Welcome

Welcome to this online tutorial focusing on the dietary management of dyslipidemias, as an important part in the prevention of cardiovascular disease (CVD). This is a “refresher” course, for general practitioners (GPs) and healthcare professionals (HCPs) in primary care practices, to leverage existing knowledge in this key area.

In recent years, dietary habits and their influence on cardiovascular risk have been extensively reviewed. The most recent European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS) guidelines on the management of dyslipidaemias and ESC CVD prevention guidelines, also state that dietary modifications should form the basis for CVD prevention. This module will specifically address the role of dietary and lifestyle modifications, in particular the use of foods with added plant sterols/stanols, to help lower cholesterol levels and prevent CVD.

The aim of this tutorial is to provide you with the latest guidelines and practical advice to assist you when managing patients.

Key areas covered:
- Strategies for management of elevated cholesterol levels recommended by ESC and EAS, focus on the impact of dietary and lifestyle changes on heart health
- The role of dietary fats, dietary fibres, and foods with added plant sterols/stanols in actively reducing cholesterol levels, and their place in the current nutritional guidelines for the prevention of CVD and the management of dyslipidaemias
- Practical advice on motivating patients to make changes to their diet and lifestyle

Learning outcomes:
- Understand the role of diet and lifestyle changes required to reduce cholesterol levels, and therefore prevent CVD and maintain a healthy heart
- Identify patients at increased CVD risk due to elevated cholesterol levels, who will benefit from diet and lifestyle changes
- Understand the role of dietary intervention including foods with added plant sterols and stanols in cholesterol lowering and identify those patients who will benefit from them
- Know how to give dietary advice to help lower your patient’s cholesterol levels and their risk of developing CVD

List of abbreviations used throughout the text

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HEALTHY DIETARY PATTERNS FOR CVD PREVENTION
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PLANT STANOLS AND STEROLS IN DYSLIPIDAEMIA
DIETARY FIBRES IN DYSLIPIDAEMIA
SOY PROTEIN IN DYSLIPIDAEMIA
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Know how to give dietary advice to help lower your patient’s cholesterol levels and their risk of developing CVD

List of abbreviations used throughout the text

- AHA: American Heart Association
- ALA: Alpha Linolenic Acid
- ASC: American Society of Cardiology
- BMI: Body mass index
- BP: Blood pressure
- CHD: Coronary Heart Disease
- CVD: Cardiovascular Disease
- DALYs: Disability-adjusted life years
- DASH: Dietary Approach to Stop Hypertension
- DHA: Docosahexaenoic acid
- EAS: European Atherosclerosis Society
- EPA: Eicosapentaenoic Acid
- ESC: European Society of Cardiology
- FH: Familial Hypercholesterolemia
- GPs: General practitioners
- HCPs: Healthcare professionals
- JBS: Joint British Societies
- LA: Linoleic Acid
- MUFA: Monounsaturated fatty acids
- PREDIMED: Primary Prevention of Cardiovascular Disease with a Mediterranean Diet
- PUFA: Polyunsaturated fatty acids
- RCTs: Randomized controlled trials
- SAMS: Statin Associated Muscle Symptoms
- SCORE: Systemic Coronary Risk Estimation
- SFA: Saturated fatty acids
- TC: Total cholesterol
- TFA: Trans fatty acids
- TG: Triglycerides
- WHO: World Health Organization

References


Burden of Cardiovascular Disease

CVD is a leading cause of death in developed and developing countries. Particularly coronary heart disease (CHD) and ischemic stroke are leading causes of premature mortality and disability-adjusted life years (DALYs) in Europe resulting in over 4 million deaths each year.

CVD accounts in Europe for 42% of all female deaths before the age of 75 years, as well as causing 38% of deaths in men. The World Health Organization (WHO) also estimates that CVD is the largest disease burden on Europe, accounting for 27% of all DALYs.

As a consequence, CVD is a major burden on healthcare budgets and costs the European Union nearly €200 billion each year. Of this total cost, around 54% is due to health care costs, 24% due to productivity losses and 22% due to the informal care of people with CVD.

CVD risk factors

The causes of CVD are multifactorial with many directly linked to diet and lifestyle. The major risk factors include:

<table>
<thead>
<tr>
<th>Non-modifiable risk factors:</th>
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<tbody>
<tr>
<td>Gender</td>
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<tr>
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The majority of risk factors are modifiable with changes. For more detailed information on CVD risk factors.
including following a healthy diet or other lifestyle changes, such as stopping smoking and taking regular exercise.⁴,⁵
Diet and lifestyle interventions for CVD prevention

Dietary habits and their influence on CVD risk have been extensively reviewed and the European guidelines on CVD prevention and the management of dyslipidaemias state that dietary modifications should form the basis for CVD prevention\(^1,2,3\). Some dietary modifications directly result in measurable changes in blood cholesterol levels (see Table 2), as well as in BP and BMI. Even where changes in these risk factors are not observed, dietary modifications still appear to make an important contribution to CVD prevention\(^1,2,3\).

### Table 2: Approximate LDL-cholesterol reduction achievable by dietary modifications

<table>
<thead>
<tr>
<th>Dietary Component</th>
<th>Dose or change in intake/dietary habit</th>
<th>Approximate LDL-Cholesterol Reduction</th>
<th>Level of evidence</th>
<th>Approved health claim*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce saturated fat (SFA) and replace with unsaturated fats, namely polyunsaturated fatty acids (PUFA) and monounsaturated fatty acids (MUFA)</td>
<td>Exchange 5% energy of SFA with PUFA Exchange 5% energy of SFA with MUFA</td>
<td>7(^a) 6(^a)</td>
<td>2 stars 3 stars</td>
<td>✅</td>
</tr>
<tr>
<td>Reduce dietary cholesterol</td>
<td>&lt;300 mg/day</td>
<td>3(^b)</td>
<td>1 star 2 stars</td>
<td>✅</td>
</tr>
<tr>
<td>Increase dietary fibre intake from foods rich in soluble fibre</td>
<td>≥3 g/day β-glucan</td>
<td>5-6(^c,d)</td>
<td>3 stars 4 stars</td>
<td>✅</td>
</tr>
<tr>
<td>Consider plants sterols/stanols</td>
<td>1.5-3 g/day</td>
<td>7-12(^e,f)</td>
<td>3 stars 4 stars</td>
<td>✅</td>
</tr>
<tr>
<td>Consider soy protein</td>
<td>≥25 g/day</td>
<td>3-4(^g,h)</td>
<td>1 star 2 stars</td>
<td>❌</td>
</tr>
</tbody>
</table>

\(^a\) Level of Evidence A = Data derived from multiple randomized clinical trials or meta-analysis

\(^b\) Level of Evidence B = Data derived from a single randomized clinical trial or large non-randomized studies

Table adapted in parts from ESC/EAS Guidelines for the management of dyslipidaemias\(^2\). LDL-cholesterol reductions were adapted from \(^*\)Mensink RP et al., 2003; \(^1\)Wegewmans RM et al., 2001; \(^4\)Whitehead A. et al., 2014; \(^2\)Zhu x. et al., 2015; \(^6\)Ras RT et al., 2014; \(^7\)Commission Regulation No 686/2014; \(^8\)Sacks FM et al., 2006; \(^11\)Benkhedda et al, 2014

\(^*\)There are different types of health claims such as general health (function) claims and disease risk reduction claims. Disease risk reduction claims are statements that link a food (component) to a reduced risk of developing a diet-related disease or condition. The European Commission authorizes different health claims provided they are based on scientific evidence and can be easily understood by consumers. The European Food Safety Authority (EFSA) is responsible for evaluating the scientific evidence supporting health claims.
Diet and lifestyle interventions for CVD prevention

INTRODUCTION

In this section, you will get an insight of:

- The effects of different types of dietary fats on blood cholesterol;
- How to improve the quality of dietary fats intake;
- The role of nuts and fish/fish oil in CVD prevention

In adults, a total dietary fats intake between 20% and 35% of daily calories, is currently recommended\(^1,2\). Dietary fats recommendations aiming at reducing CHD risk mainly focus on reducing the intake of saturated fats by replacing them with unsaturated fats\(^1,3,4\).
Plant sterols and stanols in dyslipidaemia

In this section, you will get an insight of:

- What are plant sterols and stanols and how do they lower LDL-cholesterol;
- What are the cardiovascular benefits of including plant sterols and stanols as part of diet and lifestyle interventions in the management of dyslipidemia;
- What are the benefits of plant sterols and stanols in LDL-cholesterol management for patients already on drug therapy;

Based on the current ESC/EAS guidelines, a daily consumption of 2 g of plant sterols and stanols is recommended to achieve a significant inhibition of intestinal cholesterol absorption, subsequently leading to lowering LDL-cholesterol levels in the blood by 10%.
Dietary fibres in dyslipidaemia

This section will provide an insight on:

- the importance of including foods rich in dietary fibres into the daily diet in the context of a healthy diet and lifestyle for CVD prevention;
- the role of soluble fibres in TC and LDL-cholesterol lowering;
Soy protein in dyslipidaemia

This section will focus on the effect of soy protein on TC and LDL-cholesterol lowering.
Although this online learning tutorial focuses mainly on the dietary management of dyslipidemias, other lifestyle factors, such as smoking cessation, increasing physical activity, alcohol consumption in moderation and body weight management are also important factors contributing to the prevention of CVD.

This section will provide advice and a few practical tips you can suggest to your patients when talking about the importance of diet and lifestyle changes in CVD prevention.
Motivating patients to make diet and lifestyle changes

While the benefits of a healthy lifestyle, including diet modifications, stopping smoking, weight management and regular exercise for maintaining optimal LDL-cholesterol levels and reducing CVD risk are clear it can be hard to motivate patients to undertake these changes. The ESC/EAS guidelines highlight a few key steps that are crucial to influence any behavior change. These include

- Spending enough time with the individual to create a therapeutic relationship even just a few more minutes can make a difference
- Asking questions to check that the individual has understood the advice and has any support they require to follow it
- Acknowledging the individual's personal view
- Accepting that individuals may need support for a long time and that repeated efforts to encourage and maintain lifestyle change may be necessary in many individuals
- Encouraging the expression of worries and anxieties, concerns and self-evaluation of motivation for behavior change and chances of success
- Speaking to the individual in his/her own language and being supportive of every improvement in lifestyle
- Making sure that all healthcare professionals involved provide consistent information

Using the JBS “HearthAge” risk calculator could be helpful to make your patient aware of his/her current estimated heart age and especially to motivate him/her, showing the benefits that may be achieved by sustained, long-term reduction of
CVD risk factors through diet and lifestyle changes.
Summary of key learnings

**BURDEN OF CARDIOVASCULAR DISEASE:**

- Cardiovascular disease (CVD), particularly Coronary Heart Disease (CHD) and ischaemic stroke, is the main cause of premature mortality in Europe resulting in over 4 million deaths each year

**IMPACT OF DIETARY AND LIFESTYLE CHANGES ON CVD PREVENTION:**

- The World Health Organization (WHO) states that more than three-quarters of CVD mortality may be prevented with adequate changes in lifestyle
- European Society of Cardiology/European Atherosclerosis Society guidelines on the prevention of CVD, state that dietary modifications should form the basis for CVD prevention

**LOWERING LDL-CHOLESTEROL - A CENTRAL TARGET OF CVD PREVENTION:**

- Increased plasma total cholesterol (TC), in particular LDL-cholesterol is a known cause of coronary atherosclerosis
- Lowering total and LDL-cholesterol is the key therapeutic target for reducing CVD risk
- Nutritional and behaviour changes have been shown to lower LDL-cholesterol levels by up to 20%

**EUROPEAN GUIDELINES ON THE USE OF PLANT STEROLS/STANOLS TO LOWER CHOLESTEROL:**

- The ESC/EAS recommend the daily consumption of foods with added plant sterols/stanols (approximately...
MOTIVATING PATIENTS TO MAKE DIETARY CHANGES:

- Work with patients’ dietary preferences, motivating them to substitute unhealthy options for healthier ones using the patient fact sheet.

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EFSA Panel on Dietetic Products NaAN. Scientific Opinion on Dietary Reference Values for fats, including saturated fatty acids, polyunsaturated fatty acids, monounsaturated fatty acids, trans fatty acids, and cholesterol. EFSA Journal 2010;8:1461 2010.


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Case 1: A 55-year old female

Case Study 1: A 55-year old female patient, normal weight

Cardiovascular disease risk factors identified:

- Hypercholesterolaemia (serum total cholesterol 228mg/dl (5.9mmol/l), elevated, LDL-cholesterol 174mg/dl (4.5mmol/l), elevated)
- Age - 55 years
- Smoker
- Elevated blood pressure, despite medication (145/95mmHg)
- Father had died of an acute myocardial infarction at the age of 45 years

TREATMENT APPROACH:

According to the EAS and ESC guidelines for the management of dyslipidaemia, lifestyle changes together with statin treatment should be considered. Patient was reluctant to start medication, so a three step approach was undertaken.

Step 1

Step 2

Step 3
Faculty Page

This European Atherosclerosis Society (EAS) e-learning tutorial has been developed by an international group of basic scientists and clinical investigators with expertise in cholesterol metabolism, plant sterol and plant stanol biology, and cardiovascular disease.

THE EXPERT GROUP IS MADE UP OF:

Professor Alberico L. Catapano
EAS President; Professor of Pharmacology, University of Milan, Italy

Alberico L. Catapano is Full Professor of Pharmacology at the Faculty of Pharmacy at the University of Milano in the Department of Pharmacological Sciences. He is also Director of the Center for the Study of Atherosclerosis in Milan, Italy. (more info...)

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University of Pierre and Marie Curie, France

John Chapman is Research Professor at the University of Pierre and Marie Curie, and Director Emeritus of the National Institute for Health and Medical Research (INSERM) at the Pitié-Salpêtrière University Hospital in Paris, France. (more info...)

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University of Helsinki, Finland

Helena Gylling is Professor Emerita of Clinical Nutrition and Senior Lecturer in Internal Medicine at the University of Helsinki. Prof Gylling's research interests include cholesterol and plant sterol metabolism in health and disease. (more info...)

Professor Winfried März
Professor at the Clinical Institute of Medical and Chemical Laboratory Diagnostics at the Medical University of Graz, Österreich

Winfried März is a professor at the Clinical Institute of Medical and Chemical Laboratory Diagnostics at the Medical University of Graz, Österreich and associated scientists and the Mannheim Institute of Public Health. He is also director of the Academy for Synlab doctor 'training based in Mannheim synlab Services GmbH, Augsburg. (more info...)

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University Hospital Sant Joan, Spain

Luis Masana was Professor of Medicine and Head of the Internal
epidemiological studies at the national and international level including INTERSALT and MONICA. (more info...)

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Professor of Metabolic Diseases at the Federico II University, Naples, Italy

Gabriele Riccardi is full professor of Metabolic Diseases and Chairman of the Master Course on Human Nutrition at the Federico II University in Naples. He is also Director of the Unit for Diabetes, Nutrition and Metabolic Diseases at the University Hospital. (more info...)

Medicine Department and Lipid and Cardiovascular Risk Unit at the University Hospital Sant Joan from 1992 to 2006. (more info...)
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including following a healthy diet or other lifestyle changes, such as stopping smoking and taking regular exercise.\(^4\,5\)
LDL-cholesterol: the pivotal target for preventing CVD

Lipid metabolism can be disturbed in different ways, leading to changes in plasma lipoprotein function and/or levels\(^6\).

Elevated plasma total cholesterol (TC) and in particular LDL-cholesterol is a known cause of coronary atherosclerosis\(^6\).

Established and compelling evidence based on outcomes from multiple randomized controlled trials (RCTs) has shown that reducing TC and LDL-cholesterol levels can significantly reduce cardiovascular morbidity and mortality\(^6\).

In terms of reducing cardiovascular events and CVD mortality, lowering LDL-cholesterol has been shown to be beneficial irrespective of the underlying mechanisms by which this is achieved (reduced absorption or synthesis, or increased clearance of cholesterol)\(^7\).

Atherosclerosis, the underlying cause of CVD, is a slowly progressive disease that begins early in life and develops over several decades before becoming clinically manifested. It is a dynamic process however and it can be slowed down and potentially reversed to an extent\(^8\).

Prolonged exposure to lower LDL-cholesterol beginning early in life is associated with a substantially greater reduction in the risk of CHD compared to treating high LDL-cholesterol levels later in life\(^9\). Therefore, lowering LDL-cholesterol earlier in the disease process, through changes towards a healthy diet and lifestyle, and eventually resorting to drug therapies, should be encouraged for the prevention of CVD.
Cholesterol, fats and cellular waste products accumulate inside the arterial wall. Chemical reactions occurring within the buildup of material cause cholesterol molecules to oxidize. This initiates an inflammatory response in which monocytes from the blood stream travel to the site. Stimulation from oxidized cholesterol converts the monocytes into macrophages. The macrophages eat and digest the cholesterol molecules. As a result, the macrophages change into foam cells, which accumulate to form plaque.

As the plaque increases in size, the arterial wall thickens and hardens. At the same time, smooth muscle cells within the arterial wall begin to multiply. Most of the smooth muscle cells move to the surface of the plaque. These cells contribute to the formation of a firm, fibrous cap covering the plaque. Eventually the passageway through the artery narrows enough to reduce blood flow and the amount of oxygen received by the organs it supplies.
Atherogenic lipid triad: another type of dyslipidemia

Besides elevation of TC and LDL-cholesterol levels, several other types of dyslipidaemias appear to predispose to premature CVD. A specific common pattern is termed the atherogenic lipid triad. It consists of the co-existence of three lipid abnormalities: mildly elevated plasma triglyceride (TG) levels (due to increased very low density lipoprotein remnant particles), low HDL-cholesterol concentrations and the presence of increased small, dense LDL particles. As there is limited evidence on the effectiveness and safety of intervening in this pattern to reduce CVD risk, this pattern or its components must be regarded as optional targets of CVD prevention.

Therefore, lowering LDL-cholesterol remains the main target for reducing CVD risk.

Blood pressure: a second target for preventing CVD

Hypertension or elevated blood pressure (BP), namely Systolic BP ≥ 140 and/or Diastolic BP ≥ 90 mmHg has been identified as one of the major risk factors for CHD, stroke and heart failure.

High sodium (salt) intake, low potassium intake, high alcohol consumption, smoking and physical inactivity, as well as body weight gain may increase BP in susceptible subjects.

Targeted lifestyle modifications are the cornerstone for the prevention of hypertension. Healthy diet and lifestyle interventions are recommended in all patients with elevated or high-normal BP, namely pre-hypertension (Systolic BP 130-139 and/or Diastolic BP 85-89 mmHg), as well as to prevent elevated BP.
Other modifiable CVD risk factors: Obesity

Dyslipidemia, diabetes, and CVD, or any combination of these, are the most common metabolic complications of obesity. Risk of CHD, ischemic stroke and type 2 diabetes increases steadily with an increasing body mass index (BMI). Weight reduction, as well as prevention of further body weight gain is indispensable to prevent or delay the major metabolic complications of obesity and to reduce CVD risk.

Other modifiable CVD risk factors: Diabetes

CVD is the leading cause of morbidity and mortality in people with diabetes mellitus. Patients with diabetes, especially type 2 diabetes, often have an unhealthy blood lipid profile, including high LDL-cholesterol, low HDL-cholesterol, and high TG. Together with hyperglycemia, dyslipidemia in diabetic patients may facilitate the development of CHD and other complications of atherosclerosis. Diet and lifestyle intervention remains a key component for CVD prevention also in patients with diabetes. Weight reduction in overweight or obese subjects, increasing physical activity and adopting a healthy, well-balanced diet are fundamental considerations to improve both glycemic control and the blood lipid profile, thus reducing CVD risk.
Ways to measure cardiovascular risk

Certain people such as those with established CVD, existing diabetes or presence of further risk factors are automatically considered at ‘very high’ or ‘high’ total cardiovascular risk, requiring active evaluation and management of all risk factors. For all others, current guidelines on CVD prevention recommend the use of a risk estimation model such as Systemic Coronary Risk Estimation (SCORE).

In order to estimate the lifetime CVD risk, the Joint British Societies (JBS) “HeartAge” risk calculator might be a useful tool.

Risk assessment systems

SCORE:

Risk charts such as SCORE are designed to assist with risk estimation in healthy people with no signs of disease. The SCORE system, based on European data, estimates the 10-year risk of a first fatal atherosclerotic event, for example a heart attack, stroke, or other occlusive arterial disease including sudden cardiac death. Risk estimates have been produced for high and low risk regions in Europe. A relative risk chart has also been produced for younger people, as a low absolute risk may conceal a high relative risk, requiring lifestyle advice.

To find out more about how to use the SCORE risk assessment system please see the joint EAS/ESC guidelines on the management of dyslipidemias.

Table 1: Intervention strategies as a function of total CV risk and LDL-Cholesterol level

<table>
<thead>
<tr>
<th>Total CV risk (SCORE) %</th>
<th>LDL-Cholesterol Levels</th>
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<tbody>
<tr>
<td></td>
<td>&lt;70 mg/dl</td>
</tr>
<tr>
<td></td>
<td>&lt;1.8 mmol/L</td>
</tr>
<tr>
<td>&lt;1</td>
<td>No lipid intervention</td>
</tr>
<tr>
<td>1 to &lt;5</td>
<td>Lifestyle intervention</td>
</tr>
<tr>
<td>&gt;=5 to &lt;10, or high risk</td>
<td>Lifestyle intervention, consider drug*</td>
</tr>
</tbody>
</table>
OTHER SCORING SYSTEMS:

Other systems also exist, for example, the Framingham system is similar and based on US data, using information from the Framingham Heart Study to assess 10-year risk of fatal and non-fatal CVD events in patients \(^3,13\).

