	<ul style="list-style-type: none"> • Choose reduced fat dairy products (e.g. plain reduced fat/nonfat milk, yogurt, cottage cheese, ricotta)
<ul style="list-style-type: none"> • Coconut oil, coconut cream, coconut milk 	<ul style="list-style-type: none"> • Use other types of vegetable oil (e.g. olive, sunflower), refer to page 23 for more details about oil
<ul style="list-style-type: none"> • Animal fat (e.g. lard, ghee), skin of poultry, fat on meat, processed meat 	<ul style="list-style-type: none"> • Choose fresh or frozen fish, skinless poultry, and lean cuts of meat

Healthy fats - polyunsaturated fat

Common sources ✓

- Vegetables oils and soft margarine spreads (e.g. canola, grapeseed, soybean, corn, sunflower)



- Seeds and nuts (e.g. chia seed, flaxseed, sunflower seed, sesame seed, walnut, hazelnut, Brazil nut)



- Tahini (i.e. ground sesame seeds)



- Oily fish and seafood (e.g. tuna, salmon, sardine, longtail shad, Spanish mackerel)






- Omega-3 enriched food: eggs, bread, tofu



Suggested intake

- Use small amount of vegetable oil in cooking or as a salad dressing
- Have a handful (30g) of unsalted baked nuts once a day
- Add 2 teaspoon of seeds into food/drinks (e.g. low-fat yogurt, oats, salad, smoothie)
- Consider using tahini in replacement of jam or kaya on toast
- Aim for 2 – 3 servings of fish per week, including oily fish (1 serving = ~120g raw)
- If you don't normally eat fish or if you are a vegetarian, try to include omega-3 enriched food into your diet

Healthy fats - monounsaturated fat

Common sources ✓	Suggested intake
<ul style="list-style-type: none">• Avocado  <ul style="list-style-type: none">• Vegetable oils and spreads (e.g. olive oil, peanut oil)  <ul style="list-style-type: none">• Most raw nuts (e.g. almond, peanut, cashew and unsalted, no sugar added, 100% nut spread) 	<ul style="list-style-type: none">• Use ¼ medium ripen avocado in place of mayonnaise or margarine on toast• Use healthy oil spreads sparingly• Use small amount of vegetable oil in cooking or as a salad dressing• Have a handful (30g) of unsalted nuts as a snack once a day• Use 2 tablespoons of peanut butter on wholegrain bread or oats

Limit Dietary Cholesterol Intake

Dietary cholesterol is found only in animal products. Plant foods such as nuts, grains, fruits and vegetables do not contain cholesterol. Highest levels of dietary cholesterol are found in organ meat, egg yolk, fish roe, and some shellfish.

Food Item	Cholesterol (mg per serving)
Chicken liver, boiled (½ cup, 80g)	315
Oyster, raw (6 whole, 300g)	243
Egg yolk, boiled (1 whole)	240
Sotong, sambal (1 serving, 120g)	204
Crab, steamed (1 whole, 262g)	188
Pig, stomach, braised (1 serving, 100g)	150
Prawn with head, steamed (5 whole, 80g)	150
Chicken, breast, baked (1 serving, 90g)	82
Fish, snapper, steamed (1 serving, 120g)	72



Source: HealthHub, 2021

A diet high in total fat, especially saturated and trans fat, has a greater effect than eating foods high in cholesterol. So, it is important to reduce saturated and trans fat intake.

For some people, taking foods high in cholesterol can increase their cholesterol levels. **To be safe, limit your cholesterol intake to less than 200mg per day.** Keep high cholesterol food to less than 3 times a week.

Reduce Refined Sugars Intake

It is best to limit refined sugars (i.e. added sugars to foods and beverages) as they are high in calories but provide us with little to no nutrition. Limiting these foods can help improve your blood sugar level, triglyceride level, and prevent weight gain.



Cordial, soft drinks,
fruit juices, isotonic drinks



3-in-1 drinks / cereals*



Malted drinks,
condensed milk*



Hot desserts with coconut
cream*, ice-cream*,
kuehs*, cakes*



Sweets, chocolates*,
donuts*



Rock sugar, gula melaka,
glucose, syrup, honey

*These foods are also high in fat

Tips to reduce refined sugar intake:

- ✓ Choose sugar-free beverages such as plain water, sparkling water, unsweetened tea (tea bags) and diet soft drinks
- ✓ Choose beverages with less sugar such as kopi-O (less sugar), chrysanthemum tea (less sugar), if a sugar-free beverage is not available
- ✓ Use artificial sweeteners for sweetness if necessary

Avoid Alcohol Intake

Alcohol is high in calories (1g alcohol = 7kcal) and does not provide any nutritional benefits. Excessive alcohol tends to harm the liver, increase blood triglyceride level, and promotes weight gain.