However, it has been found that it could overestimate (or underestimate) risk in populations other than the US population; therefore it is important to assess your patients using the most appropriate risk scoring system for them \(^14\).

The JBS “HeartAge” risk calculator

The JBS3 “HeartAge” risk calculator is a newly developed and easy to use tool, intended for use by GPs and other HCPs with their patients \(^15\). Differently from the other scoring systems mentioned above, this risk calculator has been developed to estimate the lifetime risk of developing a cardiovascular event in healthy people (with no established CVD), by calculating their “Heart Age”. Heart Age can differ from the chronological age, depending on the presence and severity of those modifiable risk factors that lead to CVD \(^15\).

Heart Age gives patients a better understanding of their CVD risk over their lifetime and the benefits that may be achieved by sustained long-term reduction of CVD risk factors through diet and lifestyle changes, and/or drug therapies, if necessary. To find out more information about the JBS3 “HeartAge” risk calculator, please see the Joint British Societies’ consensus recommendations for the prevention of cardiovascular disease JBS3 \(^15\).
CVD prevention offers positive long-term health benefits for patients of all ages

Currently CVD prevention in the young, or those with just a mild or moderate risk, is limited, but can result in substantial benefit. As atherosclerosis is a chronic, progressive disease usually initiated during the first 30 years of life, maintaining desirable LDL-cholesterol levels at an early stage, even from childhood, substantially delays or possibly prevents the onset of the disease. This approach is associated with a markedly greater reduction in CVD risk than lowering already elevated LDL-cholesterol levels in middle age. However, it should be considered never too late to take action to lower cholesterol levels.

So, how can LDL-cholesterol levels be maintained at optimal or desired levels throughout life without long-term drug use and adding to the burden on the healthcare system? Dietary habits and lifestyle factors need to be seriously considered; particularly as nutritional and behavioral changes have been shown to lower LDL-cholesterol levels by up to 20%.

Cardiovascular disease is the result of a lifelong process and, as such, intervention strategies to reduce risk such as adopting a healthy diet and lifestyle should begin as early in life as possible.

Furthermore, cohort studies demonstrate a clear link between a low total CVD risk profile (through lifestyle) and low CHD incidence. One example is a cohort study of

In fact, 62% of coronary events in this cohort may have been prevented with better adherence to these five healthy lifestyle practices. Furthermore, among men
42,847 male US health professionals aged 40-75 years followed for a 16-year period during which a total of 2,183 incident coronary events were observed. Results indicated that higher healthy lifestyle scores were associated with lower incidences of CHD. These low-risk scores were defined as:

- absence of smoking
- body mass index <25 kg/m²
- moderate-to-vigorous physical activity 30 min/d
- moderate alcohol consumption (5 to 30 g/d)
- being in the top for a healthy diet score

Taking medication for hypertension or hypercholesterolemia, 57% of all coronary events may have been prevented with a low-risk lifestyle.
References


beginning early in life on the risk of coronary heart
disease: a Mendelian randomization analysis. J Am Coll
Cardiol 2012;60(25):2631-2639.
Diet and lifestyle interventions for CVD prevention

Dietary habits and their influence on CVD risk have been extensively reviewed and the European guidelines on CVD prevention and the management of dyslipidaemias state that dietary modifications should form the basis for CVD prevention\(^1,2,3\). Some dietary modifications directly result in measurable changes in blood cholesterol levels (see Table 2), as well as in BP and BMI. Even where changes in these risk factors are not observed, dietary modifications still appear to make an important contribution to CVD prevention\(^1,2,3\).

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<th>Dietary Component</th>
<th>Dose or change in intake/dietary habit</th>
<th>Approximate LDL-Cholesterol Reduction</th>
<th>Level of evidence</th>
<th>Approved health claim*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce saturated fat (SFA) and replace with unsaturated fats, namely polyunsaturated fatty acids (PUFA) and monounsaturated fatty acids (MUFA)</td>
<td>Exchange 5% energy of SFA with PUFA Exchange 5% energy of SFA with MUFA</td>
<td>7(^a) 6(^a)</td>
<td>★★★</td>
<td>✔</td>
</tr>
<tr>
<td>Reduce dietary cholesterol</td>
<td>≤300 mg/day</td>
<td>3(^b)</td>
<td>★★</td>
<td></td>
</tr>
<tr>
<td>Other LDL-lowering options</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase dietary fibre intake from foods rich in soluble fibre</td>
<td>≥3 g/day (β)-glucan</td>
<td>5-6(^c,d)</td>
<td>★★★</td>
<td>✔</td>
</tr>
<tr>
<td>Consider plants sterols/stanols</td>
<td>1.5-3 g/day</td>
<td>7-12(^e,f)</td>
<td>★★★</td>
<td>✔</td>
</tr>
<tr>
<td>Consider soy protein</td>
<td>≥25 g/day</td>
<td>3-4(^g,h)</td>
<td>★★</td>
<td>×</td>
</tr>
</tbody>
</table>

*Level of Evidence A = Data derived from multiple randomized clinical trials or meta-analysis
Level of Evidence B = Data derived from a single randomized clinical trial or large non-randomized studies

Table adapted in parts from ESC/EAS Guidelines for the management of dyslipidaemias\(^2\) LDL-cholesterol reductions were adapted from \(^*\)Mensink RP et al., 2003\(^4\); \(^\dagger\)Weggemans RM et al.,2001\(^5\); \(^\ddagger\)Whitehead A. et al., 2014\(^6\); \(^\S\)Zhu x. et al., 2015\(^7\); \(^\R\)Ras RT et al., 2014\(^8\); \(^\C\)Commission Regulation No 686/2014\(^9\); \(^\S\)acks FM et al., 2006\(^10\); \(^\B\)enkhedda et al, 2014\(^11\)

*There are different types of health claims such as general health (function) claims and disease risk reduction claims. Disease risk reduction claims are statements that link a food (component) to a reduced risk of developing a diet-related disease or condition. The European Commission authorizes different health claims provided they are based on scientific evidence and can be easily understood by consumers. The European Food Safety Authority (EFSA) is responsible for evaluating the scientific evidence supporting health claims.
MOTIVATING PATIENTS TO MAKE DIET AND LIFESTYLE CHANGES

SUMMARY OF KEY LEARNINGS

KNOWLEDGE TEST

REFERENCES

CASE STUDIES

FACULTY
Dietary Patterns for preventing CVD

INTRODUCTION

Dietary choices are based on personal and cultural food preferences and include a combination of foods whose nutrients may interact synergistically and have a cumulative effect on health, including the risk of CVD.

Dietary patterns that include a wide variety of nutritious foods are more likely to meet nutrient requirements and confer health benefits than those diets that are selectively restricted in calories or nutrients\textsuperscript{12}.

Furthermore, using a foods group based approach may offer a comprehensive strategy for the prevention of CVD.

Based on a growing body of evidence\textsuperscript{13, 14}, dietary patterns beneficial for cardiovascular health are plant-based, consisting of a high consumption of whole grains, fruits, vegetables, legumes, nuts and seeds; moderate consumption of fish, poultry and eggs; and limited consumption of red meat, sweets, and sugar-sweetened beverages.

This section will explore specific dietary patterns associated with a reduction of CVD risk, which are also favorable to manage dyslipidemia, particularly:

- The Mediterranean Diet
- The Portfolio Diet
- The Dietary Approach to Stop Hypertension (DASH) Diet
MOTIVATING PATIENTS TO MAKE DIET AND LIFESTYLE CHANGES

SUMMARY OF KEY LEARNINGS

KNOWLEDGE TEST

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CASE STUDIES

FACULTY
The Mediterranean diet

The Mediterranean diet may be considered as a "gold standard" eating pattern for CVD risk prevention as adherence to it favorably affects numerous CVD risk factors, including dyslipidemia, hypertension, and diabetes.\(^{15}\)

The (traditional) Mediterranean diet (see Table 3) is characterized by:

- Abundance of plant-based foods encompassing whole grains, fruits, vegetables, legumes and nuts;
- Low to moderate consumption of dairy products;
- Low consumption of red meat (few times per month);
- Moderate consumption of fish, poultry and eggs;
- Optional moderate amount of wine, with meals (maximum 1-2 glasses per day for men and 1 glass for women);
- Olive oil as main source of dietary fats;
- Herbs and spices to flavor food.

Table 3 Food groups and frequency of consumption according to Mediterranean diet

<table>
<thead>
<tr>
<th>Daily consumption</th>
<th>Weekly</th>
<th>Occasionally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every main meal should contain:</td>
<td>LEGUMES ≥ 2 servings</td>
<td>SWEETS (Sugar, candies, pastries and beverages such as sweetened fruit juices and soft drinks)</td>
</tr>
<tr>
<td>CEREALS and GRAIN FOODS: 1-2 servings per meal in the form of whole grain bread, pasta, rice, barley, couscous and others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEGETABLES: ≥2 servings per meal, varying in colors. At least one of the servings should be consumed raw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRUITS: 1-2 servings per meal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAIRY PRODUCTS: low-fat dairy</td>
<td>FISH ≥2 servings</td>
<td></td>
</tr>
<tr>
<td>OLIVE OIL (preferably extra virgin) as main source of dietary fats</td>
<td>WHITE MEAT 2 servings</td>
<td></td>
</tr>
</tbody>
</table>
Adherence to a Mediterranean diet has been shown to be beneficial with respect to CVD risk\(^\text{13}\). For instance, the Primary Prevention of Cardiovascular Disease with a Mediterranean Diet (PREDIMED) trial has recently reported significant beneficial effects of a Mediterranean diet supplemented with extra-virgin olive oil or with a mix of nuts on multiple cardiovascular and metabolic risk factors and primary prevention of CVD\(^\text{16}\).

Most importantly, cardiovascular benefits of the Mediterranean diet in primary prevention of CVD have been extensively observed also in middle-aged people\(^\text{16}\).

Most of the effects may be ascribed to the changes in the quality of dietary fats (saturated fatty acids replaced by unsaturated fatty acids), a high content of dietary fibre, antioxidant compounds and minerals\(^\text{15}\), that could synergistically act on several pathways, resulting in a substantial improvement of general and especially heart health\(^\text{14}\).
The Portfolio diet: A dietary portfolio of foods to maximize cholesterol lowering

Re-introducing those plant foods that are high in dietary fibre, vegetable proteins and unsaturated fats next to plant sterols into the daily diet is advantageous to improve an abnormal blood lipid profile and to reduce or delay the need for pharmacological interventions. The core of the Portfolio diet is to combine plant-based cholesterol-lowering foods with a low dietary cholesterol intake (<200 mg/day) and a low saturated fat intake (≤ 7% of total energy). Four dietary components have been included in the diet for their potential ability to lower serum cholesterol: plant sterols, soluble fibre, soy protein, and nuts, especially almonds.

Within the Portfolio diet approach (see Table 4), a recommended intake of:

- 1 g of plants sterols /1000 kcal;
- 22.5 g of soy proteins /1000 kcal;
- 10 g of viscous dietary fibre /1000 kcal
- 23 g of almonds /1000 kcal

The Portfolio diet may also have relevance in reduction of BP in the long-term.

The Portfolio diet approach can be a valid vegetarian dietary alternative, as the focus of the diet is based on consuming plant-based foods. Besides, it may be easily combined with other dietary patterns, which also emphasize increased consumption of plant foods, such as the Mediterranean and the DASH diet, and with other lifestyle interventions.

### Table 4 Dietary components of the Portfolio diet

<table>
<thead>
<tr>
<th>Food group (recommended quantity/servings)</th>
<th>Type of foods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary components of the Portfolio diet</strong></td>
<td></td>
</tr>
<tr>
<td>Viscous fibre (10 g/1000 kcal)</td>
<td>Oat, oat bread, oat bran breads, barley, psyllium containing cereals, vegetables;</td>
</tr>
<tr>
<td>Soy protein (22.5 g/1000 kcal)</td>
<td>Soy beverage, tofu, soy meat analogues, soy cheese</td>
</tr>
<tr>
<td>Plant sterols (1 g/1000 kcal)</td>
<td>Foods with added plant sterols/stanols</td>
</tr>
<tr>
<td>Nuts: almonds (23 g/1000 kcal)</td>
<td>Any (unsalted) nuts, especially almonds</td>
</tr>
<tr>
<td><strong>Additional components</strong></td>
<td></td>
</tr>
<tr>
<td>Other vegetable proteins (6–8 g/1000 kcal)</td>
<td>Beans, lentils, peas</td>
</tr>
<tr>
<td>Egg whites and egg substitute (≤3 whole egg equivalent per week)</td>
<td>Egg white, egg substitute, egg replacements</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Fruit and vegetables (2.5–5 servings/1000 kcal)</td>
<td>All fruits and vegetables</td>
</tr>
<tr>
<td>Poultry, fish, and red meats (≤3 serving per week)</td>
<td>White poultry meat, any fish, lean or extra lean red meats</td>
</tr>
<tr>
<td>Fat-free or low-fat dairy foods (≤2 servings per week)</td>
<td>Skimmed milk, low-fat yogurt, low-fat or fat-free cheese, or cottage cheese</td>
</tr>
<tr>
<td>Oils and margarine high in monounsaturated fatty acids (11 g/1000 kcal)</td>
<td>Olive, rapeseed (canola) oil; vegetable oil-based spreads</td>
</tr>
</tbody>
</table>

Source: Jenkins DJ et al., 2006.
The DASH diet: Dietary Approach to Stop Hypertension (DASH)

The DASH diet is an eating plan primarily targeted to lower BP\textsuperscript{21,22}. It is also an effective nutritional strategy to prevent CVD\textsuperscript{13} since it has also been shown to also have great beneficial effects on blood lipid levels, improving both TC and LDL-cholesterol, thus leading to a reduction of CVD risk\textsuperscript{14,23}.

The DASH diet shares some dietary features with the Mediterranean diet as it:

- Emphasizes vegetables, fruits, and fat-free or low-fat dairy products
- Includes whole grains, fish, poultry, beans, seeds, nuts, and vegetable oils
- Limits sodium intake as well as sweets, sugar-sweetened beverages, and red meat consumption

Most of the effects of the DASH diet may be ascribed to a higher intake of protective nutrients present in the different food groups (Figure 1) such as potassium, calcium, magnesium, dietary fibre and vegetable proteins. At the same time, this dietary pattern is lower in refined grain foods, saturated and trans fats, sodium, as compared to the Western diet characterized by high intakes of red meat, sugary desserts, high-fat foods, and refined grain foods\textsuperscript{13}.

**Figure 1** The DASH diet foods groups

Overall, all three dietary patterns are shown to be beneficial with respect to CVD risk. They reduce total and LDL-cholesterol levels and BP, emphasizing the importance of specific food choices and healthier alternatives rather than a specific macronutrient composition.
Summary of recommendations on dietary patterns

It is possible to achieve a healthy diet in multiple ways and preferably, with a wide combination of foods.

It is important to consider that gradual and small changes are the most effective way to contribute to long-term dietary modifications (see Table 5).

Table 5 Make healthy food choices

<table>
<thead>
<tr>
<th>Increase:</th>
<th>Exchange:</th>
<th>Limit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>Refined cereals</td>
<td>Processed meat and red meat</td>
</tr>
<tr>
<td>Pulses</td>
<td>Wholegrain cereals</td>
<td></td>
</tr>
<tr>
<td>Fruits and berries</td>
<td>Vegetable oils, Vegetable oil</td>
<td>Beverages and foods with</td>
</tr>
<tr>
<td></td>
<td>based-spreads</td>
<td>added sugar</td>
</tr>
<tr>
<td>Fish and seafood</td>
<td>High-fat dairy</td>
<td>Salt</td>
</tr>
<tr>
<td>Nuts and seeds</td>
<td>Low-fat dairy</td>
<td>Alcohol</td>
</tr>
</tbody>
</table>

Adapted from the Nordic Nutrition Recommendations 2012

Dietary recommendations should always take into account local food habits, however interest in healthy food choice from other cultures should be promoted. A balance of foods and beverages within energy needs should be promoted to prevent weight gain.

Additionally, among the wide variety of foods, foods combinations or a foods groups based approach, such as in these dietary patterns can be considered an effective ways to improve the total CVD risk profile.

REMEMBER: The key for a healthy diet is to vary and to focus on quality, quantity and frequency of food intake!
References


3. Joint British Societies’ consensus recommendations for the prevention of cardiovascular disease (JBS3). Heart 2014;100 Suppl 2:i1-i67


Saturated Fatty acids (SFA)

SFA represent the major type of fats in the diet in most countries. Specifically, SFA have the strongest impact on blood cholesterol, increasing TC and LDL-cholesterol levels. There is consistent scientific evidence that replacing saturated with unsaturated fats is the most beneficial for CHD risk reduction. Table 6 shows the effect of replacing 5% of the dietary energy from SFA on LDL-cholesterol.

<table>
<thead>
<tr>
<th>SFA replacement with:</th>
<th>Approximate LDL-cholesterol reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monounsaturated Fatty Acids (MUFA)</td>
<td>-8 mg/dL (-0.21 mmol/L) = -6%</td>
</tr>
<tr>
<td>Polyunsaturated fatty acids (PUFA)</td>
<td>-10 mg/dL (-0.26 mmol/L) = -7%</td>
</tr>
</tbody>
</table>

According to guidelines, the goal for CVD prevention is reducing SFA consumption to less than 10% of total energy by replacing SFA with unsaturated fat.

The replacement of SFA by both PUFA and MUFA is beneficial for blood lipids, while the effects of replacing SFA with carbohydrates depends on the quality of the carbohydrates.

Trans Fatty acids (TFA)

Dietary TFA raise LDL-cholesterol and lower HDL cholesterol and contribute consistently and significantly to increase the risk of CHD. Reducing TFA intake is an important target to lower LDL-cholesterol and consequently, to decrease the risk of CHD.

As TFA adversely affect multiple CVD risk factors, their intake should be kept as low as possible. No more than 1% of total energy should come from TFA.

Sources of SFA:
Fatty meat and dairy products such as full-fat milk, hard cheese, butter and cream, tropical oils such as coconut and palm oil, fully hydrogenated vegetable oils, egg yolk, foods containing 'hidden fat' such as confectionary and cakes or crisps.

Sources of TFA:
From ruminants such as beef and lamb. Industrial TFA originate from partially hydrogenated vegetable oils, and are commonly found in convenience foods (e.g. pizza with cheese), battered or deep-fried foods (e.g. take-away potato crisps), commercial baked goods like pies and pastries.

As TFA are harmful for health, the use of partially hydrogenated vegetable oils in food manufacturing (e.g. margarine) has been considerably reduced in Europe over the past years. Nevertheless, TFA intake may still vary between different European countries.
Foods that naturally contain TFA are dairy products such as butter, milk, cheese, and meat.

### Dietary cholesterol

Dietary cholesterol raises blood cholesterol levels. Yet, the impact of dietary cholesterol on blood cholesterol is weaker if compared with that of SFA and TFA. Nevertheless, it is important to consider the possible consequence of high dietary cholesterol intake on blood lipid levels in those individuals with CVD or who are at increased risk of CVD (see Chapter 1).

When guidelines are followed to lower the intake of SFA, this usually also leads to a reduction in dietary cholesterol intake because they come from the same dietary sources.

The EAS/ESC guidelines recommend that cholesterol intake should not exceed 300 mg/day.

### SOURCES OF DIETARY CHOLESTEROL:

SFA and cholesterol are typically found in the same foods; dietary cholesterol comes only from foods of animal origin, such as meat, egg yolks, and full-fat dairy products, including butter, cream and cheese. Shrimps and prawns are rich in cholesterol as well. Occasional consumption of these foods items, rather than habitual, is advised.
INTRODUCTION

In this section, you will get an insight of:

- The effects of different types of dietary fats on blood cholesterol;
- How to improve the quality of dietary fats intake;
- The role of nuts and fish/fish oil in CVD prevention

In adults, a total dietary fats intake between 20% and 35% of daily calories, is currently recommended\(^1\,^2\). Dietary fats recommendations aiming at reducing CHD risk mainly focus on reducing the intake of saturated fats by replacing them with unsaturated fats\(^1\,^3\,^4\).
Monounsaturated Fatty Acids (MUFA)

Replacing SFA with MUFA improves the blood lipid profile and does not affect HDL-cholesterol levels\(^5\) (See Table 6).

**SOURCES OF MUFA:**

MUFA are found in a wide variety of foods including vegetable oils, especially olive,

Polyunsaturated fatty Acids (PUFA)

PUFA lower LDL-cholesterol levels when they replace SFA or carbohydrates\(^5,6,12\) (See Table 6).

PUFA can be divided into two subgroups: Omega-6, and Omega-3.

Among PUFA, linoleic acid (LA) and alpha-linolenic acid (ALA) are essential fatty acids and are needed for growth and development and maintaining health.

A healthy diet should contain both Omega-6 and Omega-3 PUFA\(^2\).
Omega-6 (mostly LA) are the major PUFA in human diet and are widely present in plant (based) foods. The richest sources are soybean, corn, sunflower and safflower oils, along with vegetable oil-based spreads and margarines.

Also nuts and seeds are rich in Omega-6.

Omega-3

There are two types of Omega-3 in the diet: "vegetable" and "marine" Omega-3.

- The "vegetable" Omega-3 ALA is present in linseed, rapeseed, and soybean oil, chia seeds, nuts and green leafy vegetables (e.g. Brussels sprouts, kale, spinach, and salad greens);

- The "marine" very long chain Omega-3 eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) occur in oily fish such as herring, sardines, tuna, trout, salmon and mackerel. In lean fish (such as cod), they are found in liver, which is a natural source of fish oil.

Omega-3 can also be found in fortified foods such as soymilks, cooking oils, eggs, spreads.

EPA and DHA are not strictly "essential", as the human body can form them from ALA.

EPA and DHA do not lower LDL-cholesterol; nonetheless they have other beneficial effects such as lowering blood TG and reducing BP.