If you drink alcoholic beverages, do so in moderation. **Women should drink no more than one standard drink per day and men should drink no more than two per day.** You should have at least 2 alcohol free days per week.

What is a standard alcoholic drink?



1 standard drink contains 10g alcohol



Tips to help you drink in moderation:

- ✓ Drink water in between alcoholic drinks. This will help slow down your drinking
- ✓ Use low/zero calorie mixers (e.g. diet soft drinks and soda water) to help reduce added calories
- ✓ Choose light or non-alcoholic beers/wines/spirits with less or no alcohol content
- ✓ Instead of drinking, consider other social activities such as exercising with friends

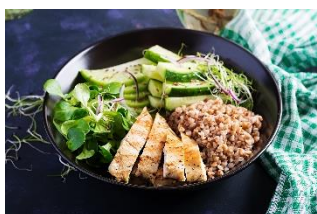
Increase Dietary Fibre Intake

Dietary fibre is part of the plant that cannot be digested by your body. There are two types of fibre - soluble fibre and insoluble fibre. In Singapore, the recommended fibre intake is 20g for women and 26g for men. This equates to two servings of fruit, two servings of vegetables and choosing wholegrains, whenever possible.

The table below shows how much is one serve of fruits and vegetables.

One serving of fruit	One serving of vegetables
 <ul style="list-style-type: none"> • 1 small apple, orange, pear or mango (130g) • 1 wedge of papaya, pineapple or watermelon (130g) • 10 grapes or longans (50g) • 1 medium banana (120g) 	 <ul style="list-style-type: none"> • 100g raw non-leafy vegetables • 150g leafy vegetables • ¾ mug cooked vegetables (100g) • ¼ plate cooked vegetables (100g)

High fibre foods take a longer time to digest. This will make you feel full for a longer duration hence consuming lesser calories. In particular, **soluble fibre** such as oats and barley, have been shown to help lower the LDL (bad) cholesterol by binding to the cholesterol and removing it from the body.



Increase Dietary Fibre Intake

What are wholegrains?

They are whole seeds (also called “kernels”) comprising three nutrient-packed parts: the bran, the germ, and the endosperm. In comparison, refined grains like white rice in which one or more of these parts are stripped off, and thus are less nutritious.

Examples of wholegrains:



Brown rice



Oats



Wholemeal
bread



Wholemeal
biscuits



Chapati

Tips to increase fibre intake:

- ✓ Replace white rice with brown rice or consider adding oats, barley, or beans into rice
- ✓ Choose wholegrain options for bread, pasta and cereal
- ✓ Eat a variety of fruits and vegetables of different colours
- ✓ Eat fresh fruit (with skin whenever possible) instead of fruit juices or dried fruits
- ✓ Choose to have legumes instead of meat/poultry/fish at main meals
- ✓ Try getting frozen vegetables and fruits to have a ready supply at home
- ✓ Be creative in adding beans or vegetables in every dish
- ✓ Add seeds to your drinks or oats















NOTE: Drink extra fluid when increasing fibre intake to avoid constipation.

Healthier Snack Ideas

Some snacks can be high in fat, sugar, or both. This makes them high in calories and you will need to walk more steps to burn these calories.











Here are some high calorie snacks to avoid (✖) and their lower calorie alternatives (✔):

High Calorie Snacks ✖	Lower Calorie Alternatives ✔
 <p>1 packet potato chips (80g)  = 8640 steps</p>	 <p>1 cup homemade popcorn* (65g)  = 2500 steps</p>
 <p>1 chocolate bar (43g)  = 4880 steps</p>	 <p>1 cup of strawberries (152g)  = 980 steps</p>
 <p>1 piece of chocolate cake (55g)  = 4100 steps</p>	 <p>1 slice of multigrain bread (32g) + 1 teaspoon soft margarine  = 2400 steps</p>