For individuals who do not eat fish or seafood, or following a vegetarian or vegan diet, increasing the consumption of "vegetable" Omega-3-rich food sources, including seeds, nuts, vegetable oils and green leafy vegetables, is encouraged to ensure the recommended daily intake of Omega-3.

Within the Omega-6 family, there is also arachidonic acid. It occurs in smaller amount and originates from animal foods (e.g. meat, poultry and eggs).
Moving towards a healthy dietary pattern: particular foods that should be included more often in the diet

Dietary management of CVD risk is a key element in CVD prevention. Hence, considering foods, rather than nutrients in isolation, is advantageous.

VEGETABLE OILS AND MARGARINES

When aiming to reduce SFA intake by replacing them with unsaturated fats for CVD prevention, plant-based sources, such as vegetable oils and vegetable oil-based spreads and margarines can be healthy substitutes to animal-derived SFA.

Vegetable oils deliver essential fatty acids such as Omega-3 ALA and the Omega-6 LA as well as fat soluble vitamins, e.g. Vit. E. They provide different combinations of SFA, MUFA and PUFA depending on their origin. Among vegetable oils, olive oil, particularly extra-virgin olive oil, is especially emphasized in the Mediterranean dietary pattern as it is particularly rich in MUFA and antioxidants compounds. In fact, the PREDIMED trial has shown that supplementing a Mediterranean diet with extra-virgin olive oil can reduce the incidence of major cardiovascular events among persons at high CVD risk^{14}.

Margarines are made from various vegetable oils that are rich in PUFA and MUFA. Some margarines contain added plant sterols and stanols or Omega-3 which confer a particular cardiovascular health benefit and help to lower LDL-cholesterol and TG levels^{13, 15}.

NUTS

Nuts are another plant-based alternative to SFA rich foods. Most common nuts in the diet are almonds, walnuts, peanuts, hazelnuts, pistachios and chestnuts. Including nuts as a part of a daily healthy diet should

Nut consumption has been also associated with reduced risk of CHD and hypertension^{18}.

The beneficial effects on multiple CVD and metabolic risk factors of supplementing a diet with a portion (approximately 30g) of nuts was shown in the PREDIMED trial^{14}.

Increase nuts consumption (preferably unsalted) for a healthy hearth: a little amount, can have a big impact for CVD prevention.

FISH AND FISH OIL

Fish and seafood deserve particular attention within dietary changes towards a heart healthy diet. They are an important source of many nutrients including unsaturated fats and protein, several vitamins (e.g. Vit. D and B) and minerals (e.g. selenium, iodine, and potassium)^{9}.

A characteristic of fish and, especially, oily fish, is its high content of very long chain Omega-3 EPA and DHA.

In addition to the cardiovascular health benefits (see above), EPA and DHA have anti-inflammatory effects, and, for this reason, they might not only prevent plaque development but also contribute to the atherosclerotic plaque stabilization^{19}.

Next to fish, fish oil or marine omega-3 are beneficial for heart health. Although fish oil does not have an effect on blood TC and LDL-cholesterol levels, at high doses
be emphasized as, if compared to foods of animal origin (like meat, cheese, whole milk and egg yolks), they have a very high unsaturated to saturated fats ratio\textsuperscript{16}. In fact, they are also high in Omega-3 (e.g. ALA) and low in SFA. Next to their optimal lipid profile, other not-fat components, such as plant sterols, dietary fibres, along with particular amino acids, are likely to play an important role in their LDL-cholesterol lowering effect\textsuperscript{16,17}. 

\textbf{ADVICE}: Eat fish at least twice a week, one of which should be an oily fish\textsuperscript{6}. In addition to providing very long chain Omega-3 fatty acids fish provides proteins, vitamins and minerals. Opt for a moderate consumption of mollusks and shellfish, as they are also a significant source of cholesterol. 

\textbf{SUMMARY OF KEY LEARNINGS}

\textbf{KNOWLEDGE TEST}

\textbf{REFERENCES}

\textbf{CASE STUDIES}

\textbf{FACULTY}
Dietary fats in a nutshell

For CVD prevention, the type of dietary fat, but not the total amount of fat, predicts their effects on blood cholesterol levels (see Table 7).

Although following total fat recommendations is an important goal, particular attention should be paid to the quality of dietary fat. Help your patients to improve their blood lipid profile through healthier foods choice (see Table 8).

Table 7: Impact of dietary fats on LDL-cholesterol levels

<table>
<thead>
<tr>
<th>Dietary fats</th>
<th>LDL-cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFA</td>
<td></td>
</tr>
<tr>
<td>TFA</td>
<td></td>
</tr>
<tr>
<td>Replacing SAFA with MUFA</td>
<td></td>
</tr>
<tr>
<td>Replacing SAFA with PUFA</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: Tips to improve blood lipid profile

Make the smartest food choice

Recognize saturated fats: they originate primarily from animal sources and most of them are visible (butter, visible fat of the meat, lard, bacon, ham, sausages...)

Replace foods containing saturated fats with foods that are high in unsaturated fats, such as:
- oily fish (e.g. mackerel and salmon)
- nuts (e.g. almonds, walnuts, hazelnuts)
- seeds (e.g. flaxseeds and pumpkin)
- vegetable oils and vegetable oil-based spreads and margarines (i.e. sunflower, olive, corn, walnut and rapeseed oils)

Consider food products whose labels claim: “Source of Omega-3 fats” and/or “High in unsaturated fats/PUFA/MUFA”

Reduce fatty cuts of meat (trim visible fat from meat and ham; take the skin off from chicken), as well as high-fat dairy products intake

Prefer healthy methods of cooking

Increase the consumption of foods rich in soluble fibers such as legumes, fruit and vegetables; wholegrains such as oat and barley
Consider to use food with added plant-sterols/stanols

Consider healthy dietary patterns

Get physically active
References

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8. Li Y, Hruby A, Bernstein AM et al. Saturated Fats


Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease: A Prospective Cohort Study. J Am Coll Cardiol 2015;66(14):1538-1548.


What are plant sterols and stanols and what are their sources?

Plant sterols and stanols are components of our everyday diet as they are found in all plant-based foods (see sources of plant sterols and stanols in Table 9). They are bioactive components in plants with similar functions as that of cholesterol in mammals.

In the general population, the daily intake of plant sterols is about 300 mg. Those following a vegetarian or vegan diet may ingest up to 600 mg/day.

Plant stanols are present in smaller amounts than plant sterols in everyday foods. The amounts of plant stanols ingested from the diet is 17-24 mg/day.

SOURCES OF PLANT STEROLS AND STANOLS:

Vegetable oils (e.g. corn, rapeseed, soybean, sunflower), margarines, cereals (e.g. corn, rye, wheat, barley, millet, oat), legumes (e.g. peas, beans and lentils), seeds (e.g. sunflower) and nuts (e.g. peanuts and almonds), vegetables (e.g. broccoli, cauliflower, carrots) and fruits (e.g. avocado, raspberry, orange).

Plant sterols and stanols are also added to foods such as vegetable fat-based spreads and margarine as well as to milk, yoghurt, yoghurt drinks and other foods.

### Table 9: Plant sterols and stanols content in naturally occurring food sources (in mg/100 g edible food)

<table>
<thead>
<tr>
<th>Food group</th>
<th>Plant sterols and stanols (mg/100 g of edible portion)</th>
<th>Food group</th>
<th>Plant sterols and stanols (mg/100 g of edible portion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable Oils:</td>
<td></td>
<td>Nuts and seeds:</td>
<td></td>
</tr>
<tr>
<td>• Sunflower oil</td>
<td>436</td>
<td>• Almonds</td>
<td>208</td>
</tr>
<tr>
<td>• Olive oil</td>
<td>177</td>
<td>• Peanuts</td>
<td>116</td>
</tr>
<tr>
<td>• Rapeseed oil</td>
<td>773</td>
<td>• Sunflower seeds</td>
<td>322</td>
</tr>
<tr>
<td>• Soybean oil</td>
<td>349</td>
<td>• Pistachio nuts</td>
<td>297</td>
</tr>
<tr>
<td>Vegetable oil-based margarines:</td>
<td></td>
<td>Vegetables:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>•</td>
<td></td>
</tr>
</tbody>
</table>
Plant sterols and stanols are widely distributed in plant-based foods, but daily intake of plant sterols and stanols from those natural sources is not sufficient for an effective LDL-cholesterol lowering effect.
Plant sterols and stanols in dyslipidaemia

In this section, you will get an insight of:

- What are plant sterols and stanols and how do they lower LDL-cholesterol;
- What are the cardiovascular benefits of including plant sterols and stanols as part of diet and lifestyle interventions in the management of dyslipidemia;
- What are the benefits of plant sterols and stanols in LDL-cholesterol management for patients already on drug therapy;

Based on the current ESC/EAS guidelines, a daily consumption of 2 g of plant sterols and stanols is recommended to achieve a significant inhibition of intestinal cholesterol absorption, subsequently leading to lowering LDL-cholesterol levels in the blood by 10%.¹
What are the cardiovascular benefits of including plant sterols and stanols in a healthy lifestyle?

Studies have shown that, even at their highest intakes, naturally occurring dietary plant sterols and stanols only have a modest effect on lowering cholesterol concentrations.

This is because levels of plant sterols and stanols occurring in natural food sources are too low. Clinical studies show that foods with added plant sterols and stanols significantly lower blood cholesterol, especially LDL-cholesterol, a major CVD risk factor.

LDL-cholesterol lowering is linked to lower CVD risk regardless of the underlying mechanism.

Numerous clinical studies have shown that foods with added plant sterols and stanols lower LDL-cholesterol in a dose-dependent manner. For an LDL-cholesterol lowering effect of 7-10%, a daily intake of approximately 2 g/day of plant sterols/stanols (see Figure 2) is needed. An LDL-cholesterol lowering effect of 10-12% has been observed for intakes of plant sterols and stanols up to approximately 3 g/d.

To obtain such amounts of plant sterols and stanols from ordinary foods is not possible. Hence, incorporation of foods with added plant sterols and stanols in the daily diet is needed to achieve significant LDL-cholesterol reduction. Although there is no CVD outcome data for such products it is reasonable to postulate a beneficial effect on CVD outcomes based on their well-established LDL-cholesterol lowering effect.

With a daily intake of approximately 2 g plant sterols stanols, a reduction in LDL-cholesterol can be expected in 2-3 weeks of intake and is sustained with continued consumption.

Discontinuing the use of plant sterols and stanols will result in cholesterol levels returning to original levels.

REMEmber: Continuous intake of plant sterols and stanols is needed to maintain the LDL-cholesterol lowering effect over time.

ADVICE: Using foods with added plant sterols and stanols can help to lower LDL-cholesterol as part of a healthy diet and lifestyle.
Incorporating additional plant sterols/stanols in the daily diet is effective in reducing LDL-cholesterol.

Plant sterols and stanols - mode of action

The cholesterol absorption pathway represents an attractive target in the management of dyslipidemia. It offers clinical opportunities for dietary supplementation with components that can help to reduce intestinal cholesterol absorption. Plant sterols and stanols are the most prominent of these dietary components.

Plant sterol and stanols reduce the absorption of cholesterol from the gut by 30 to 40%, which means that less cholesterol is absorbed and circulating in the bloodstream. TC and LDL-cholesterol levels are therefore reduced, with no significant effect on HDL-cholesterol levels.
The intestinal handling of cholesterol and plant sterols and stanols occurs in three phases:

A When cholesterol (either from the diet or from the bile) and plant sterols and stanols reach the small intestine, they are incorporated into particles called mixed micelles. The micelles are essential for carrying these hydrophobic compounds in the gut through the intestinal wall.

B Once in the micelles, uptake of cholesterol and plant sterols/stanols into the enterocytes (the intestinal absorptive cells) occurs.

C The bulk of absorbed cholesterol is incorporated into chylomicrons, i.e. lipoprotein particles that transport cholesterol and fats via the lymphatic system to the liver and into the blood. On the contrary, the bulk of plant sterols and stanols is pumped back from the enterocytes into the gut lumen and only a minimal amount will actually reach the blood circulation.

Plant sterols and stanols reduce LDL-cholesterol levels in the blood by reducing the amount of cholesterol absorbed from the intestine.

Due to the similar molecular structure, plant sterols and stanols compete with exogenous cholesterol (from the diet) and endogenous cholesterol (from the liver via the bile) for incorporation into micelles (Phase 1). By displacing cholesterol from micelles, plant sterols and stanols reduce the amount of cholesterol that is actually absorbed.
EAS recommendations for the use of plant sterols and stanols

Plants sterols and stanols are recommended by the EAS as a part of lifestyle intervention in the management of dyslipidemia.\(^1,2\)

Foods containing plant sterols and stanols may be used either alone or in combination with statins or other cholesterol-lowering drugs (see below).

For patients with familial hypercholesterolemia (FH), cholesterol-lowering treatment is necessary. Next to drug treatment, diet and lifestyle interventions play an important role, especially in children with FH.\(^10\) The benefits of reducing LDL-cholesterol are greater if action is taken early in life rather than later in life.\(^2\)

The latest EAS consensus panel papers\(^2,10,11\) recommend that food with added plant sterols and stanols may be considered for:

- Individuals with high cholesterol levels at low/intermediate global CVD risk who do not need cholesterol-lowering drugs;
- In combination to cholesterol-lowering drugs (i.e. statins) in high and very high CVD risk patients who do not achieve LDL-cholesterol targets or are statin intolerant;
- In adults and children from the age of 6 years with familial hypercholesterolemia (FH);
- In patients with statin-associated muscle symptoms (SAMS);

Early management of elevated LDL-cholesterol can reduce CVD burden\(^1,12\).

CVD prevention, through dietary and lifestyle change\(^13\), should start as soon as possible.

Plant sterols and stanols combined with statins

The EAS consensus panel advocates combining plant sterols and stanols with statins to maximize the potential for reaching LDL-cholesterol goals to manage overall CVD risk.\(^2\) Due to their distinct mechanism of action, plant sterols and stanols (i.e. inhibitors of cholesterol absorption) are expected to have an additive effect when combined with a statin (i.e. inhibitors of cholesterol synthesis).\(^2\) In fact, in clinical studies, dietary plant sterols and stanols have been shown to further increase LDL-cholesterol reduction by 7-10% when used in addition to statin therapy - a result superior to that achieved by doubling the statin dose (6%)\(^2,14,15,16\) (see Table 10).

If experiencing statin-associated muscle symptoms (SAMS), which may require interruption of the use of statins, including foods with added plant sterols and stanols may help to reach LDL-cholesterol targets, next to other lipid-lowering therapies.\(^11\) Furthermore, according to the EAS Consensus Panel, the Portfolio diet approach may be appropriate in patients with SAMS, as well as dietary patterns that include foods low in saturated fats and high in viscous fibre in addition to foods with added plant sterols and stanols.
Consumption of plant sterols and stanols and treatment with ezetimibe both reduce cholesterol absorption in the intestine, although the exact mechanisms of action differ. Very limited data are currently available about the combined use of plant sterols and stanols and ezetimibe.

The results from one clinical study indicate that adding plant sterols on top of ezetimibe has no therapeutic benefit over ezetimibe alone in hypercholesterolemic individuals. On the other hand, a significant further reduction in intestinal cholesterol absorption has been shown in another study during administration of ezetimibe plus plant sterols (2 g/day) which resulted in an additional 7% reduction in LDL-cholesterol compared to ezetimibe alone.

### Table 10: Approximate and cumulative LDL-cholesterol reduction achievable by dietary modification

<table>
<thead>
<tr>
<th>Ways to further lower cholesterol</th>
<th>Dietary Change</th>
<th>Approximate LDL-cholesterol reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>In combination with statins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doubling statin dose</td>
<td>-</td>
<td>6%</td>
</tr>
<tr>
<td>Adding plant sterol/Stanols</td>
<td>1.5-2.4g/day</td>
<td>7 - 10%</td>
</tr>
</tbody>
</table>

Table adapted from ESC/EAS Guidelines, 2011 and Gylling et al., 2014.
Plants sterols and stanols are recommended by the EAS as a part of lifestyle intervention in the management of dyslipidemia.

Plant sterols and stanols have been shown to effectively lower TC and LDL-cholesterol concentrations in a dose-dependent manner (7-12% LDL-cholesterol lowering with intakes of approximately 1.5-3 g/d).

To obtain approximately 2 g of plant sterols and stanols per day from ordinary foods is not possible. Therefore, foods with added plant sterols and stanols should be considered as part of a healthy diet to actively reduce TC and LDL-cholesterol.

Finally, foods with added plant sterols and stanols provide an additional LDL-cholesterol lowering effect in dyslipidemic patients at high CVD risk already treated with lipid-lowering drugs such as statins; therefore, they are recommended also in adjunct to pharmacological therapy.
References


sterols and fat soluble antioxidant concentrations.

What are dietary fibres and what are their sources?

Traditionally, dietary fibre is defined as the portion of plant foods that is resistant to digestion by human gastrointestinal enzymes.

Dietary fibre itself has no nutritional value and does only provide a small amount of energy (~2 kcal/g) formed by bacterial fermentation of fibre in the colon. Nevertheless, fibres play an important role in the regulation of different physiological functions in the human body.

Some of these fibre compounds (cellulose, hemicellulose and lignin) are insoluble in water, and are therefore called insoluble fibres. They mainly act on the functioning of the gastrointestinal tract, facilitating the transit time of foods, normalising bowel movements, increasing stool bulk and preventing constipation.

Insoluble fibres are mainly found in whole grains (e.g. barley, wheat, millet, brown rice, oat, rye), vegetables and in the seeds and skin of fruits.

Other fibre compounds (like beta-glucan, pectin, gums and mucilages like psyllium) are water-soluble and are therefore called soluble fibres.

As soluble fibres can absorb water, they form a viscous bolus in the gut that partially delays and/or reduces the absorption of certain nutrients such as carbohydrates, fats and cholesterol. In this way, they contribute to the control of blood glucose and cholesterol levels1,2.

Dietary fibres in a nutshell

A PARTICULAR SOLUBLE FIBRE: BETA-GLUCAN

Beta-glucan is one main types of soluble fibre and is found in the bran of many common whole grains, with oat and barley containing the highest amounts.

Examples of food products especially rich in beta-glucan are oat meal, oat bran and cereals, barley flakes, pearl barley.
Dietary fibres in dyslipidaemia

This section will provide an insight on:

- the importance of including foods rich in dietary fibres into the daily diet in the context of a healthy diet and lifestyle for CVD prevention;
- the role of soluble fibres in TC and LDL-cholesterol lowering;
What are the cardiovascular benefits of including dietary fibres in a healthy diet?

A high intake of dietary soluble and insoluble fibre has been associated with a lower prevalence of major CVD risk factors such as dyslipidaemia, hypertension, diabetes and obesity.

To ensure all the health benefits of dietary fibres, a daily intake of 25-45 g is recommended.

A specific and significant cholesterol-lowering effect has been found especially with soluble fibres.

Furthermore, combining soluble fibres (10 g/day) with plant sterols, soy protein and nuts (almonds) into the diet (PORTFOLIO diet) has shown to potentially lower LDL-cholesterol up to 30%.

Regarding beta-glucan, several clinical studies have shown that a diet containing at least 3 g/day of oat/barley beta-glucan lowers TC and LDL-cholesterol by about 5-6%. It should be noted that beta-glucan consumption needs to be maintained for a sustained cholesterol-lowering effect.

See Table 11 to learn more on how to get the recommended amount of soluble fibres and beta-glucan through foods.

Daily beta-glucan consumption (≥3 g/day) may be recommended for hypercholesterolaemic patients for LDL-cholesterol reduction.

Table 11 How to get the recommended soluble fibre and beta-glucan intake to help in lowering LDL-cholesterol.

<table>
<thead>
<tr>
<th>Food Source</th>
<th>Soluble fibre approximate amount in g</th>
<th>Food Source</th>
<th>Soluble fibre approximate amount in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legumes, 100 g, dry</td>
<td>2-3</td>
<td>Vegetables, 100 g, cooked</td>
<td>1</td>
</tr>
<tr>
<td>Beans (black beans,</td>
<td>2-3</td>
<td>Broccoli</td>
<td>1</td>
</tr>
<tr>
<td>Lentils (yellow,</td>
<td>1</td>
<td>Brussels Sprouts</td>
<td>3</td>
</tr>
<tr>
<td>green, orange)</td>
<td></td>
<td>Carrots</td>
<td>1</td>
</tr>
<tr>
<td>Peas (chickpeas)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits, a medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>piece</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apples</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bananas</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blackberries (75 g)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citrus Fruit (orange,</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>grapefruit)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To include 5 g/day of soluble fibre, into the daily diet:

Example 1: 1 serving of oatmeal or oat bran/barley + 2 servings of fruit + 2 servings of vegetables

Example 2: 1 serving of oatmeal or oat bran/barley + 2 servings of fruit + 1 serving of legumes + 1 serving of vegetables

To include 3 g/day of beta-glucan into the daily diet:

2 servings (40-50 g) of oatmeal or oat bran or

1 serving (70-80 g) of barley


A diet that provides 25-45 g/day of total dietary fibres, including 5-15 g/day of soluble fibres, is effective, and recommended for blood cholesterol control. Including 1-2 servings of oat or barley grains into the daily diet may have a particular benefit in lowering LDL-cholesterol (see above).

See Table 12 to learn more about how to reach the recommended daily amount of dietary fibres through foods.

**Table 12 How to reach the dietary fibre recommendations.**

<table>
<thead>
<tr>
<th>Food group</th>
<th>Approximate portion</th>
<th>Approximate amount of total fibre per portion</th>
<th>Suggested portions per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEGUMES (e.g. chickpeas, dried beans, lentils, green peas)</td>
<td>30 g (dried)</td>
<td>4 g</td>
<td>0-1</td>
</tr>
<tr>
<td>CEREALS (e.g. brown rice, pearled barley, couscous, millet, whole oat, whole wheat bread, oatmeal, oat bran, rye bread)</td>
<td>80 g</td>
<td>8 g</td>
<td>2-4</td>
</tr>
<tr>
<td>VEGETABLES (e.g. artichokes, broccoli, cabbage, carrots, cauliflower, eggplant, okra)</td>
<td>200 g</td>
<td>8 g</td>
<td>2 or more</td>
</tr>
<tr>
<td>FRESH FRUIT (e.g. kiwi, apple, apricot, banana, cherries, nectarine, orange, peach, pear, plum)</td>
<td>150 g</td>
<td>4 g</td>
<td>1-2</td>
</tr>
<tr>
<td>BERRIES (e.g. raspberries, blueberries, red- and blackcurrants)</td>
<td>50 g</td>
<td>3 g</td>
<td>1</td>
</tr>
<tr>
<td>DRIED FRUIT (e.g. dried prunes, dried apricot)</td>
<td>100 g</td>
<td>7 g</td>
<td>0-1</td>
</tr>
<tr>
<td>NUTS (e.g. almonds, cashews, hazelnuts, pistachios, pecans, walnuts)</td>
<td>30 g</td>
<td>3 g</td>
<td>1</td>
</tr>
</tbody>
</table>
**DIETARY FIBRES - MODE OF ACTION:**

The exact mechanism through which soluble fibre lower LDL-cholesterol levels is not known. It is likely that the viscous bolus formed by the fibres in the gut lumen reduces the absorption of cholesterol and the reabsorption of bile acids. As a consequence, faecal excretion of cholesterol and of bile acids is increased, leading to an increased bile acid synthesis in the liver from cholesterol.

It is probable that, in addition to fibre, foods that are high in dietary fibre contain other compounds (e.g. plant sterols/stanols, minerals, omega-3 and omega-6 PUFAs and specific phenolic compounds) that contribute to the protective cardiovascular effect of dietary fibres.
Dietary fibres in a nutshell

Dietary fibres are found in fruits, vegetables, legumes and wholegrain cereals and especially soluble fibres have a cholesterol-lowering effect. High-fibre foods are an optimal choice when aiming to move towards a heart healthy diet.

- A dietary fibre intake of 25-45 g per day is currently recommended\(^4,5\).
- Consuming 5-15 g of soluble fibre is effective and recommended for blood cholesterol control\(^6\).
- Including 1-2 daily servings of oats/barley grains may add a particular benefit for lowering TC and LDL-cholesterol.

The consumption of adequate amounts of plant-based foods not only ensures adequate dietary fibres intake, but also a significant intake of other nutrients (vitamins, minerals as well as vegetable proteins) and non-nutrients (known as phytochemicals) whose interaction may contribute to the protective cardiovascular effect of dietary fibres\(^10\).
References


What is soy protein?

Soy protein is an edible component derived from the soybean and is gaining considerable attention since it is likely to have a TC and LDL-cholesterol lowering effect.\(^2,3,4\)

**SOURCES OF SOY PROTEIN:**

Soy protein occurs in whole soybean products such as tofu, miso, tempeh (fermented soybean products from Asian cuisine), soy nuts, and fermented soybean pasta. Other sources are non-dairy-type products (e.g. soy drink, soy cheese and soy yoghurt) and meat alternatives (e.g. veggie soy burgers).

Soy protein is also present in highly refined soybean products such as soy protein concentrates and isolates that can be used for instance in meat products to increase the protein content, as well as to improve the texture and to prolong the shelf life.

Soy-derived ingredients can also be found in breakfast cereals, sauces and soups. For instance, in bakery products, adding soy flour enhances the nutritional value by increasing the dietary fiber and protein content.

Soybeans and soybean-based foods are not traditional European foods. Nevertheless, soy and soy-derived products are receiving a growing interest in the context of a healthy diet, as this legume is a good source of:

- high-quality protein,
- PUFA (both omega-3 and omega-6),
- dietary fibres,
- a variety of vitamins (e.g. folate and other B vitamins) and minerals, especially potassium, iron, phosphorus, whereas it is low in SFA and does not contain cholesterol.\(^1\)
Soy protein in dyslipidaemia

This section will focus on the effect of soy protein on TC and LDL-cholesterol lowering.
Effect of Soy Protein on TC and LDL-cholesterol

Clinical studies have shown a modest LDL-cholesterol lowering effect of soy protein in the magnitude of 3-4% for intakes of at least 25 g of soy protein per day*. As this amount approximately covers 50% of the recommended daily protein intake it is difficult to achieve within an everyday Western type diet.

*To get the required intake of 25 g of soy protein you need to combine several soybean-based foods (see Table 13):

Table 13: Soy protein content in soybean products

<table>
<thead>
<tr>
<th>Soybean source</th>
<th>Approximate soy protein amount (g/100 g of edible portion)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tofu</td>
<td>16</td>
</tr>
<tr>
<td>Soy drink</td>
<td>2.9</td>
</tr>
<tr>
<td>Soy yoghurt</td>
<td>5</td>
</tr>
<tr>
<td>Soy bean sprouts</td>
<td>6.2</td>
</tr>
<tr>
<td>Soy sauce</td>
<td>8.7</td>
</tr>
<tr>
<td>Soy burger (soy meat alternative)</td>
<td>15.7</td>
</tr>
</tbody>
</table>


Although achieving the suggested soy protein intake (25 g) in the daily diet can be demanding, a regular consumption of soy food products along with those foods containing plant components is able to lower blood cholesterol and can help to maximize total- and LDL-cholesterol reduction.

The components in soy protein responsible for the LDL-cholesterol lowering effect are not fully clear. It is likely that soy isoflavones, a non-nutrient component of soy protein, might be partially responsible for the LDL-cholesterol reduction, but the evidence is not conclusive.

Other evidence suggests that the protein per se and specific soy peptides may be responsible for the cholesterol-lowering effect.

Scientific studies suggest that, regardless of the source of soy protein, soy protein-containing foods when replacing animal protein foods may contribute to a modest LDL-cholesterol lowering effect.
Soy protein in a nutshell

Soybean and soy-derived products represent a healthy way to obtain vegetable proteins and add variety when moving towards a more plant-based diet.

According to scientific evidence and as also stated in the ESC/EAS guidelines, soy protein has a modest LDL-cholesterol lowering effect (3-4%). Nevertheless, soy foods can be a valid substitute for foods rich in animal protein and high in saturated fats.

Although the LDL-cholesterol lowering effect of soy protein is modest, including soybean and soy-derived products in the daily diet can be taken into account as one of the possible options for managing elevated LDL-cholesterol levels.

REMEMBER: Soy protein modestly lowers LDL-cholesterol and may be an alternative for foods high in animal protein. Soy-based foods can be consumed as part of a plant-based diet.
References


Quit Smoking

Smoking is a considerable lifestyle risk factor for CVD. According to estimations from SCORE, the 10-year fatal CVD risk is approximately doubled in smokers. Cigarette smoking is destructive and even exposure to passive smoking has been shown to increase the risk of CVD and should be avoided.

Smoking may cause CVD through several mechanisms. For instance, nicotine, an addictive substance in cigarettes, indirectly increases heart rate and blood pressure, thus forcing the heart to a greater struggle, which can result in organs and blood vessels damage. Additionally, smoking increases blood TG levels and LDL-cholesterol while decreasing HDL-cholesterol.

Smoking is a reversible CVD risk factor: quit as soon as possible!

Many of the key principles for behavior change also apply to smoking cessation and remembering the “five A” can be a helpful strategy:

<table>
<thead>
<tr>
<th>Ask about smoking status</th>
<th>Systematically inquire about smoking status at every opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise on quitting</td>
<td>Unequivocally urge all smokers to quit</td>
</tr>
<tr>
<td>Assess readiness</td>
<td>Determine the person’s degree of addiction and readiness to quit</td>
</tr>
<tr>
<td>Assist with a strategy</td>
<td>Agree on a smoking cessation strategy, including setting a quit date, behavioral counselling, and pharmacological support</td>
</tr>
<tr>
<td>Arrange follow-up</td>
<td>Arrange a schedule of follow-up</td>
</tr>
</tbody>
</table>

The JBS “HeartAge” risk calculator emphasizes the benefits for early smoking cessation even at an older age. Patients should be encouraged to quit smoking at every available opportunity and supported during the smoking-cessation process. Consult the Joint European Guidelines on CVD prevention in clinical practice to know more about smoking cessation therapies.
Changing smoking behavior is important in lowering CVD risk.
Other lifestyle changes in CVD prevention

Although this online learning tutorial focuses mainly on the dietary management of dyslipidemias, other lifestyle factors, such as smoking cessation, increasing physical activity, alcohol consumption in moderation and body weight management are also important factors contributing to the prevention of CVD.

This section will provide advice and a few practical tips you can suggest to your patients when talking about the importance of diet and lifestyle changes in CVD prevention.
Physical exercise

An inactive lifestyle is another major risk factor for CVD. An increase in overall levels of physical activity and aerobic exercise is also suggested by several guidelines\(^1,3,5\) as a very important non-pharmacological tool for primary CVD prevention.

Physical activity has a positive effect on many of the established risk factors for CVD such as preventing and reducing BP, helping to control body weight, improving blood lipids (reducing LDL-cholesterol without consistent effects on HDL-cholesterol and TG) and lowering the risk of developing type 2 diabetes\(^1,3,5\).

**Daily physical activity, at moderate intensity should be emphasized as a part of an active lifestyle!**

Primary care is an important setting for the promotion of physical activity. Recommendations should be tailored to patient’s needs and range from simple lifestyle advice through to the roll-out of targeted programs for harder-to-reach individuals. 2.5 to 5 hours per week of moderate-intensity physical activity/aerobic exercise training or 1 to 1.5 hours per week of vigorous-intensity physical activity/aerobic exercise training is recommended\(^1\). One can achieve these recommendations by splitting the total volume of physical activity/ aerobic exercise training into 3-5 sessions per week or into 2-3 daily bouts of 10-15 minutes each distributed over most days of the week\(^1\).

Moderate activity raises the heart rate and make the breath go faster. Examples of moderate-intensity physical activity include common activities such as walking fast, gardening work, riding a bike on level ground or with a few hills, and hiking.

150 minutes of moderate-intensity physical activity are equivalent to 75 minutes of vigorous aerobic activity, such as running or jogging or a game of singles tennis every week.

**INITIAL LIFESTYLE STEPS TO HELP PATIENTS TO BECOME MORE PHYSICALLY ACTIVE ARE:**

- Encouraging patients to walk to the next station or bus stop rather than taking the usual one, taking the stairs rather than a lift.
- Simple exercise programmes that can be worked into a daily schedule, such as gardening, house cleaning and walking to the shops.
- Riding a bike on level ground or with some hills.
- Encouraging spending less time watching TV and opting for outdoor recreational activities.
- Muscle strengthening exercises such as lifting weights or working with resistance bands.

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**INTRODUCTION**

**CARDIOVASCULAR DISEASE AND RISK FACTORS**

**HEALTHY DIETARY PATTERNS FOR CVD PREVENTION**

**DIETARY FATS IN DYSLIPIDEMIA**

**PLANT STANOLS AND STEROLS IN DYSLIPIDEMIA**

**DIETARY FIBRES IN DYSLIPIDEMIA**

**SOY PROTEIN IN DYSLIPIDEMIA**

**OTHER LIFESTYLE CHANGES IN CVD PREVENTION**

- Other lifestyle changes in CVD prevention
- Quit Smoking
- Physical exercise
- Moderate alcohol consumption
- Weight management
- Lifestyle and dietary changes in a nutshell
- References
for at least 30 minutes a day every day.
Moderate alcohol consumption

It is well known that heavy alcohol drinking is harmful for health. Excessive alcohol intake and binge drinking are also associated with increased CVD risks.

In contrast, accumulating scientific evidence from epidemiological studies indicates that light to moderate drinking may reduce CVD risk, especially CHD and all-cause mortality. It is hypothesized that the cardiovascular protective effect of alcohol is attributable to several mechanisms, including reducing platelet aggregation (alcohol is a natural anticoagulant) and lowering BP, and increasing levels of HDL-cholesterol.

Non-drinkers should not be encouraged to start drinking. There are no health-related reasons for non-drinkers to start drinking.

Especially there seems to be a favorable effect of red wine which may be related the protective effect of non-alcohol compounds such as antioxidants like polyphenols (resveratrol) present in especially red wine.

For instance, moderate wine consumption (1-2 glasses per day for men and 1 glass per day for women), preferably during the meal, is an optional part of the Mediterranean dietary pattern.

ADVICE: The key word in alcohol consumption is moderation! No more than 1 drink/day for women (10 g of alcohol) and 1-2 drinks/day for men (10-20 g of alcohol) should be consumed.

ONE DRINK EQUALS

1 alcoholic drink is approximately equivalent to 10 g of alcohol = 330 ml of beer (5% alcohol) or 140 ml of wine (12% alcohol) or 42 ml of distilled spirit (40% alcohol).
MOTIVATING PATIENTS TO MAKE DIET AND LIFESTYLE CHANGES

SUMMARY OF KEY LEARNINGS

KNOWLEDGE TEST

REFERENCES

CASE STUDIES

FACULTY
Weight management

Both overweight and obesity are associated with an increased risk of CVD mortality. In this context, weight reduction in the presence of overweight, obesity and abdominal adiposity is recommended as it is associated with favorable effects on BP and dyslipidemia.

Obesity, especially abdominal obesity, increases the likelihood of developing diabetes, dyslipidemia, hypertension, CHD, stroke, and it has been clearly linked to poor health outcomes and all-cause mortality. An increase in the BMI is associated with adverse changes in the blood lipid profile resulting in elevated TC, LDL-cholesterol, and TG levels and low HDL-cholesterol levels. The risk of comorbidities starts already with a BMI in the range of 25.0–29.9 Kg/m^2 (overweight) and it further increases with a BMI greater than 30 Kg/m^2 (obesity). Weight loss has a beneficial influence on HDL-cholesterol levels and also on TC and LDL-cholesterol in the long term.

In this context, weight reduction in the presence of overweight, obesity and abdominal adiposity is recommended as it is associated with favorable effects on BP and dyslipidemia.

When present, excess intra-abdominal fat has been associated with several metabolic abnormalities, which may lead to CVD. Assessing and monitoring changes in waist circumference over time may be helpful, in addition to measuring BMI, since it can provide an estimate of increased abdominal adiposity even in the absence of a change in BMI, thus screening for possible health risks.

If the waist circumference is ≥ 94 cm in men and ≥80 cm for women no further weight should be gained. If the waist circumference is ≥102 cm in men and ≥88 cm for women weight reduction should be advised.

To achieve optimal health, a BMI 18.5–24.9 Kg/m^2 should be maintained.

Focusing on dietary and lifestyle interventions is the core of weight management.

Making healthy food choices, being physically active (see above), and reducing sedentary time should be encouraged.

Additionally, personal motivation plays a decisive role in switching toward a healthier diet and lifestyle.

Many of the unfavorable effects of excess body weight on blood lipid profile can be reversed with weight reduction.

REMEMBER: Even moderate weight loss may have a great impact on general and cardiovascular health, encourage it when needed.

http://dietattheheart.com/other_changes/weight_management[26/05/2016 16:06:11]
Lifestyle and dietary changes in a nutshell

Lifestyle and dietary modifications are the cornerstone in CVD prevention. Here you find a summary (see Table 14) of the different lifestyle and dietary approaches which are recommended to manage the major modifiable CVD risk factors and hence CVR risk:

Table 14: Recommendations for a healthy diet and lifestyle

<table>
<thead>
<tr>
<th>Recommendations for a healthy diet</th>
<th>Diet patterns like the DASH, the Portfolio diet, or the Mediterranean diet, are more likely to meet balanced nutrient requirements than those diets that are selectively restricted in calories or nutrients.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use a foods group approach</td>
<td>Saturated fat should be replaced with MUFA or PUFA to reduce LDL-cholesterol.</td>
</tr>
<tr>
<td>Reduce saturated fats by replacing them with mono- and polyunsaturated fats</td>
<td>Foods with added plant sterols/stanols are effective in reducing LDL-cholesterol when consumed in recommended amounts (1.5-3 g/day).</td>
</tr>
<tr>
<td>Consider foods with added plant sterols/stanols</td>
<td>Consume 25-45 g of dietary fibre per day of which 5-15 g of soluble fibres from foods rich in these fibres for a cholesterol-lowering effect.</td>
</tr>
<tr>
<td>Increase dietary fibre intake especially intake of foods rich in soluble fibres</td>
<td></td>
</tr>
<tr>
<td>Limit salt intake</td>
<td>Salt intake should be reduced below 5 g/day by avoiding table salt and limiting salt in cooking and by choosing foods low in added salt.</td>
</tr>
<tr>
<td>Limit sugar intake</td>
<td>The intake of beverages and foods with added sugars, particularly soft drinks, should be limited, particularly for patients with hypertriglyceridemia. Sugar intake should not exceed 10% of total energy.</td>
</tr>
</tbody>
</table>

Recommendations on lifestyle changes

<p>| Keep being physical active                                                                         | Physical activity should be encouraged, aiming at regular physical exercise for at least 30 minutes a day                                                                                      |
| Reduce body weight if overweight/obesity occurs                                                   | A BMI of &lt; 25 kg/m² is associated with favorable effects on BP and dyslipidemia                                                                                                                                 |
| For those who drink alcoholic beverages, moderation should be advised (no more than 1 drink/day for women) |                                                                                                                                                                                                  |</p>
<table>
<thead>
<tr>
<th>Moderate alcohol intake</th>
<th>and 1-2 drinks/day for men) and patients with hypertriglyceridemia should abstain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid tobacco and quit smoking</td>
<td>Use and exposure to tobacco and even passive smoking has to be avoided</td>
</tr>
</tbody>
</table>

Table adapted from ESC/EAS Guidelines for the management of dyslipidemias, 2011\(^1\) and the Joint European Guidelines on CVD prevention in clinical practice, 2012\(^1\).
References


Motivating patients to make diet and lifestyle changes

While the benefits of a healthy lifestyle, including diet modifications, stopping smoking, weight management and regular exercise for maintaining optimal LDL-cholesterol levels and reducing CVD risk are clear it can be hard to motivate patients to undertake these changes. The ESC/EAS guidelines highlight a few key steps that are crucial to influence any behavior change. These include:

- Spending enough time with the individual to create a therapeutic relationship even just a few more minutes can make a difference
- Asking questions to check that the individual has understood the advice and has any support they require to follow it
- Acknowledging the individual's personal view
- Encouraging the expression of worries and anxieties, concerns and self-evaluation of motivation for behavior change and chances of success
- Speaking to the individual in his/her own language and being supportive of every improvement in lifestyle
- Accepting that individuals may need support for a long time and that repeated efforts to encourage and maintain lifestyle change may be necessary in many individuals
- Making sure that all healthcare professionals involved provide consistent information

Gradual change that is sustained is often more permanent than a rapid change

Using the JBS "HearthAge risk calculator" could be helpful to make your patient aware of his/her current estimated heart age and especially to motivate him/her, showing the benefits that may be achieved by sustained, long-term reduction of...
CVD risk factors through diet and lifestyle changes.
Modification of Diet

In addition to general steps on motivating patients to undertake and maintain behavior changes, it can be helpful to also consider the following points when addressing diet:

- Dietary modifications should form the basis of CVD prevention.

**REVIEW**

- Work closely with your patient and his/her family to understand their diet history, food preferences, meal patterns and ethnic background.
- Consider asking your patient to keep a food diary for a few days before their next appointment to enable a meaningful discussion about their dietary habits.

**REVISE**

- Use a diet sheet that can be tailored and other visual support material (such as the Eatwell plate, and patient fact sheet) to educate your patient about the importance of making small changes to their diet and how those changes could have a big effect on their cholesterol levels.
- Involve your patient as much as possible in this process by letting them choose the foods they think they can include healthier options - then have a discussion around these as a basis.
  - Discuss replacing saturated fats with unsaturated fats and provide foods examples.
  - Discuss increasing dietary fibre intake, with a special focus on soluble fibre and beta-glucan intake.
  - Discuss adding a food with added plant stanols/sterols.
- Make sure the patient understands how quickly they could expect to see these changes affecting their cholesterol levels.
- Consider referring the patient to a registered dietician.