100 calories = 2000 steps

*using 1.5 tsp of unpopped corn kernels

Healthier Snack Ideas

High Calorie Snacks ❌	Lower Calorie Alternatives ✅
 <p>1 chicken curry puff (71g) = 4920 steps</p>	 <p>1 piece of small plain thosai (45g) = 1940 steps</p>
 <p>1 bowl of soya bean curd, with syrup (310g) = 2840 steps</p>	 <p>1 bowl of soya bean curd, no syrup (310g) = 1060 steps</p>
 <p>1 cup soft serve ice cream with chocolate sauce = 6860 steps</p>	 <p>1 small tub of low-fat yogurt (150g) = 1947 steps</p>
 <p>1 banana fritter (65g) = 3920 steps</p>	 <p>1 banana (125g) = 2220 steps</p>
 <p>1 piece of cookie = 4488 steps</p>	 <p>3 pieces of wheat cracker (30g) = 2640 steps</p>

100 calories = 2000 steps

Physical Activity

Exercise has been found to increase HDL (good) cholesterol.

Other benefits of physical activity:

- Helps you manage your weight
- Reduces your body fat
- Lowers your risk of chronic diseases (e.g. diabetes, heart diseases and stroke)
- Relieves stress
- Improves sleep



Here are some ways to aim for 150 minutes moderate-intensity physical activity every week:

- ✓ Get off the bus or train one stop earlier and walk the rest of the way
- ✓ Take the stairs instead of the lift/elevator
- ✓ Start small and gradually increase the intensity over time (e.g. start with one flight of stairs per day for the first week and increase by one flight each week)
- ✓ Include a variety of activities such as brisk walking (at a walking pace of 1km in 10-15 minutes), badminton, leisurely bike riding, table tennis, swimming, cycling
- ✓ Start with an activity that you like

Consult your doctor to check if you are medically fit to perform these physical activities.

Commonly Asked Questions

Q: Should I be avoiding eggs if my cholesterol is high?

A: Dietary cholesterol has less effect on blood cholesterol as compared to food high in saturated fat and trans fat. As part of a healthy diet, the Health Promotion Board advise that up to four egg yolks can be eaten every week. Use low fat cooking methods such as boiling or poaching to reduce total fat intake.

Q: Should I be adding Psyllium to my food?

A: Psyllium is a seed husk high in soluble fibre. Psyllium can be bought in powder form and added to breakfast cereal, drinks and porridge. Drink extra fluid if adding psyllium or other soluble fibres to your diet to avoid constipation.

Q: I heard beta glucan helps to improve cholesterol levels. What food sources contains beta glucan?

A: Beta-glucan is a type of soluble fibre. Studies have shown that regular consumption of approximately 3g of beta glucan from food like barley, oats, and oat bran may help lower cholesterol levels. 1.5 cup of cooked oatmeal provides 3g of beta glucan.

Q: Should I be having soy milk and soy products?

A: There is limited evidence to suggest soy and its by-products could lower cholesterol. However, when consumed as part of a healthy, balanced diet, it could still help to lower cholesterol. For example, choose to have tofu or tempeh as a replacement for fatty/processed meats. Additionally, soy milk (unsweetened) is a great dairy alternative for vegetarians or lactose intolerant individuals.

Commonly Asked Questions

Q: Should I consume plant sterols or plant stanols fortified food?

A: Plant sterols and stanols are found naturally in small amounts in many grains, vegetables, fruits, legumes, nuts and seeds. They are also often added into dairy products and margarine. However, for plant sterols and stanols to truly make a difference to our cholesterol levels, we would have to consume these foods in large quantities daily.

Clinical studies have shown that consuming 1.5 to 3g of plant sterols and stanols daily as part of a healthy balanced diet can help lower LDL cholesterol. It is important to always check the food label carefully, as food products containing plant sterols and stanols could contain excess calories and/or added sugar.

Q: Should I be taking heart health supplements?

A: The first line treatment for high cholesterol (hyperlipidaemia) is to adhere to your prescribed medication and follow a healthy diet with regular exercise regime. Heart supplements should never be a substitute for your medication.

The common list of heart health supplements includes fish oil, plant sterols capsule and red yeast rice. However, more studies are required to further determine its heart health benefits.

Supplements containing omega-3 may interact with blood thinners (e.g. aspirin, warfarin) and could cause excessive bleeding. Discuss with your doctor or pharmacist before taking any health supplements to reduce the risk of drug interactions.