**REASSESS**

- Ensure a follow-up schedule is in place to help support your patient through this time of habitual change.
- Repeat if necessary
References

<table>
<thead>
<tr>
<th>What should I eat?</th>
<th>Try to move from red to green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary recommendations to help lower cholesterol</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bread, cereals and potatoes</th>
<th>Croissants, waffles, fried potatoes, roast potatoes, sugar-coated breakfast cereals.</th>
<th>Refined (white) cereals, for example, bread, biscuits, mashed potatoes.</th>
<th>Whole grain cereals, bread, rice, pasta, non-sugar added breakfast cereals oats, boiled potato.</th>
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<tbody>
<tr>
<td>Fruit and vegetables</td>
<td>Vegetables fried in batter, prepared in butter, or creamy sauce.</td>
<td>Canned fruit in syrup (drain off syrup), fruit juices.</td>
<td>Fresh, frozen, dried fruit and vegetables.</td>
</tr>
<tr>
<td>Meat, fish and alternatives</td>
<td>Fatty cuts of meat, belly pork, lamb, duck, goose. Sausages, salami, bacon, spare ribs, chicken nuggets. Meat pies, sausage rolls and pasties. Fish in creamy sauces. Fried fish or meat in batter.</td>
<td>Lean cuts of meat and reduced fat products including sausages, burgers and meatballs.</td>
<td>(Extra) lean pork, ham, lamb, minced beef, chicken and turkey (without skin) All fish: cod, plaice, sole, whiting, (fresh, canned) tuna shellfish. Oily fish: (fresh, canned) mackerel sardines, pilchards, salmon, trout, herring. Soya mince, beans, tofu.</td>
</tr>
<tr>
<td>Dairy products and eggs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oils and fats</td>
<td>Butter, solid margarines, palm and coconut oils, lard, bacon fat.</td>
<td>Soft spreads, lower fat, unsaturated fat spreads (with plant sterols/stanols). Liquid margarine. Vegetable oil such as rape seed or sunflower seed and olive oil.</td>
<td></td>
</tr>
</tbody>
</table>
## Dietary change

<table>
<thead>
<tr>
<th>Replace saturated fats with mono- and polyunsaturated fats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Replace full-fat dairy products (for example, cheese, cream, milk, yoghurt) with fat-free or low-fat versions</td>
</tr>
<tr>
<td>• Decrease the intake of fatty meat and meat products, such as sausages by replacing them with lean meat options</td>
</tr>
<tr>
<td>• Decrease the intake of bakery products rich in saturated fat (for example, Danish pastries, cookies)</td>
</tr>
<tr>
<td>• Replace butter or other animal fats like lard with:</td>
</tr>
<tr>
<td>- soft vegetable oil spreads in spreading</td>
</tr>
<tr>
<td>- vegetable oils or liquid “bottle” margarines in cooking</td>
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<tr>
<td>- soft vegetable oil based spreads or liquid “bottle margarines” in baking</td>
</tr>
<tr>
<td>• Use vegetable oil based dressings in salads</td>
</tr>
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<td>• Even small amounts of nuts and seeds bring unsaturated fats to the daily diet</td>
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<table>
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<th>Increase the intake of soluble dietary fibre</th>
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</thead>
<tbody>
<tr>
<td>• Use whole grain products instead of refined grains</td>
</tr>
<tr>
<td>- oatmeal or rye porridge, brans</td>
</tr>
<tr>
<td>- bread, pasta, rice, muesli and cereals in whole grain versions</td>
</tr>
<tr>
<td>• At least 500g daily of a combination of:</td>
</tr>
<tr>
<td>- root vegetables and other vegetables</td>
</tr>
<tr>
<td>- berries and fruit</td>
</tr>
<tr>
<td>• Beans, lentils, potatoes, peas and seeds also bring fibre into the diet</td>
</tr>
<tr>
<td>• Eat cooked and raw vegetables with every meal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Include foods with added plant stanols/sterols as part of the daily diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Replace your normal spread with a spread containing plant sterols or stanols OR</td>
</tr>
<tr>
<td>• Include dairy foods like milk, yoghurt or a yoghurt drink with added stanols/sterols as part of your daily meals</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Other features of a heart-healthy lifestyle</th>
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<tbody>
<tr>
<td>• Eat fish at main meals 2–3 times a week</td>
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<td>- oily fish at least once per week</td>
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<td>• Make low-salt food choices</td>
</tr>
<tr>
<td>• If overweight, reduce energy (calorie) intake so that weight is reduced by 5–10%</td>
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<tr>
<td>• Increase in energy expenditure by doing exercise that fits with your routine</td>
</tr>
</tbody>
</table>
Case 2: A 44-year old male

March 2011

Case study 2: A 44-year old male patient, 185 cm tall with a body mass index of 28.6 kg/m²

CARDIOVASCULAR RISK FACTORS IDENTIFIED:

- Known hypertension - blood pressure fluctuating around 140/100 mmHg
- Smoker until two years ago (approximately 40 pack years)
- Moderate alcohol consumption, occasionally moderate physical exercise (jogging, swimming)
- Regular snoring;
- No significant family history of cardiovascular disease

TREATMENT APPROACH:

The patient was already being treated for hypertension sporadically using beta-blockers, which have now been stopped following abnormal fatigue and orthostatism.

DIAGNOSES FOLLOWING INITIAL TESTS (SEE TABLE 8 - MARCH):

- Essential arterial hypertension grade I, impaired fasting glucose, suspected non alcoholic fatty liver disease (NAFLD), mild hyperuricemia, vitamin D deficiency, metabolic syndrome
- Risk for a fatal cardiovascular event according to SCORE (www.heartscore.org): 1 percent in 10 years. The risk for fatal cardiovascular disease is low in absolute terms due to the young age of the patient, but it is still four times higher than it could be in this age group.
- Treatment targets according to ESC, ESH and EAS: blood pressure less than 140/90 mmHg; LDL cholesterol less than 115 mg/dl (2.98 mmol/l).

Step 1

Step 2

Step 3

NEXT SECTION
Case 1: A 55-year old female

Case Study 1: A 55-year old female patient, normal weight

Cardiovascular disease risk factors identified:

- Hypercholesterolaemia (serum total cholesterol 228mg/dl (5.9mmol/l), elevated, LDL-cholesterol 174mg/dl (4.5mmol/l), elevated)
- Age - 55 years
- Smoker
- Elevated blood pressure, despite medication (145/95mmHg)
- Father had died of an acute myocardial infarction at the age of 45 years

TREATMENT APPROACH:

According to the EAS and ESC guidelines for the management of dyslipidaemia, lifestyle changes together with statin treatment should be considered. Patient was reluctant to start medication, so a three step approach was undertaken.

Step 1
Step 2
Step 3
Other lifestyle changes in CVD prevention

Although this online learning tutorial focuses mainly on the dietary management of dyslipidemias, other lifestyle factors, such as smoking cessation, increasing physical activity, alcohol consumption in moderation and body weight management are also important factors contributing to the prevention of CVD.

This section will provide advice and a few practical tips you can suggest to your patients when talking about the importance of diet and lifestyle changes in CVD prevention.
Motivating patients to make diet and lifestyle changes

While the benefits of a healthy lifestyle, including diet modifications, stopping smoking, weight management and regular exercise for maintaining optimal LDL-cholesterol levels and reducing CVD risk are clear it can be hard to motivate patients to undertake these changes. The ESC/EAS guidelines highlight a few key steps that are crucial to influence any behavior change. These include:

1. Spending enough time with the individual to create a therapeutic relationship even just a few more minutes can make a difference.
2. Asking questions to check that the individual has understood the advice and has any support they require to follow it.
3. Acknowledging the individual's personal view.
4. Acknowledging the challenging life-long habits can be difficult and that gradual change that is sustained is often more permanent than a rapid change.
5. Accepting that individuals may need support for a long time and that repeated efforts to encourage and maintain lifestyle change may be necessary in many individuals.
6. Speaking to the individual in his/her own language and being supportive of every improvement in lifestyle.
7. Making sure that all healthcare professionals involved provide consistent information.

Using the JBS "HearthAge" risk calculator could be helpful to make your patient aware of his/her current estimated heart age and especially to motivate him/her, showing the benefits that may be achieved by sustained, long-term reduction of
CVD risk factors through diet and lifestyle changes.
## What should I eat?

Try to move from red to green

Dietary recommendations to help lower cholesterol

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<tr>
<th>Bread, cereals and potatoes</th>
<th>Croissants, waffles, fried potatoes, roast potatoes, sugar-coated breakfast cereals.</th>
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<td>Meat, fish and alternatives</td>
<td>Fatty cuts of meat, belly pork, lamb, duck, goose. Sausages, salami, bacon, spare ribs, chicken nuggets. Meat pies, sausage rolls and pasties. Fish in creamy sauces. Fried fish or meat in batter.</td>
<td>Lean cuts of meat and reduced fat products including sausages, burgers and meatballs.</td>
<td>(Extra) lean pork, ham, lamb, minced beef, chicken and turkey (without skin) All fish: cod, plaice, sole, whiting, (fresh, canned) tuna shellfish. Oily fish: (fresh, canned) mackerel sardines, pilchards, salmon, trout, herring. Soya mince, beans, tofu.</td>
</tr>
<tr>
<td>Beans, pulses, nuts &amp; seeds</td>
<td></td>
<td></td>
<td>All nuts and seeds, especially almonds, walnuts, linseed, pumpkin, sesame, sunflower seeds. (Chick) peas, lentils, sweetcorn, kidney beans, lentils, sweetcorn. Rinse if canned in salt or sugar</td>
</tr>
<tr>
<td>Oils and fats</td>
<td>Butter, solid margarines, palm and coconut oils, lard, bacon fat.</td>
<td></td>
<td>Soft spreads, lower fat, unsaturated fat spreads (with plant sterols/stanols). Liquid margarine. Vegetable oil such as rape seed or sunflower seed and olive oil.</td>
</tr>
<tr>
<td>Dietary change</td>
<td>Practical changes in the diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
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| Replace saturated fats with mono- and polyunsaturated fats | - Replace full-fat dairy products (for example, cheese, cream, milk, yoghurt) with fat-free or low-fat versions  
- Decrease the intake of fatty meat and meat products, such as sausages by replacing them with lean meat options  
- Decrease the intake of bakery products rich in saturated fat (for example, Danish pastries, cookies)  
- Replace butter or other animal fats like lard with:  
  - soft vegetable oil spreads in spreading  
  - vegetable oils or liquid “bottle” margarines in cooking  
  - soft vegetable oil based spreads or liquid “bottle margarines” in baking  
- Use vegetable oil based dressings in salads  
- Even small amounts of nuts and seeds bring unsaturated fats to the daily diet |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Increase the intake of soluble dietary fibre        | - Use whole grain products instead of refined grains  
  - oatmeal or rye porridge, brans  
  - bread, pasta, rice, muesli and cereals in whole grain versions  
- At least 500g daily of a combination of:  
  - root vegetables and other vegetables  
  - berries and fruit  
- Beans, lentils, potatoes, peas and seeds also bring fibre into the diet  
- Eat cooked and raw vegetables with every meal |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Include foods with added plant stanols/sterols as part of the daily diet | - Replace your normal spread with a spread containing plant sterols or stanols OR  
- Include dairy foods like milk, yoghurt or a yoghurt drink with added stanols/sterols as part of your daily meals |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Other features of a heart-healthy lifestyle         | - Eat fish at main meals 2–3 times a week  
  - oily fish at least once per week  
- Make low-salt food choices  
- If overweight, reduce energy (calorie) intake so that weight is reduced by 5–10%  
- Increase in energy expenditure by doing exercise that fits with your routine |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
## Tips for healthy cooking

Next to making healthy food choices it is also important to pay attention to the way of preparing meals. Healthy cooking can be easy.

### General suggestions

- Limit (deep) frying foods. Vary among the different cooking methods (e.g. stir-frying, roasting, grilling, steaming, baking, braising, poaching or microwaving);
- When grilling avoid over cooking and remove the burned part of the food;
- Include raw vegetables in each meal;
- Replace highly refined foods (e.g. white flour, white bread) with whole grains (e.g. whole wheat flour, brown rice, oat, barley) whenever possible;

### Choose the right fats to cook and pay attention to the quantities;

- Reduce saturated fats intake as from using animal fats by preferring vegetable plant oils/ derived margarines to cook;
- Use low-fat yoghurt/milk instead of full fat yoghurt/milk, cream;
- Trim visible fat from meat and ham; take the skin off from chicken;

### Minimize the nutrient loss

- When boiling foods (especially vegetables), use as little water as possible; don’t over boil the food;
- Microwaving and steaming can be a valid alternative to boiling to preserve vitamins and minerals;
- Steaming is one of the healthiest cooking methods that allows the food to retain the maximum amount of vitamins and minerals;

### Cutting down salt

- Taste the food before adding salt;
- Herbs and spices can be used in recipes to partially or wholly replace salt. They also enhance the food taste;
- Prefer vinegar or lemon juice over salt for seasoning;
- Prefer fresh or frozen vegetables and legumes since canned vegetables and legumes tend to be packed with salt;
- Choose reduced salt bread and breakfast cereals (read the nutritional facts);
- Avoid high-sodium seasoning like soy sauce;
- Limit the consumption of salty processed meat (read the nutritional facts);
- Avoid herb and spice mixes because they often contain a lot of salt. Use fresh/dried herbs whenever possible;
Other lifestyle changes

Although this online learning tutorial focuses mainly on the dietary management of dyslipidaemias, smoking cessation and exercise are also factors in the prevention of CVD. Below are a few tips you can suggest to your patients when talking to them about their diet and lifestyle:

SMOKING:

Changing smoking behavior is important in lowering CVD risk. Many of the above key principles for behavior change also apply to smoking cessation and remembering the five As can be a helpful strategy:

- Ask about smoking status
- Advise on quitting
- Assess readiness
- Assist with a strategy
- Arrange follow-up⁵

Exercise:

Primary care is an important setting for the promotion of physical activity. Recommendations should be tailored to patient’s needs and range from simple lifestyle advice through to the roll-out of targeted programmes for harder-to-reach individuals.

Initial lifestyle steps to help patients achieve the recommended 30 minutes exercise a day may include:

- Encouraging patients to walk to the next station or bus stop rather than taking the usual one, taking the stairs rather than a lift.
- Simple exercise programmes that can be worked into a daily schedule, such as gardening, house cleaning and walking to the shops.
- Riding a bike on level ground or with some hills.
- Muscle strengthening exercises such as lifting weights or working with resistance bands.
Knowledge test

Test your knowledge with the below 11 questions.
To pass the module and achieve accreditation, you must answer at least 6 out of 11 correctly on your first attempt.

1. From the list below identify five of the main modifiable risk factors of CVD?
   - Elevated blood pressure
   - Increased age
   - Smoking
   - Unhealthy diet
   - Elevated blood LDL-cholesterol

2. Which of these risk estimation tools can predict a person’s lifetime risk of developing a cardiovascular event?
   - Systemic Coronary Risk Estimation (SCORE)
   - Joint British Societies (JBS) “HeartAge” risk calculator
   - Framingham score system

3. Which is a central blood lipid target for CVD prevention?
   - Increasing HDL-cholesterol and lowering triglycerides
   - Lowering LDL-cholesterol
   - Lowering total cholesterol and HDL cholesterol

4. What is the approximate recommended daily intake of plant sterols/stanols to actively reduce LDL-cholesterol by 7-12%?
   - 500 mg/day
   - 1.5-3 g/day
   - 5 g/day

5. Which kind of dietary fibre has been associated to a specific and significant LDL-cholesterol effect?
   - Insoluble fibre: it acts on the functioning of the gastrointestinal tract
   - Soluble fibre, especially oat/barley beta-glucan: it partially delays and/or reduce the absorption of cholesterol
   - Dietary fibre has not been associated to any LDL-cholesterol effect

6. What is the mechanism of action of plant sterols/stanols?
   - Increasing intestinal cholesterol uptake of both dietary and biliary cholesterol from the intestinal tract
   - Increasing cholesterol metabolism
   - Reducing intestinal cholesterol absorption by reducing the uptake of both dietary and biliary cholesterol from the intestinal tract

7. What is the approximate recommended daily intake of plant sterols/stanols to actively reduce LDL-cholesterol by 7-12%?
   - Yes, combining plant sterols/stanols with statins further increases LDL-cholesterol reduction
   - Yes, combining plant sterols/stanols with statins further increases HDL-cholesterol reduction
   - No, is not recommended to use plant sterols/stanols in combination with statins

8. The EAS/ESC recommend the daily consumption of food with added plant sterols/stanols as an
   - Quit smoking
   - Occasional physical exercise
   - Regular physical exercise

9. Are there benefits from using plant sterols/stanols in combination with a statin?
   - Yes, combining plant sterols/stanols with statins further increases LDL-cholesterol reduction
   - Yes, combining plant sterols/stanols with statins further increases HDL-cholesterol reduction
   - No, is not recommended to use plant sterols/stanols in combination with statins

10. From the list below identify three lifestyle options that can help in reducing CVD risk
    - Quit smoking
    - Occasional physical exercise
    - Weight loss in presence of obesity or overweight

11. Which dietary advice would you give to your patients? (More than one answer may be correct)
    - Increasing consumption of fruits and berries
    - Exchanging refined cereals with wholegrain cereals
    - Exchanging butter, butter based-spreads with vegetable oils, vegetable oil based-
4. Name **three** dietary components that are emphasized for their ability to lower serum cholesterol.

1. Plant sterols/stanols
2. Insoluble dietary fibre
3. Soluble dietary fibre
4. Quality of dietary fats, i.e. replacing saturated with unsaturated fatty acids

**effective way to lower LDL-cholesterol levels. Which patients are most likely to benefit from the use of foods containing plant sterols/stanols? (More than one answer may be correct)**

1. Individuals with high cholesterol levels at low/intermediate CV risk who do not need cholesterol-lowering drugs
2. Only patients at intermediate levels of CVD risk
3. Adults and children from the age of 6 years with familial hypercholesterolemia
4. Patients with Statin-Associated Muscle Symptoms (SAMS)
Welcome

Welcome to this online tutorial focusing on the dietary management of dyslipidemias, as an important part in the prevention of cardiovascular disease (CVD). This is a “refresher” course, for general practitioners (GPs) and healthcare professionals (HCPs) in primary care practices, to leverage existing knowledge in this key area.

In recent years, dietary habits and their influence on cardiovascular risk have been extensively reviewed. The most recent European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS) guidelines on the management of dyslipidaemias and ESC CVD prevention guidelines, also state that dietary modifications should form the basis for CVD prevention. This module will specifically address the role of dietary and lifestyle modifications, in particular the use of foods with added plant sterols/stanols, to help lower cholesterol levels and prevent CVD.

The aim of this tutorial is to provide you with the latest guidelines and practical advice to assist you when managing patients.

Key areas covered:
- Strategies for management of elevated cholesterol levels recommended by ESC and EAS, focus on the impact of dietary and lifestyle changes on heart health
- The role of dietary fats, dietary fibres, and foods with added plant sterols/stanols in actively reducing cholesterol levels, and their place in the current nutritional guidelines for the prevention of CVD and the management of dyslipidaemias
- Practical advice on motivating patients to make changes to their diet and lifestyle

Learning outcomes:
- Understand the role of diet and lifestyle changes required to reduce cholesterol levels, and therefore prevent CVD and maintain a healthy heart
- Identify patients at increased CVD risk due to elevated cholesterol levels, who will benefit from diet and lifestyle changes
- Understand the role of dietary intervention including foods with added plant sterols and stanols in cholesterol lowering and identify those patients who will benefit from them
- Know how to give dietary advice to help lower your patient’s cholesterol levels and their risk of developing CVD

List of abbreviations used throughout the text

INTRODUCTION
CARDIOVASCULAR DISEASE AND RISK FACTORS
HEALTHY DIETARY PATTERNS FOR CVD PREVENTION
DIETARY FATS IN DYSLIPIDEMIA
PLANT STANOLS AND STEROLS IN DYSLIPIDAEMIA
DIETARY FIBRES IN DYSLIPIDAEMIA
SOY PROTEIN IN DYSLIPIDAEMIA
OTHER LIFESTYLE CHANGES IN CVD PREVENTION
MOTIVATING PATIENTS TO MAKE DIET AND LIFESTYLE CHANGES
SUMMARY OF KEY LEARNINGS
KNOWLEDGE TEST
REFERENCES
CASE STUDIES
FACULTY
References

ESC/EAS Guidelines for the management of
dyslipidaemias The Task Force for the management of
dyslipidaemias of the European Society of Cardiology
(ESC) and the European Atherosclerosis Society
(EAS). Eur Heart J 2016; 39:2999-3058 and
Atherosclerosis 2016; 253: 281-344.

European Guidelines on cardiovascular disease
prevention in clinical practice. The Sixth Joint Task
Force of the European Society of Cardiology and
Other Societies on Cardiovascular Disease Prevention
in Clinical Practice (constituted by representatives of
10 societies and by invited experts). Eur Heart J 2016;
37 (29):2315-2381.
Burden of Cardiovascular Disease

CVD is a leading cause of death in developed and developing countries. Particularly coronary heart disease (CHD) and ischemic stroke are leading causes of premature mortality and disability-adjusted life years (DALYs) in Europe. CVD is resulting in over 3.9 million deaths or 45% of all death each year.

CVD accounts in Europe for 35% of all deaths before the age of 75 years, both in men and women. CVD is the largest disease burden on Europe, accounting for 23% of all DALYs lost.

As a consequence CVD is a major burden on healthcare budgets and costs the European Union nearly €210 billion each year. Of this total cost, around 53% is due to health care costs, 26% due to productivity losses and 21% due to the informal care of people with CVD.

With adequate changes in lifestyle, at least 80% of (premature) CVD mortality may be prevented.

CVD risk factors

The causes of CVD are multifactorial with many directly linked to diet and lifestyle. The major risk factors include:

<table>
<thead>
<tr>
<th>Non-modifiable risk factors:</th>
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<td>Gender</td>
<td>Elevated LDL-cholesterol</td>
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<td>Elevated blood pressure</td>
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The majority of risk factors are modifiable with changes including following a healthy diet or other lifestyle changes, such as stopping smoking and taking regular exercise.

For more detailed information on CVD risk factors please visit: 2016 EAS/ESC Guidelines for the management of dyslipidaemias and the European Guidelines on cardiovascular disease prevention in clinical practice.
Diet and lifestyle interventions for CVD prevention

Dietary habits and their influence on CVD risk have been extensively reviewed and the European guidelines for CVD prevention and for the management of dyslipidaemias state that dietary modifications should form the basis for CVD prevention\textsuperscript{1,2,3}. Some dietary modifications directly result in measurable changes in blood cholesterol levels (see Table 2), as well as in BP and BMI. Even where changes in these risk factors are not observed, dietary modifications still appear to make an important contribution to CVD prevention\textsuperscript{1,2,3}.

**Table 2: Approximate LDL-cholesterol reduction achievable by dietary modifications**

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<tr>
<th>Dietary Component</th>
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<th>Approved health claim*</th>
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<td>Reduce saturated fat (SFA) and replace with unsaturated fats, namely polyunsaturated fatty acids (PUFA) and monounsaturated fatty acids (MUFA)</td>
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<td>&lt;300 mg/day</td>
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<td>Consider plants sterols/stanols</td>
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<td>≥25 g/day</td>
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INTRODUCTION

In this section, you will get an insight of:

- The effects of different types of dietary fats on blood cholesterol;
- How to improve the quality of dietary fats intake;
- The role of nuts and fish/fish oil in CVD prevention

In adults, a total dietary fats intake between 20% and 35% of daily calories, is currently recommended. Dietary fats recommendations aiming at reducing CHD risk mainly focus on reducing the intake of saturated fats by replacing them with unsaturated fats.
Based on the current ESC/EAS guidelines, a daily consumption of 2 g of plant sterols and stanols is recommended to achieve a significant inhibition of intestinal cholesterol absorption, subsequently leading to lowering LDL-cholesterol levels in the blood by 7-10%.¹
Dietary fibres in dyslipidaemia

This section will provide an insight on:

- the importance of including foods rich in dietary fibres into the daily diet in the context of a healthy diet and lifestyle for CVD prevention;
- the role of soluble fibres in TC and LDL-cholesterol lowering;

What are dietary fibres and what are their sources?

What are the cardiovascular benefits of including dietary fibres in a healthy diet?

Dietary fibres in a nutshell

References
Soy protein in dyslipidaemia

This section will focus on the effect of soy protein on TC and LDL-cholesterol lowering.
Other lifestyle changes in CVD prevention

Although this online learning tutorial focuses mainly on the dietary management of dyslipidemias, other lifestyle factors, such as smoking cessation, increasing physical activity, alcohol consumption in moderation and body weight management are also important factors contributing to the prevention of CVD.

This section will provide advice and a few practical tips you can suggest to your patients when talking about the importance of diet and lifestyle changes in CVD prevention.
Motivating patients to make diet and lifestyle changes

While the benefits of a healthy lifestyle, including diet modifications, stopping smoking, weight management and regular exercise for maintaining optimal LDL-cholesterol levels and reducing CVD risk are clear it can be hard to motivate patients to undertake these changes. The ESC/EAS guidelines highlight a few key steps that are crucial to influence any behavior change. These include:

- Spending enough time with the individual to create a therapeutic relationship even just a few more minutes can make a difference.
- Asking questions to check that the individual has understood the advice and has any support they require to follow it.
- Acknowledging the individual's personal view.
- Encouraging the expression of worries and anxieties, concerns and self-evaluation of motivation for behavior change and chances of success.
- Speaking to the individual in his/her own language and being supportive of every improvement in lifestyle.
- Accepting that individuals may need support for a long time and that repeated efforts to encourage and maintain lifestyle change may be necessary in many individuals.
- Making sure that all healthcare professionals involved provide consistent information.

Using the JBS “HearthAge” risk calculator could be helpful to make your patient aware of his/her current estimated heart age and especially to motivate him/her, showing the benefits that may be achieved by sustained, long-term reduction of CVD risk factors through diet and lifestyle changes.
Summary of key learnings

BURDEN OF CARDIOVASCULAR DISEASE:

- Cardiovascular disease (CVD), particularly Coronary Heart Disease (CHD) and ischaemic stroke, is the main cause of premature mortality in Europe resulting in over 3.9 million deaths each year

IMPACT OF DIETARY AND LIFESTYLE CHANGES ON CVD PREVENTION:

- The World Health Organization (WHO) states that more than three-quarters of CVD mortality may be prevented with adequate changes in lifestyle
- European Society of Cardiology/European Atherosclerosis Society guidelines on the prevention of CVD, state that dietary modifications should form the basis for CVD prevention

LOWERING LDL-CHOLESTEROL - A CENTRAL TARGET OF CVD PREVENTION:

- Increased plasma total cholesterol (TC), in particular LDL-cholesterol is a known cause of coronary atherosclerosis
- Lowering total and LDL-cholesterol is the key therapeutic target for reducing CVD risk
- Nutritional and behaviour changes have been shown to lower LDL-cholesterol levels by up to 20%

EUROPEAN GUIDELINES ON THE USE OF PLANT STEROLS/STANOLS TO LOWER CHOLESTEROL:

- The ESC/EAS recommend the daily consumption of foods with added plant sterols/stanols (approximately 2 g/day) as part of dietary changes as an effective way to lower LDL-cholesterol levels by up to 10%, in patients at all levels of CV risk

MOTIVATING PATIENTS TO MAKE DIETARY CHANGES:

- Work with patients' dietary preferences, motivating them...
to substitute unhealthy options for healthier ones using the patient fact sheet

REFERENCES:


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Case study 1: A 55-year old female

Case Study 1: A 55-year old female patient, normal weight

Cardiovascular disease risk factors identified:

- Hypercholesterolaemia (serum total cholesterol 228mg/dl (5.9mmol/l), elevated, LDL-cholesterol 174mg/dl (4.5mmol/l), elevated)
- Age - 55 years
- Smoker
- Elevated blood pressure, despite medication (145/95mmHg)
- Father had died of an acute myocardial infarction at the age of 45 years

TREATMENT APPROACH:

According to the EAS and ESC guidelines for the management of dyslipidaemia, lifestyle changes together with statin treatment should be considered. Patient was reluctant to start medication, so a three step approach was undertaken.

Step 1

Step 2

Step 3
Faculty Page

This European Atherosclerosis Society (EAS) e-learning tutorial has been developed by an international group of basis scientists and clinical investigators with expertise in cholesterol metabolism, plant sterol and plant stanol biology, and cardiovascular disease.

THE EXPERT GROUP IS MADE UP OF:

Professor Alberico L. Catapano
EAS President; Professor of Pharmacology, University of Milan, Italy

Alberico L. Catapano is Full Professor of Pharmacology at the Faculty of Pharmacy at the University of Milano in the Department of Pharmacological Sciences. He is also Director of the Center for the Study of Atherosclerosis in Milan, Italy. (more info...)

Professor Helena Gylling
University of Helsinki, Finland

Helena Gylling is Professor Emerita of Clinical Nutrition and Senior Lecturer in Internal Medicine at the University of Helsinki. Prof Gylling’s research interests include cholesterol and plant sterol metabolism in health and disease. (more info...)

Professor John Chapman
University of Pierre and Marie Curie, France

John Chapman is Research Professor at the University of Pierre and Marie Curie, and Director Emeritus of the National Institute for Health and Medical Research (INSERM) at the Pitié-Salpêtrière University Hospital in Paris, France. (more info...)

Professor Guy de Backer
Emeritus-Professor of Medicine, Ghent University, Belgium

Guy De Backer is Emeritus-Professor of Medicine, Ghent University, Belgium. He has participated as Principal Investigator in numerous epidemiological studies at the national and international level including INTERSALT and MONICA. (more info...)

Professor Luis Masana
University Hospital Sant Joan, Spain

Luis Masana was Professor of Medicine and Head of the Internal Medicine Department and Lipid and Cardiovascular Risk Unit at the University Hospital Sant Joan from 1992 to 2006. (more info...)

Professor Gabriele Riccardi
Professor of Metabolic Diseases at the Federico II University, Naples, Italy
Gabriele Riccardi is full professor of Metabolic Diseases and Chairman of the Master Course on Human Nutrition at the Federico II University in Naples. He is also Director of the Unit for Diabetes, Nutrition and Metabolic Diseases at the University Hospital. (more info...)
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Unhealthy diet
Lack of exercise
Smoking
Obesity
Diabetes

The majority of risk factors are modifiable with changes including following a healthy diet or other lifestyle changes, such as stopping smoking and taking regular exercise.

For more detailed information on CVD risk factors please visit: 2016 EAS/ESC Guidelines for the management of dyslipidaemias and the European Guidelines on cardiovascular disease prevention in clinical practice.
FACULTY
LDL-cholesterol: the pivotal target for preventing CVD

Lipid metabolism can be disturbed in different ways, leading to changes in plasma lipoprotein function and/or levels.

Elevated plasma total cholesterol (TC) and in particular LDL-cholesterol is a known cause of coronary atherosclerosis.

Established and compelling evidence based on outcomes from multiple randomized controlled trials (RCTs) has shown that reducing TC and LDL-cholesterol levels can significantly reduce cardiovascular morbidity and mortality.

In terms of reducing cardiovascular events and CVD mortality, lowering LDL-cholesterol has been shown to be beneficial irrespective of the underlying mechanisms by which this is achieved (reduced absorption or synthesis, or increased clearance of cholesterol).

Atherosclerosis, the underlying cause of CVD, is a slowly progressive disease that begins early in life and develops over several decades before becoming clinically manifested. It is a dynamic process however and it can be slowed down and potentially reversed to an extent.

Prolonged exposure to lower LDL-cholesterol beginning early in life is associated with a substantially greater reduction in the risk of CHD compared to treating high LDL-cholesterol levels later in life. Therefore, lowering LDL-cholesterol earlier in the disease process, through changes towards a healthy diet and lifestyle, and eventually resorting to drug therapies, should be encouraged for the prevention of CVD.
monocytes into macrophages. The macrophages eat and digest the cholesterol molecules. As a result, the macrophages change into foam cells, which accumulate to form plaque.

As the plaque increases in size, the arterial wall thickens and hardens. At the same time, smooth muscle cells within the arterial wall begin to multiply. Most of the smooth muscle cells move to the surface of the plaque. These cells contribute to the formation of a firm, fibrous cap covering the plaque. Eventually the passageway through the artery narrows enough to reduce blood flow and the amount of oxygen received by the organs it supplies.
Blood pressure: a second target for preventing CVD

Hypertension or elevated blood pressure (BP), namely Systolic BP ≥ 140 and/or Diastolic BP ≥ 90 mmHg has been identified as one of the major risk factors for CHD, stroke and heart failure. High sodium (salt) intake, low potassium intake, high alcohol consumption, smoking and physical inactivity, as well as body weight gain may increase BP in susceptible subjects.

Targeted lifestyle modifications are the cornerstone for the prevention of hypertension. Healthy diet and lifestyle changes are recommended in all patients with suboptimal and elevated BP and should always be advised for patients receiving BP-lowering drugs, as these may reduce the dose of BP-lowering drugs needed to achieve BP control. The dietary intervention specific to hypertension is salt restriction. At best, advice should be given to avoid added salt and high-salt food next to advice to eat more fruits and vegetables and to reduce intake of saturated fat and cholesterol.

Other modifiable CVD risk factors: Obesity

Dyslipidemia, diabetes, and CVD, or any combination of these, are the most common metabolic complications of obesity. Risk of CHD, ischemic stroke and type 2 diabetes increases steadily with an increasing body mass index (BMI).

Weight reduction, as well as prevention of further body weight gain is indispensable to prevent or delay the major metabolic complications of obesity and to reduce CVD risk.

Other modifiable CVD risk factors: Diabetes

CVD is the leading cause of morbidity and mortality in people with diabetes mellitus. Patients with diabetes, especially type 2 diabetes, often have an unhealthy blood lipid profile, including high LDL-cholesterol, low HDL-cholesterol, and high TG. Together with hyperglycemia,

Diet and lifestyle intervention remains a key component for CVD prevention also in patients with diabetes. Weight reduction in overweight or obese subjects, increasing physical activity and adopting a healthy, well-balanced diet are fundamental considerations to improve both glycemic
dyslipidemia in diabetic patients may facilitate the development of CHD and other complications of atherosclerosis. Control and the blood lipid profile, thus reducing CVD risk.
Ways to measure cardiovascular risk

Certain people such as those with established CVD, existing diabetes or presence of further risk factors are automatically considered at ‘very high’ or ‘high’ total cardiovascular risk, requiring active evaluation and management of all risk factors. For all others, current guidelines on CVD prevention recommend the use of a risk estimation model such as Systemic Coronary Risk Estimation (SCORE) to estimate total CVD risk, because in most people atherosclerotic CVD is the result of a combination of different risk factors that interact with each other in a complex way. Another commonly used system is the Framingham model.

In order to estimate the lifetime CVD risk, the Joint British Societies (JBS) ‘HeartAge’ risk calculator might be a useful tool.

Risk assessment systems

SCORE:
Risk charts such as SCORE are designed to assist with risk estimation in healthy people with no signs of disease. The SCORE system, based on European data, estimates the 10-year risk of a first fatal atherosclerotic event, for example a heart attack, stroke, or other occlusive arterial disease including sudden cardiac death. Risk estimates have been produced for high and low risk regions in Europe. A relative risk chart has also been produced for younger people, as a low absolute risk may conceal a high relative risk, requiring lifestyle advice.

To find out more about how to use the SCORE risk assessment system please see the joint EAS/ESC guidelines on the management of dyslipidemias.

Table 1: Possible intervention strategies as a function of total CV risk and LDL-Cholesterol level

<table>
<thead>
<tr>
<th>Total CV risk (SCORE) %</th>
<th>LDL-C Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;70 mg/dL, &lt;1.8 mmol/L</td>
</tr>
<tr>
<td></td>
<td>70 to &lt;100 mg/dL, 1.8 to &lt;2.6 mmol/L</td>
</tr>
<tr>
<td></td>
<td>100 to &lt;155 mg/dL, 2.6 to &lt;4.0 mmol/L</td>
</tr>
<tr>
<td></td>
<td>155 to &lt;190 mg/dL, 4.0 to &lt;4.9 mmol/L</td>
</tr>
<tr>
<td></td>
<td>≥190 mg/dL, ≥4.9 mmol/L</td>
</tr>
<tr>
<td>&lt;1</td>
<td>Lifestyle Advice</td>
</tr>
<tr>
<td>≥1 to &lt;5</td>
<td>Lifestyle advice</td>
</tr>
<tr>
<td></td>
<td>Lifestyle advice, consider drug if uncontrolled</td>
</tr>
<tr>
<td>≥5 to ≤10, or high risk</td>
<td>Lifestyle advice and drug treatment for most</td>
</tr>
<tr>
<td></td>
<td>Lifestyle advice and concomitant drug treatment</td>
</tr>
<tr>
<td>≥10 or very high risk</td>
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CV: cardiovascular; LDL-C: low-density lipoprotein cholesterol; SCORE: Systemic Coronary Risk Estimation.
OTHER SCORING SYSTEMS:

Other systems also exist, for example, the Framingham system is similar and based on US data, using information from the Framingham Heart Study to assess 10-year risk of fatal and non-fatal CVD events in patients\textsuperscript{3,13}. However, it has been found that it could overestimate (or underestimate) risk in populations other than the US population; therefore it is important to assess your patients using the most appropriate risk scoring system for them\textsuperscript{14}.

The JBS “HeartAge” risk calculator

The JBS3 “HeartAge” risk calculator is a newly developed and easy to use tool, intended for use by GPs and other HCPs with their patients\textsuperscript{15}. Differently from the other scoring systems mentioned above, this risk calculator has been developed to estimate the lifetime risk of developing a cardiovascular event in healthy people (with no established CVD), by calculating their “Heart Age”. Heart Age can differ from the chronological age, depending on the presence and severity of those modifiable risk factors that lead to CVD\textsuperscript{15}. Heart Age gives patients a better understanding of their CVD risk over their lifetime and the benefits that may be achieved by sustained long-term reduction of CVD risk factors through diet and lifestyle changes, and/or drug therapies, if necessary. To find out more information about the JBS3 “HeartAge” risk calculator, please see the Joint British Societies’ consensus recommendations for the prevention of cardiovascular disease JBS3\textsuperscript{15}.
CVD prevention offers positive long-term health benefits for patients of all ages

Currently CVD prevention in the young, or those with just a mild or moderate risk, is limited, but can result in substantial benefit. As atherosclerosis is a chronic, progressive disease usually initiated during the first 30 years of life, maintaining desirable LDL-cholesterol levels at an early stage, even from childhood, substantially delays or possibly prevents the onset of the disease. This approach is associated with a markedly greater reduction in CVD risk than lowering already elevated LDL-cholesterol levels in middle age. However, it should be considered never too late to take action to lower cholesterol levels.

So, how can LDL-cholesterol levels be maintained at optimal or desired levels throughout life without long-term drug use and adding to the burden on the healthcare system? Dietary habits and lifestyle factors need to be seriously considered; particularly as nutritional and behavioral changes have been shown to lower LDL-cholesterol levels by up to 20%.

Cardiovascular disease is the result of a lifelong process and, as such, intervention strategies to reduce risk such as adopting a healthy diet and lifestyle should begin as early in life as possible.

Furthermore, cohort studies demonstrate a clear link between a low total CVD risk profile (through lifestyle) and low CHD incidence. One example is a cohort study of 42,847 male US health professionals aged 40-75 years followed for a 16-year period during which a total of 2,183 incident coronary events were observed. Results indicated that higher healthy lifestyle scores were associated with lower incidences of CHD. These low-risk scores were defined as:

- absence of smoking
- body mass index <25kg/m²
- moderate-to-vigorous physical activity 30min/d

In fact, 62% of coronary events in this cohort may have been prevented with better adherence to these five healthy lifestyle practices. Furthermore, among men taking medication for hypertension or hypercholesterolemia, 57% of all coronary events may have been prevented with a low-risk lifestyle.
- moderate alcohol consumption (5 to 30g/d)
- being in the top for a healthy diet score
References


Dietary Patterns for preventing CVD

INTRODUCTION

Dietary choices are based on personal and cultural food preferences and include a combination of foods whose nutrients may interact synergistically and have a cumulative effect on health, including the risk of CVD. Dietary patterns that include a wide variety of nutritious foods are more likely to meet nutrient requirements and confer health benefits than those diets that are selectively restricted in calories or nutrients. Furthermore, using a foods group based approach may offer a comprehensive strategy for the prevention of CVD.

Based on a growing body of evidence, dietary patterns beneficial for cardiovascular health are plant-based, consisting of a high consumption of whole grains, fruits, vegetables, legumes, nuts and seeds; moderate consumption of fish, poultry and eggs; and limited consumption of red meat, sweets, and sugar-sweetened beverages.

This section will explore specific dietary patterns associated with a reduction of CVD risk, which are also favorable to manage dyslipidemia, particularly:

- The Mediterranean Diet
- The Portfolio Diet
- The Dietary Approach to Stop Hypertension (DASH) Diet
Diet and lifestyle interventions for CVD prevention

Dietary habits and their influence on CVD risk have been extensively reviewed and the European guidelines for CVD prevention and for the management of dyslipidaemias state that dietary modifications should form the basis for CVD prevention\textsuperscript{1,2,3}. Some dietary modifications directly result in measurable changes in blood cholesterol levels (see Table 2), as well as in BP and BMI. Even where changes in these risk factors are not observed, dietary modifications still appear to make an important contribution to CVD prevention\textsuperscript{1,2,3}.

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<td>Increase dietary fibre intake from foods rich in soluble fibre</td>
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<td>Consider plants sterols/stanols</td>
<td>1.5-3 g/day</td>
<td>7-12%\textsuperscript{e,f}</td>
<td>★★★</td>
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<tr>
<td>Consider soy protein to replace partially animal protein foods</td>
<td>≥ 25 g/day</td>
<td>3-4%\textsuperscript{g,h}</td>
<td>★★★</td>
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\textsuperscript{a}Level of Evidence A = Data derived from multiple randomized clinical trials or meta-analysis
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Table adapted in parts from ESC/EAS Guidelines for the management of dyslipidaemias\textsuperscript{2} LDL-cholesterol reductions were adapted from Menisk RP et al., 2003\textsuperscript{4}; Weggemans RM et al, 2001\textsuperscript{5}; Whitehead A. et al., 2014\textsuperscript{6}; Zhu x. et al., 2015\textsuperscript{7}; Ras RT et al., 2014\textsuperscript{8}; Commission Regulation No 686/2014\textsuperscript{9}; Sacks FM et al., 2006\textsuperscript{10}; Benkhedda et al, 2014\textsuperscript{11}

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The Mediterranean diet

The Mediterranean diet may be considered as a "gold standard" eating pattern for CVD risk prevention as adherence to it favorably affects numerous CVD risk factors, including dyslipidemia, hypertension, and diabetes\(^\text{15}\). The (traditional) Mediterranean diet (see Table 3) is characterized by:

- Abundance of plant-based foods encompassing whole grains, fruits, vegetables, legumes and nuts;
- Low to moderate consumption of dairy products;
- Low consumption of red meat (few times per month);
- Moderate consumption of fish, poultry and eggs;
- Optional moderate amount of wine, with meals (maximum 1-2 glasses per day for men and 1 glass for women);
- Olive oil as main source of dietary fats;
- Herbs and spices to flavor food.

### Table 3 Food groups and frequency of consumption according to Mediterranean diet

<table>
<thead>
<tr>
<th>Daily consumption</th>
<th>Weekly</th>
<th>Occasionally</th>
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<tbody>
<tr>
<td>Every main meal should contain:</td>
<td>LEGUMES ≥ 2 servings</td>
<td>SWEETS (Sugar, candies, pastries and beverages such as sweetened fruit juices and soft drinks)</td>
</tr>
<tr>
<td>CEREALS and GRAIN FOODS: 1-2 servings per meal in the form of whole grain bread, pasta, rice, barley, couscous and others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEGETABLES: ≥ 2 servings per meal, varying in colors. At least one of the servings should be consumed raw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRUITS: 1-2 servings per meal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAIRY PRODUCTS: low-fat dairy</td>
<td>FISH ≥ 2 servings</td>
<td></td>
</tr>
<tr>
<td>OLIVE OIL (preferably extra virgin) as main source of dietary fats</td>
<td>WHITE MEAT 2 servings</td>
<td></td>
</tr>
<tr>
<td>SPICES, HERBS, GARLIC and ONIONS</td>
<td>EGGS 2-4</td>
<td></td>
</tr>
<tr>
<td>OLIVES, NUTS and SEEDS</td>
<td>RED MEAT ≤ 2 servings. Preferably lean cuts</td>
<td></td>
</tr>
<tr>
<td>1,5 to 2 liter of WATER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
REMEMBER: The Mediterranean diet includes both healthy dietary and lifestyle habits!