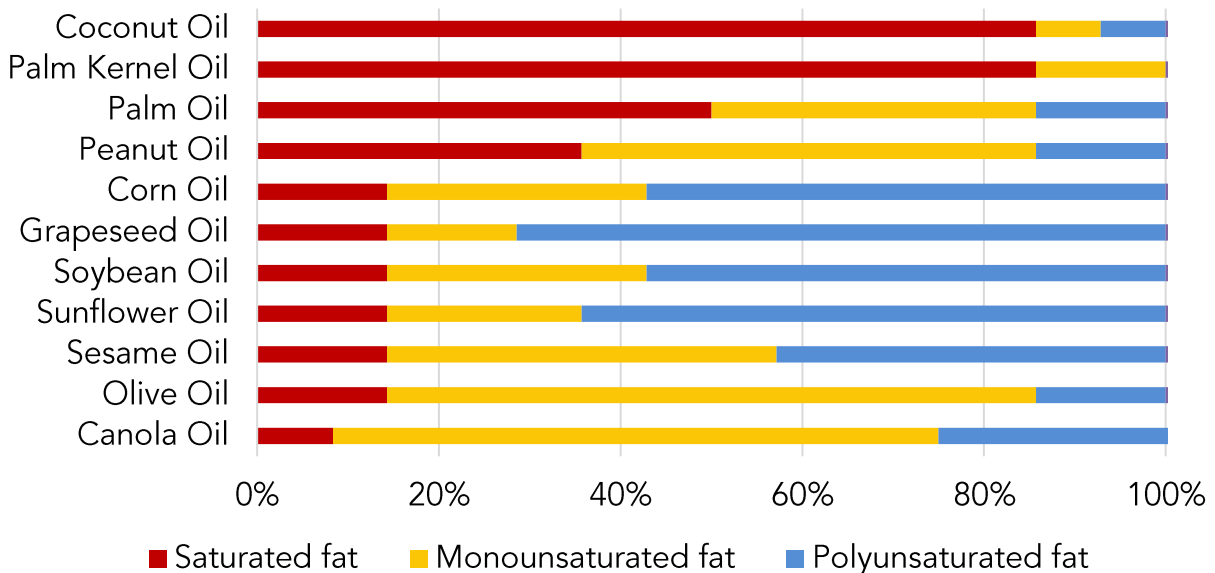
Commonly Asked Questions

Q: Which is the best type of cooking oil?

A: Choose healthier cooking oils higher in unsaturated fat and with a lower saturated fat content or purchase oils with the Healthier Choice Symbol (HCS). It is still recommended to use minimal oil in cooking.



Lower in Saturated Fat



Source: USDA Nutrient Database for Standard Reference (Release 14), the National Sunflower Association and the Flax Council of Canada.

It is recommended to use unrefined oils (labelled as unrefined, cold-pressed, raw, or virgin) for very low heat cooking or raw applications like salad dressings as they tend to have lower smoke points.

Smoke point is the temperature at which oil breaks down and burn, giving food an unpleasant burnt taste. In the process, free radicals harmful to your body are released.



Meal Plan

Breakfast

Morning tea

Lunch

Afternoon tea

Dinner

Supper

Other Useful Resources

For more useful resources feel free to visit HealthHub (<https://www.healthhub.sg/>), or Tan Tock Seng online Health library to guide you to make informed decisions about your health and health care.

Steps for Tan Tock Seng online Health Library:

Visit www.ttsh.com.sg > Home > Patients and Visitors > Health Library Index (A - Z) (Please scan the QR code on the last page for easy access)

Nutrition related resources:

- [Nutrition: Healthier Cooking Methods](#)
- [Nutrition: Increase Fruits and Vegetable Intake](#)
- [Nutrition: Reducing Sodium Intake When Eating Out](#)
- [Nutrition: Mindful Eating](#)
- [Nutrition: Weight Management](#)

Exercise related resources:

- [Exercise: Get Active!](#)
- [Exercise - Aerobics Exercise](#)
- [Exercise - Indoor Workout for Active Adults](#)
- [Exercise: Home Exercise Workout \(Lower Limb Strengthening and Balance Training\)](#)
- [Exercise: Home Exercise Workout \(Upper and Lower Limb Strengthening and Balance Training\)](#)

Clinics B2

TTSH Medical Centre, Level B2

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