Adherence to a Mediterranean diet has been shown to be beneficial with respect to CVD risk\(^\text{13}\). For instance, the Primary Prevention of Cardiovascular Disease with a Mediterranean Diet (PREDIMED) trial has recently reported significant beneficial effects of a Mediterranean diet supplemented with extra-virgin olive oil or with a mix of nuts on multiple cardiovascular and metabolic risk factors and primary prevention of CVD\(^\text{16}\).

Most importantly, cardiovascular benefits of the Mediterranean diet in primary prevention of CVD have been extensively observed also in middle-aged people\(^\text{16}\).

Most of the effects may be ascribed to the changes in the quality of dietary fats (saturated fatty acids replaced by unsaturated fatty acids), a high content of dietary fibre, antioxidant compounds and minerals\(^\text{15}\), that could synergistically act on several pathways, resulting in a substantial improvement of general and especially heart health\(^\text{14}\).

REMEMBER: It is never too late to change dietary habits to improve cardiovascular health!
The Portfolio diet: A dietary portfolio of foods to maximize cholesterol lowering

Re-introducing those plant foods that are high in dietary fibre, vegetable proteins and unsaturated fats next to plant sterols into the daily diet is advantageous to improve an abnormal blood lipid profile and to reduce or delay the need for pharmacological interventions.\(^{17,18,19}\)

The core of the Portfolio diet is to combine plant-based cholesterol-lowering foods with a low dietary cholesterol intake (<200 mg/day) and a low saturated fat intake (≤ 7% of total energy)\(^2\). Four dietary components have been included in the diet for their potential ability to lower serum cholesterol: plant sterols, soluble fibre, soy protein, and nuts, especially almonds.

Within the Portfolio diet approach (see Table 4), a recommended intake of:

- 1 g of plants sterols /1000 kcal;
- 22.5 g of soy proteins /1000 kcal;
- 10 g of viscous dietary fibre /1000 kcal
- 23 g of almonds /1000 kcal

### Table 4 Dietary components of the Portfolio diet

<table>
<thead>
<tr>
<th>Food group (recommended quantity/servings)</th>
<th>Type of foods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary components of the Portfolio diet</strong></td>
<td></td>
</tr>
<tr>
<td>Viscous fibre (10 g/1000 kcal)</td>
<td>Oat, oat bread, oat bran breads, barley, psyllium containing cereals, vegetables;</td>
</tr>
<tr>
<td>Soy protein (22.5 g/1000 kcal)</td>
<td>Soy beverage, tofu, soy meat analogues, soy cheese</td>
</tr>
<tr>
<td>Plant sterols (1 g/1000 kcal)</td>
<td>Foods with added plant sterols/stanols</td>
</tr>
<tr>
<td>Nuts: almonds (23 g/1000 kcal)</td>
<td>Any (unsalted) nuts, especially almonds</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Additional components</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Other vegetable proteins (6–8 g/1000 kcal)</td>
<td>Beans, lentils, peas</td>
</tr>
<tr>
<td>Egg whites and egg substitute (≤ 3 whole egg equivalent per week)</td>
<td>Egg white, egg substitute, egg replacements</td>
</tr>
<tr>
<td>Fruit and vegetables (2.5–5 servings/1000 kcal)</td>
<td>All fruits and vegetables</td>
</tr>
<tr>
<td>Poultry, fish, and red meats (≤ 3 serving per week)</td>
<td>White poultry meat, any fish, lean or extra lean red meats</td>
</tr>
<tr>
<td>Fat-free or low-fat dairy foods (≤ 2 servings per week)</td>
<td>Skimmed milk, low-fat yogurt, low-fat or fat-free cheese, or cottage cheese</td>
</tr>
<tr>
<td>Oils and margarine high in monounsaturated fatty acids (11 g/1000 kcal)</td>
<td>Olive, rapeseed (canola) oil; vegetable oil-based spreads</td>
</tr>
</tbody>
</table>

Source: Jenkins DJ et al., 2006.\(^{17}\)
The DASH diet: Dietary Approach to Stop Hypertension (DASH)

The DASH diet is an eating plan primarily targeted to lower BP. It is also an effective nutritional strategy to prevent CVD since it has also been shown to also have great beneficial effects on blood lipid levels, improving both TC and LDL-cholesterol, thus leading to a reduction of CVD risk.

The DASH diet shares some dietary features with the Mediterranean diet as it:

- Emphasizes vegetables, fruits, and fat-free or low-fat dairy products
- Includes whole grains, fish, poultry, beans, seeds, nuts, and vegetable oils
- Limits sodium intake as well as sweets, sugar-sweetened beverages, and red meat consumption

Most of the effects of the DASH diet may be ascribed to a higher intake of protective nutrients present in the different food groups (Figure 1) such as potassium, calcium, magnesium, dietary fibre and vegetable proteins. At the same time, this dietary pattern is lower in refined grain foods, saturated and trans fats, sodium, as compared to the Western diet characterized by high intakes of red meat, sugary desserts, high-fat foods, and refined grain foods.

Figure 1 The DASH diet foods groups

Overall, all three dietary patterns are shown to be beneficial with respect to CVD risk. They reduce total and LDL-cholesterol levels and BP, emphasizing the importance of specific food choices and healthier alternatives rather than a specific macronutrient composition.
Summary of recommendations on dietary patterns

It is possible to achieve a healthy diet in multiple ways and preferably, with a wide combination of foods.

It is important to consider that gradual and small changes are the most effective way to contribute to long-term dietary modifications (see Table 5).

The European guidelines on CVD prevention in clinical practice and for the management of dyslipidaemias encourage nutritional strategies based on replacing less healthy foods with healthier alternatives and ensuring that individuals are consuming a balanced diet.1,2

Table 5 Make healthy food choices

<table>
<thead>
<tr>
<th>Increase:</th>
<th>Exchange:</th>
<th>Limit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>Refined cereals</td>
<td>Processed meat and red meat</td>
</tr>
<tr>
<td>Pulses</td>
<td>Wholegrain cereals</td>
<td></td>
</tr>
<tr>
<td>Fruits and berries</td>
<td>Butter, Butter based-spreads</td>
<td>Beverages and foods with added sugar</td>
</tr>
<tr>
<td>Fish and seafood</td>
<td>High-fat dairy</td>
<td>Salt</td>
</tr>
<tr>
<td>Nuts and seeds</td>
<td>Low-fat dairy</td>
<td>Alcohol</td>
</tr>
</tbody>
</table>

Adapted from the Nordic Nutrition Recommendations 201224

Dietary recommendations should always take into account local food habits, however interest in healthy food choice from other cultures should be promoted. A balance of foods and beverages within energy needs should be promoted to prevent weight gain.

Additionally, among the wide variety of foods, food combinations or a foods groups based approach, such as in these dietary patterns can be considered an effective ways to improve the total CVD risk profile.

REMEMBER: The key for a healthy diet is to vary and to focus on quality, quantity and frequency of food intake!


Saturated Fatty acids (SFA)

SFA represent the major type of fats in the diet in most countries.

Specifically, SFA have the strongest impact on blood cholesterol, increasing TC and LDL-cholesterol levels. There is consistent scientific evidence that replacing saturated with unsaturated fats is the most beneficial for CHD risk reduction (see Table 6).

Replacing 5% energy of saturated fats with unsaturated fats may lead up to a 7% lowering in LDL-cholesterol.

Table 6: Effect of replacing 5% of the dietary energy from SFA on LDL-cholesterol

<table>
<thead>
<tr>
<th>SFA replacement with:</th>
<th>Approximate LDL-cholesterol reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monounsaturated Fatty Acids (MUFA)</td>
<td>-8 mg/dL (-0.21 mmol/L) = -6%</td>
</tr>
<tr>
<td>Polyunsaturated fatty acids (PUFA)</td>
<td>-10 mg/dL (-0.26 mmol/L) = -7%</td>
</tr>
</tbody>
</table>

According to guidelines, the goal for CVD prevention is reducing SFA consumption to less than 10% of total energy by replacing SFA with unsaturated fat.

The replacement of SFA by both PUFA and MUFA is beneficial for blood lipids, while the effects of replacing SFA with carbohydrates depends on the quality of the carbohydrates.

Sources of SFA:
Fatty meat and dairy products such as full-fat milk, hard cheese, butter and cream, tropical oils such as coconut and palm oil, fully hydrogenated vegetable oils, egg yolk, foods containing 'hidden fat' such as confectionary and cakes or crisps.

Trans Fatty acids (TFA)

Dietary TFA raise LDL-cholesterol and lower HDL cholesterol and contribute consistently and significantly to increase the risk of CHD. Reducing TFA intake is an important target to lower LDL-cholesterol and consequently, to decrease the risk of CHD.

As TFA adversely affect multiple CVD risk factors, their intake should be kept as low as possible. No more than 1% of total energy should come from TFA.

Sources of TFA:
Foods that naturally contain TFA are dairy products such as butter, milk, cheese, and meat from ruminants such as beef and lamb. Industrial TFA originate from partially hydrogenated vegetable oils, and are commonly found in convenience foods (e.g. pizza with cheese), battered or deep-fried foods (e.g. take-away potato crisps), commercial baked goods like pies and pastries.

As TFA are harmful for health, the use of partially hydrogenated vegetable oils in food manufacturing (e.g. margarine) has been considerably reduced in Europe over the past years. Nevertheless, TFA intake may still vary between different European countries.

Dietary cholesterol

Dietary cholesterol raises blood cholesterol levels. Yet, the impact of dietary cholesterol on blood cholesterol is

Sources of Dietary Cholesterol:
weaker if compared with that of SFA and TFA. Nevertheless, it is important to consider the possible consequence of high dietary cholesterol intake on blood lipid levels in those individuals with CVD or who are at increased risk of CVD (see Chapter 1).

When guidelines are followed to lower the intake of SFA, this usually also leads to a reduction in dietary cholesterol intake because they come from the same dietary sources.

The EAS/ESC guidelines recommend that cholesterol intake in the diet should be reduced (>300 mg/day), particularly in people with high plasma cholesterol levels.

SFA and cholesterol are typically found in the same foods; dietary cholesterol comes only from foods of animal origin, such as meat, egg yolks, and full-fat dairy products, including butter, cream and cheese. Shrimps and prawns are rich in cholesterol as well. Occasional consumption of these foods items, rather than habitual, is advised.
Diet and lifestyle interventions for CVD prevention

INTRODUCTION

In this section, you will get an insight of:

- The effects of different types of dietary fats on blood cholesterol;
- How to improve the quality of dietary fats intake;
- The role of nuts and fish/fish oil in CVD prevention

In adults, a total dietary fats intake between 20% and 35% of daily calories, is currently recommended. Dietary fats recommendations aiming at reducing CHD risk mainly focus on reducing the intake of saturated fats by replacing them with unsaturated fats.
Monounsaturated Fatty Acids (MUFA)

Replacing SFA with MUFA improves the blood lipid profile and does not affect HDL-cholesterol levels\(^6\) (See Table 6).

**SOURCES OF MUFA:**

MUFA are found in a wide variety of foods including vegetable oils, especially olive, rapeseed and sunflower oils, vegetable oils based spreads and margarines\(^9\), avocado, nuts (especially hazelnuts and peanuts). Meat is also a source of MUFA\(^10\).

Polyunsaturated fatty Acids (PUFA)

PUFA lower LDL-cholesterol levels when they replace SFA or carbohydrates\(^5,6,13\) (See Table 6).

PUFA can be divided into two subgroups: Omega-6, and Omega-3.

- Among PUFA, linoleic acid (LA) and alpha-linolenic acid (ALA) are essential fatty acids and are needed for growth and development and maintaining health.
- A healthy diet should contain both Omega-6 and Omega-3 PUFA\(^2\).

**Omega-6**

Omega-6 (mostly LA) are the major PUFA in human diet and are widely present in plant (based) foods. The richest sources are soybean, corn, sunflower and safflower oils, along with vegetable oil-based spreads and margarines.

Also nuts and seeds are rich-in Omega-6\(^10\).

Within the Omega-6 family, there is also arachidonic acid. It occurs in smaller amount and originates from animal foods (e.g. meat, poultry and eggs).
Omega-3

There are two types of Omega-3 in the diet: “vegetable” and “marine” Omega-3.

- The "vegetable" Omega-3 ALA is present in linseed, rapeseed, and soybean oil, chia seeds, nuts and green leafy vegetables (e.g. Brussels sprouts, kale, spinach, and salad greens);
- The "marine" very long chain Omega-3 eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) occur in oily fish such as herring, sardines, tuna, trout, salmon and mackerel. In lean fish (such as cod), they are found in liver, which is a natural source of fish oil.

Omega-3 can also be found in fortified foods such as soymilks, cooking oils, eggs, spreads.

EPA and DHA are not strictly "essential", as the human body can form them from ALA.

EPA and DHA do not lower LDL-cholesterol; nonetheless, they have other beneficial effects such as lowering blood TG and reducing BP.

For individuals who do not eat fish or seafood, or following a vegetarian or vegan diet, increasing the consumption of “vegetable” Omega-3-rich food sources, including seeds, nuts, vegetable oils and green leafy vegetables, is encouraged to ensure the recommended daily intake of Omega-3.

EPA and DHA are included in dietary recommendations for a healthy diet and for the prevention of CVD as they have shown cardiovascular health benefits at regular intakes of at least 250 mg/day. This amount is achievable when consuming one serving of fish at least twice a week, preferably oily fish.

Next to EPA and DHA, a minimum intake of 0.5% of energy from the "vegetable" Omega-3 ALA is recommended.
Moving towards a healthy dietary pattern: particular foods that should be included more often in the diet

Dietary management of CVD risk is a key element in CVD prevention. Hence, considering foods, rather than nutrients in isolation, is advantageous.

VEGETABLE OILS AND MARGARINES

When aiming to reduce SFA intake by replacing them with unsaturated fats for CVD prevention, plant-based sources, such as vegetable oils and vegetable oil-based spreads and margarines can be healthy substitutes to animal-derived SFA.

Vegetable oils deliver essential fatty acids such as Omega-3 ALA and the Omega-6 LA as well as fat soluble vitamins, e.g. Vit. E. They provide different combinations of SFA, MUFA and PUFA depending on their origin. Among vegetable oils, olive oil, particularly extra-virgin olive oil, is especially emphasized in the Mediterranean dietary pattern as it is particularly rich in MUFA and antioxidants compounds. In fact, the PREDIMED trial has shown that supplementing a Mediterranean diet with extra-virgin olive oil can reduce the incidence of major cardiovascular events among persons at high CVD risk.

Margarines are made from various vegetable oils that are rich in PUFA and MUFA. Some margarines contain added plant sterols and stanols or Omega-3 which confer a particular cardiovascular health benefit and help to lower LDL-cholesterol and TG levels.

NUTS

Nuts are another plant-based alternative to SFA rich foods. Most common nuts in the diet are almonds, walnuts, peanuts, hazelnuts, pistachios and chestnuts. Including nuts as a part of a daily healthy diet should be emphasized as, if compared to foods of animal origin (like meat, cheese, whole milk and egg yolks), they have a very high unsaturated to saturated fats ratio. In fact, they are also high in Omega-3 (e.g. ALA) and low in SFA. Next to their optimal lipid profile, other not-fat components, such as plant sterols, dietary fibres, along with particular amino acids, are likely to play an important role in their LDL-cholesterol lowering effect.

Nut consumption has been also associated with reduced risk of CHD and hypertension.

The beneficial effects on multiple CVD and metabolic risk factors of supplementing a diet with a portion (approximately 30g) of nuts was shown in the PREDIMED trial.

Increase nuts consumption (preferably unsalted) for a healthy heart: a little amount, can have a big impact for CVD prevention.

FISH AND FISH OIL

Fish and seafood deserve particular attention within dietary changes towards a heart healthy diet. They are an important source of many nutrients including unsaturated fats and protein, several vitamins (e.g. Vit. D and B) and minerals (e.g. selenium, iodine, and potassium).

A characteristic of fish and, especially, oily fish, is its high content of very long chain Omega-3 EPA and DHA.

In addition to the cardiovascular health benefits (see above), EPA and DHA have anti-inflammatory effects, and, for this reason, they might not only prevent plaque development but also contribute to the atherosclerotic plaque stabilization.

Next to fish, fish oil or marine omega-3 are beneficial for heart health.

Although fish oil does not have an effect on blood TC and LDL-cholesterol levels, at high doses (>3g/day) EPA+DHA are effective in plasma TG lowering. Such high intakes can only be reached through supplements.
as they are also a significant source of cholesterol.
Dietary fats in a nutshell

For CVD prevention, the type of dietary fat, but not the total amount of fat, predicts their effects on blood cholesterol levels (see Table 7).

Although following total fat recommendations is an important goal, particular attention should be paid to the quality of dietary fat. Help your patients to improve their blood lipid profile through healthier foods choice (see Table 8).

Table 7: Impact of dietary fats on LDL-cholesterol levels

<table>
<thead>
<tr>
<th>Dietary fats</th>
<th>LDL-cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFA</td>
<td></td>
</tr>
<tr>
<td>TFA</td>
<td></td>
</tr>
<tr>
<td>Replacing SAFA with MUFA</td>
<td></td>
</tr>
<tr>
<td>Replacing SAFA with PUFA</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: Tips to improve blood lipid profile

Make the smartest food choice

- Recognize saturated fats: they originate primarily from animal sources and most of them are visible (butter, visible fat of the meat, lard, bacon, ham, sausages...)

- Replace foods containing saturated fats with foods that are high in unsaturated fats, such as:
  - oily fish (e.g. mackerel and salmon)
  - nuts (e.g. almonds, walnuts, hazelnuts)
  - seeds (e.g. flaxseeds and pumpkin)
  - vegetable oils and vegetable oil-based spreads and margarines (i.e. sunflower, olive, corn, walnut and rapeseed oils)

Consider food products whose labels claim: “Source of Omega-3 fats” and/or “High in unsaturated fats/PUFA/MUFA”

Reduce fatty cuts of meat (trim visible fat from meat and ham; take the skin off from chicken), as well as high-fat dairy products intake

Prefer healthy methods of cooking

Increase the consumption of foods rich in soluble fibers such as legumes, fruit and vegetables; wholegrains such as oat and barley

Consider to use food with added plant-sterols/stanols

Consider healthy dietary patterns

Get physically active
References

1. EFSA Panel on Dietetic Products NaAN. Scientific Opinion on Dietary Reference Values for fats, including saturated fatty acids, polyunsaturated fatty acids, monounsaturated fatty acids, trans fatty acids, and cholesterol. EFSA Journal 2010;8:1461-2010.


What are plant sterols and stanols and what are their sources?

Plant sterols and stanols are components of our everyday diet as they are found in all plant-based foods (see sources of plant sterols and stanols in Table 9). They are bioactive components in plants with similar functions as that of cholesterol in mammals.

In the general population, the daily intake of plant sterols is about 300 mg. Those following a vegetarian or vegan diet may ingest up to 600 mg/day.

Plant stanols are present in smaller amounts than plant sterols in everyday foods. The amounts of plant stanols ingested from the diet is 17-24 mg/day.

**SOURCES OF PLANT STEROLS AND STANOLS:**

Vegetable oils (e.g. corn, rapeseed, soybean, sunflower), margarines, cereals (e.g. corn, rye, wheat, barley, millet, oat), legumes (e.g. peas, beans and lentils), seeds (e.g. sunflower) and nuts (e.g. peanuts and almonds), vegetables (e.g. broccoli, cauliflower, carrots) and fruits (e.g. avocado, raspberry, orange).

Plant sterols and stanols are also added to foods such as vegetable fat-based spreads and margarine as well as to milk, yoghurt, yoghurt drinks and other foods.

**Table 9: Plant sterols and stanols content in naturally occurring food sources (in mg/100 g edible food)**

<table>
<thead>
<tr>
<th>Food group</th>
<th>Plant sterols and stanols (mg/100 g of edible portion)</th>
<th>Food group</th>
<th>Plant sterols and stanols (mg/100 g of edible portion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable Oils:</td>
<td></td>
<td>Nuts and seeds:</td>
<td></td>
</tr>
<tr>
<td>• Sunflower oil</td>
<td>436</td>
<td>• Almonds</td>
<td>208</td>
</tr>
<tr>
<td>• Olive oil</td>
<td>177</td>
<td>• Peanuts</td>
<td>116</td>
</tr>
<tr>
<td>• Rapseseed oil</td>
<td>773</td>
<td>• Sunflower seeds</td>
<td>322</td>
</tr>
<tr>
<td>• Soybean oil</td>
<td>349</td>
<td>• Pistachio nuts</td>
<td>297</td>
</tr>
<tr>
<td>Vegetable oil-based margarines:</td>
<td></td>
<td>Vegetable:</td>
<td></td>
</tr>
<tr>
<td>• Full-fat</td>
<td>200</td>
<td>• Broccoli</td>
<td>39</td>
</tr>
<tr>
<td>• Half-fat</td>
<td>164</td>
<td>• Brussels sprouts</td>
<td>43</td>
</tr>
<tr>
<td>Grains and cereals:</td>
<td></td>
<td>• Carrots</td>
<td>16</td>
</tr>
<tr>
<td>• Bran flakes</td>
<td>65</td>
<td>• Chick peas</td>
<td>35</td>
</tr>
<tr>
<td>• Museli</td>
<td>35</td>
<td>Fruits:</td>
<td></td>
</tr>
<tr>
<td>Fruits:</td>
<td></td>
<td>• Avocado</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pineapple</td>
<td>19</td>
</tr>
</tbody>
</table>
Plant sterols and stanols are widely distributed in plant-based foods, but daily intake of plant sterols and stanols from those natural sources is not sufficient for an effective LDL-cholesterol lowering effect.

<table>
<thead>
<tr>
<th>Food</th>
<th>Plant Sterol Content (mg/100g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oat bran</td>
<td>46</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>100</td>
</tr>
<tr>
<td>Rye bread, dark</td>
<td>51</td>
</tr>
<tr>
<td>Whole meal break</td>
<td>86</td>
</tr>
<tr>
<td>Apple</td>
<td>13</td>
</tr>
<tr>
<td>Orange</td>
<td>24</td>
</tr>
<tr>
<td>Berries (e.g. raspberry, blueberry)</td>
<td>20-30</td>
</tr>
</tbody>
</table>

Plant sterols and stanols in dyslipidaemia

In this section, you will get an insight of:

- What are plant sterols and stanols and how do they lower LDL-cholesterol;
- What are the cardiovascular benefits of including plant sterols and stanols as part of diet and lifestyle interventions in the management of dyslipidaemia;
- What are the benefits of plant sterols and stanols in LDL-cholesterol management for patients already on drug therapy;

Based on the current ESC/EAS guidelines, a daily consumption of 2 g of plant sterols and stanols is recommended to achieve a significant inhibition of intestinal cholesterol absorption, subsequently leading to lowering LDL-cholesterol levels in the blood by 7-10%.

EAS Consensus paper on phytosterols
ESC guidelines - CVD prevention
ESC/EAS guidelines - Management of Dyslipidaemias
What are the cardiovascular benefits of including plant sterols and stanols in a healthy lifestyle?

Studies have shown that, even at their highest intakes, naturally occurring dietary plant sterols and stanols only have a modest effect on lowering cholesterol concentrations.

This is because levels of plant sterols and stanols occurring in natural food sources are too low.

Clinical studies show that foods with added plant sterols and stanols significantly lower blood cholesterol, especially LDL-cholesterol, a major CVD risk factor.

LDL-cholesterol lowering is linked to lower CVD risk regardless of the underlying mechanism.

Numerous clinical studies have shown that foods with added plant sterols and stanols lower LDL-cholesterol in a dose-dependent manner. For an LDL-cholesterol lowering effect of 7-10%, a daily intake of approximately 2 g/day of plant sterols/stanols (see Figure 2) is needed. An LDL-cholesterol lowering effect of 10-12% has been observed for intakes of plant sterols and stanols up to approximately 3 g/d.

REMEMBER: Continuous intake of plant sterols and stanols is needed to maintain the LDL-cholesterol lowering effect over time.

ADVICE: Using foods with added plant sterols and stanols can help to lower LDL-cholesterol as part of a healthy diet and lifestyle.

To obtain such amounts of plant sterols and stanols from ordinary foods is not possible. Hence, incorporation of foods with added plant sterols and stanols in the daily diet is needed to achieve significant LDL-cholesterol reduction. Although there is no CVD outcome data for such products it is reasonable to postulate a beneficial effect on CVD outcomes based on their well-established LDL-cholesterol lowering effect.

With a daily intake of approximately 2 g plant sterols/stanols, a reduction in LDL-cholesterol can be expected in 2-3 weeks of intake and is sustained with continued consumption.

Discontinuing the use of plant sterols and stanols will result in cholesterol levels returning to original levels.

Figure 2 How to get the recommended daily dose of plant sterols/stanols.

1 yogurt drink with added plant sterols and stanols.

1 to 2 servings of spread with added plant sterols and stanols plus one yogurt pot with added plant sterols and stanols.

Incorporating additional plant sterols/stanols in the daily diet is effective in reducing LDL-cholesterol.
Plant sterols and stanols - mode of action

The cholesterol absorption pathway represents an attractive target in the management of dyslipidemia. It offers clinical opportunities for dietary supplementation with components that can help to reduce intestinal cholesterol absorption. Plant sterols and stanols are the most prominent of these dietary components.

Plant sterols and stanols reduce the absorption of cholesterol from the gut by 30 to 40%, which means that less cholesterol is absorbed and circulating in the blood stream. TC and LDL-cholesterol levels are therefore reduced, with no significant effect on HDL-cholesterol levels.

**Plant sterols and stanols - mode of action**

1. When cholesterol (either from the diet or from the bile) and plant sterols and stanols reach the small intestine, they are incorporated into particles called mixed micelles. The micelles are essential for carrying these hydrophobic compounds in the gut through the intestinal wall.

2. Once in the micelles, uptake of cholesterol and plant sterols/stanols into the enterocytes (the intestinal absorptive cells) occurs.

3. The bulk of absorbed cholesterol is incorporated into chylomicrons, i.e. lipoprotein particles that transport cholesterol and fats via the lymphatic system to the liver and into the blood. On the contrary, the bulk of plant sterols and stanols is pumped back from the enterocytes into the gut lumen and only a minimal amount will actually reach the blood circulation.

Due to the similar molecular structure, plant sterols and stanols compete with exogenous cholesterol (from the diet) and endogenous cholesterol (from the liver via the bile) for incorporation into micelles (Phase 1). By displacing cholesterol from micelles, plant sterols and stanols reduce the amount of cholesterol that is actually absorbed.
EAS recommendations for the use of plant sterols and stanols

Plants sterols and stanols are recommended by the EAS as a part of lifestyle intervention in the management of dyslipidemia.

The EAS consensus panel papers recommend that food with added plant sterols and stanols may be considered for:

- Individuals with high cholesterol levels at low/intermediate global CVD risk who do not need cholesterol-lowering drugs;
- In combination to cholesterol-lowering drugs (i.e. statins) in high and very high CVD risk patients who do not achieve LDL-cholesterol targets or are statin intolerant;
- In adults and children from the age of 6 years with familial hypercholesterolemia (FH);
- In patients with statin-associated muscle symptoms (SAMS);
- Foods containing plant sterols and stanols may be used either alone or in combination with statins or other cholesterol-lowering drugs (see below).

For patients with familial hypercholesterolemia (FH), cholesterol-lowering treatment is necessary. Next to drug treatment, diet and lifestyle interventions play an important role, especially in children with FH. The benefits of reducing LDL-cholesterol are greater if action is taken early in life rather than later in life.

Early management of elevated LDL-cholesterol can reduce CVD burden, CVD prevention, through dietary and lifestyle change, should start as soon as possible.

Plant sterols and stanols combined with statins

The EAS consensus panel advocates combining plant sterols and stanols with statins to maximize the potential for reaching LDL-cholesterol goals to manage overall CVD risk. Due to their distinct mechanism of action, plant sterols and stanols (i.e. inhibitors of cholesterol absorption) are expected to have an additive effect when combined with a statin (i.e. inhibitors of cholesterol synthesis). In fact, in clinical studies, dietary plant sterols and stanols have been shown to further increase LDL-cholesterol reduction by 7-10% when used in addition to statin therapy - a result superior to that achieved by doubling the statin dose (6%) (see Table 10).

If experiencing statin-associated muscle symptoms (SAMS), which may require interruption of the use of statins, including foods with added plant sterols and stanols may help to reach LDL-cholesterol targets, next to other lipid-lowering therapies. Furthermore, according to the EAS Consensus Panel, the Portfolio diet approach may be appropriate in patients with SAMS, as well as dietary patterns that include foods low in saturated fats and high in viscous fibre in addition to foods with added plant sterols and stanols.

Table 10: Approximate and cumulative LDL-cholesterol reduction achievable by dietary modification

<table>
<thead>
<tr>
<th>Ways to further lower cholesterol</th>
<th>Dietary Change</th>
<th>Approximate LDL-cholesterol reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>In combination with statins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doubling statin dose</td>
<td>-</td>
<td>6%</td>
</tr>
<tr>
<td>Adding plantsterol/Stanol</td>
<td>1.5-2.4g/day</td>
<td>7 - 10%</td>
</tr>
</tbody>
</table>

Table adapted from ESC/EAS Guidelines, 2011 and Gylling et al., 2014.
Plant sterols and stanols and Ezetimibe

Consumption of plant sterols and stanols and treatment with ezetimibe both reduce cholesterol absorption in the intestine, although the exact mechanisms of action differ. Very limited data are currently available about the combined use of plant sterols and stanols and ezetimibe.

The results from one clinical study indicate that adding plant sterols on top of ezetimibe has no therapeutic benefit over ezetimibe alone in hypercholesterolemic individuals. On the other hand, a significant further reduction in intestinal cholesterol absorption has been shown in another study during administration of ezetimibe plus plant sterols (2 g/day) which resulted in an additional 7% reduction in LDL-cholesterol compared to ezetimibe alone.
Plant sterols and stanols in a nutshell

Plants sterols and stanols are recommended by the EAS as a part of lifestyle intervention in the management of dyslipidemia\textsuperscript{1,2}.

Plant sterols and stanols have been shown to effectively lower TC and LDL-cholesterol concentrations in a dose-dependent manner (7-12% LDL-cholesterol lowering with intakes of approximately 1.5-3 g/d).

To obtain approximately 2 g of plant sterols and stanols per day from ordinary foods is not possible. Therefore, foods with added plant sterols and stanols should be considered as part of a healthy diet to actively reduce TC and LDL-cholesterol.

Finally, foods with added plant sterols and stanols provide an additional LDL-cholesterol lowering effect in dyslipidemic patients at high CVD risk already treated with lipid-lowering drugs such as statins\textsuperscript{2}; therefore, they are recommended also in adjunct to pharmacological therapy.
References


What are dietary fibres and what are their sources?

Traditionally, dietary fibre is defined as the portion of plant foods that is resistant to digestion by human gastrointestinal enzymes.

Dietary fibre itself has no nutritional value and does only provide a small amount of energy (~2 kcal/g) formed by bacterial fermentation of fibre in the colon. Nevertheless, fibres play an important role in the regulation of different physiological functions in the human body.

Some of these fibre compounds (cellulose, hemicellulose and lignin) are insoluble in water, and are therefore called insoluble fibres. They mainly act on the functioning of the gastrointestinal tract, facilitating the transit time of foods, normalising bowel movements, increasing stool bulk and preventing constipation.

Insoluble fibres are mainly found in whole grains (e.g. barley, wheat, millet, brown rice, oat, rye), vegetables and in the seeds and skin of fruits.

Other fibre compounds (like beta-glucan, pectin, gums and mucilages like psyllium) are water-soluble and are therefore called soluble fibres.

As soluble fibres can absorb water, they form a viscous bolus in the gut that partially delays and/or reduces the absorption of certain nutrients such as carbohydrates, fats and cholesterol. In this way, they contribute to the control of blood glucose and cholesterol levels.

Soluble fibres are mostly present in legumes, fruits and cereals such as oat and barley. Some plant foods contain both types of fibre.

SOURCES OF DIETARY FIBRES:

- **Legumes** such as dried beans, soybean, chickpeas, lentils, peas;
- **Vegetables** such as artichoke, avocado, cabbage, broccoli, chicory, carrots, eggplant, beets;
- **Fresh fruit** such as apples, pears, figs, bananas, kiwi, raspberries, orange, grapefruit, currants;
- **Nuts** such as walnuts, hazelnuts, almonds;
- **Dried fruits and berries** such as apricots, figs, apples, raisins, prunes, blackcurrants;
- **Wholegrains** such as brown rice, oat, barley, wheat, whole-grain pasta and bread;

A PARTICULAR SOLUBLE FIBRE: BETA-GLUCAN

Beta-glucan is one main types of soluble fibre and is found in the bran of many common whole grains, with oat and barley containing the highest amounts.

Compared to other types of soluble fibres, beta-glucan is especially effective at achieving and maintaining healthy cholesterol levels (see below).

Examples of food products especially rich in beta-glucan are oat meal, oat bran and cereals, barley flakes, pearl barley.
Dietary fibres in dyslipidaemia

This section will provide an insight on:

- the importance of including foods rich in dietary fibres into the daily diet in the context of a healthy diet and lifestyle for CVD prevention;
- the role of soluble fibres in TC and LDL-cholesterol lowering;
What are the cardiovascular benefits of including dietary fibres in a healthy diet?

A high intake of dietary soluble and insoluble fibre has been associated with a lower prevalence of major CVD risk factors such as dyslipidaemia, hypertension, diabetes and obesity\(^1\).

To ensure all the health benefits of dietary fibres, a daily intake of 25-45 g is recommended\(^4,5\).

A specific and significant cholesterol-lowering effect has been found especially with soluble fibres\(^1,2\).

Furthermore, combining soluble fibres (10 g/day) with plant sterols, soy protein and nuts (almonds) into the diet (PORTFOLIO diet) has shown to potentially lower LDL-cholesterol up to 30\(^\%\)\(^6\).

Regarding beta-glucan, several clinical studies have shown that a diet containing at least 3 g/day of oat/barley beta-glucan lowers TC and LDL-cholesterol by about 5-6%\(^3,7\). It should be noted that beta-glucan consumption needs to be maintained for a sustained cholesterol-lowering effect.

See Table 11 to learn more on how to get the recommended amount of soluble fibres and beta-glucan through foods.

**Table 11 How to get the recommended soluble fibre and beta-glucan intake to help in lowering LDL-cholesterol.**

<table>
<thead>
<tr>
<th>Food Source</th>
<th>Soluble fibre approximate amount in g</th>
<th>Food Source</th>
<th>Soluble fibre approximate amount in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legumes, 100 g, dry</td>
<td></td>
<td>Vegetables, 100 g, cooked</td>
<td></td>
</tr>
<tr>
<td>Beans (black beans, dry)</td>
<td>2-3</td>
<td>Broccoli</td>
<td>1</td>
</tr>
<tr>
<td>Lentils (yellow, green, orange)</td>
<td>1</td>
<td>Brussels Sprouts</td>
<td>3</td>
</tr>
<tr>
<td>Peas (chickpeas)</td>
<td>1</td>
<td>Carrots</td>
<td>1</td>
</tr>
<tr>
<td>Fruits, a medium piece</td>
<td></td>
<td>Grains, 50 g, cooked</td>
<td></td>
</tr>
<tr>
<td>Apples</td>
<td>1</td>
<td>Barley</td>
<td>1</td>
</tr>
<tr>
<td>Bananas</td>
<td>1</td>
<td>Oatmeal</td>
<td>1</td>
</tr>
<tr>
<td>Blackberries (75 g)</td>
<td>1</td>
<td>Oat bran</td>
<td>1</td>
</tr>
<tr>
<td>Citrus Fruit (orange, grapefruit)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pears</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To include 5 g/day of soluble fibre, into the daily diet:

**Example 1:** 1 serving of oatmeal or oat bran/barley + 2 servings of fruit + 2 servings of vegetables

**Example 2:** 1 serving of oatmeal or oat bran/barley + 2 servings of fruit + 1 serving of legumes + 1 serving of vegetables

To include 3 g/day of beta-glucan into the daily diet:

**Daily beta-glucan consumption (≥ 3 g/day) may be recommended for hypercholesterolaemic patients for LDL-cholesterol reduction**\(^3,7\).
2 servings (40-50 g) of oatmeal or oat bran or
1 serving (70-80 g) of barley


A diet that provides 25-45 g/day of total dietary fibres, including 5-15 g/day of soluble fibres, is effective, and recommended for blood cholesterol control. Including 1-2 servings of oat or barley grains into the daily diet may have a particular benefit in lowering LDL-cholesterol (see above).

See Table 12 to learn more about how to reach the recommended daily amount of dietary fibres through foods.

Table 12 How to reach the dietary fibre recommendations.

<table>
<thead>
<tr>
<th>Food group</th>
<th>Approximate portion</th>
<th>Approximate amount of total fibre per portion</th>
<th>Suggested portions per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEGUMES (e.g. chickpeas, dried beans, lentils, green peas)</td>
<td>30 g (dried)</td>
<td>4 g</td>
<td>0-1</td>
</tr>
<tr>
<td>CEREALS (e.g. brown rice, pearl barley, couscous, millet, whole oat, whole wheat bread, oatmeal, oat bran, rye bread)</td>
<td>80 g</td>
<td>8 g</td>
<td>2-4</td>
</tr>
<tr>
<td>VEGETABLES (e.g. artichokes, broccoli, cabbage, carrots, cauliflower, eggplant, okra)</td>
<td>200 g</td>
<td>8 g</td>
<td>2 or more</td>
</tr>
<tr>
<td>FRESH FRUIT (e.g. kiwi, apple, apricot, banana, cherries, nectarine, orange, peach, pear, plum)</td>
<td>150 g</td>
<td>4 g</td>
<td>1-2</td>
</tr>
<tr>
<td>BERRIES (e.g. raspberries, blueberries, red- and blackcurrants)</td>
<td>50 g</td>
<td>3 g</td>
<td>1</td>
</tr>
<tr>
<td>DRIED FRUIT (e.g. dried prunes, dried apricot)</td>
<td>100 g</td>
<td>7 g</td>
<td>0-1</td>
</tr>
<tr>
<td>NUTS (e.g. almonds, cashews, hazelnuts, pistachios, pecans, walnuts)</td>
<td>30 g</td>
<td>3 g</td>
<td>1</td>
</tr>
</tbody>
</table>

ADVICE: Choose appropriate quantities (portions) of foods from the different groups, alternating in the various meals of the day and during the week. Look at food labels to know the amount of dietary fibres in the food.

DIETARY FIBRES - MODE OF ACTION:

The exact mechanism through which soluble fibre lower LDL-cholesterol levels is not known. It is likely that the viscous bolus formed by the fibres in the gut lumen reduces the absorption of cholesterol and the reabsorption of bile acids. As a consequence, faecal excretion of cholesterol and of bile acids is increased, leading to an increased bile acid synthesis in the liver from cholesterol.

It is probable that, in addition to fibre, foods that are high in dietary fibre contain other compounds (e.g. plant sterols/stanols, minerals, omega-3 and omega-6 PUFAs and specific phenolic compounds) that contribute to the protective cardiovascular effect of dietary fibres.
Dietary fibres in a nutshell

Dietary fibres are found in fruits, vegetables, legumes and wholegrain cereals and especially soluble fibres have a cholesterol-lowering effect. High-fibre foods are an optimal choice when aiming to move towards a heart healthy diet.

- A dietary fibre intake of 25-45 g per day is currently recommended

- Consuming 7-13 g of soluble fibre is effective and recommended for blood cholesterol control.

- Including 1-2 daily servings of oats/barley grains may add a particular benefit for lowering TC and LDL-cholesterol.

- Foods enriched with beta-glucan from oat and barley are effective and recommended for LDL-cholesterol lowering at a daily dose of at least 3 g/day.

The consumption of adequate amounts of plant-based foods not only ensures adequate dietary fibres intake, but also a significant intake of other nutrients (vitamins, minerals as well as vegetable proteins) and non-nutrients (known as phytochemicals) whose interaction may contribute to the protective cardiovascular effect of dietary fibres.
References


What is soy protein?

**Soy protein** is an edible component derived from the soybean and is gaining considerable attention since it is likely to have a TC and LDL-cholesterol lowering effect\(^2\), \(^3\), \(^4\).

**SOURCES OF SOY PROTEIN:**

Soy protein occurs in whole soybean products such as tofu, miso, tempeh (fermented soybean products from Asian cuisine), soy nuts, and fermented soybean pasta. Other sources are non-dairy-type products (e.g. soy drink, soy cheese and soy yoghurt) and meat alternatives (e.g. veggie soy burgers).

Soy protein is also present in highly refined soybean products such as soy protein concentrates and isolates that can be used for instance in meat products to increase the protein content, as well as to improve the texture and to prolong the shelf life.

Soy-derived ingredients can also be found in breakfast cereals, sauces and soups. For instance, in bakery products, adding soy flour enhances the nutritional value by increasing the dietary fiber and protein content.

Soybeans and soybean-based foods are not traditional European foods. Nevertheless, soy and soy-derived products are receiving a growing interest in the context of a healthy diet, as this legume is a good source of:

- high-quality protein,
- PUFA (both omega-3 and omega-6),
- dietary fibres,
- a variety of vitamins (e.g. folate and other B vitamins) and minerals, especially potassium, iron, phosphorus,

whereas it is low in SFA and does not contain cholesterol\(^1\).
Soy protein in dyslipidaemia

This section will focus on the effect of soy protein on TC and LDL-cholesterol lowering.
Effect of Soy Protein on TC and LDL-cholesterol

Clinical studies have shown a modest LDL-cholesterol lowering effect of soy protein in the magnitude of 3–4% \(^2,4\) for intakes of at least 25 g of soy protein per day*. As this amount approximately covers 50% of the recommended daily protein intake \(^5\) it is difficult to achieve within an everyday Western type diet.

*To get the required intake of 25 g of soy protein you need to combine several soybean-based foods (see Table 13):

### Table 13: Soy protein content in soybean products

<table>
<thead>
<tr>
<th>Soybean source</th>
<th>Approximate soy protein amount (g/100 g of edible portion) (^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tofu</td>
<td>16</td>
</tr>
<tr>
<td>Soy drink</td>
<td>2.9</td>
</tr>
<tr>
<td>Soy yoghurt</td>
<td>5</td>
</tr>
<tr>
<td>Soy bean sprouts</td>
<td>6.2</td>
</tr>
<tr>
<td>Soy sauce</td>
<td>8.7</td>
</tr>
<tr>
<td>Soy burger (soy meat alternative)</td>
<td>15.7</td>
</tr>
</tbody>
</table>


Although achieving the suggested soy protein intake (25 g) in the daily diet can be demanding, a regular consumption of soy food products along with those foods containing plant components is able to lower blood cholesterol and can help to maximize total- and LDL-cholesterol reduction.

The components in soy protein responsible for the LDL-cholesterol lowering effect are not fully clear. It is likely that soy isoflavones, a non-nutrient component of soy protein, might be partially responsible for the LDL-cholesterol reduction \(^6\), but the evidence is not conclusive \(^4,7\).

Other evidence suggests that the protein per se and specific soy peptides may be responsible for the cholesterol-lowering effect \(^2\).

Scientific studies \(^2,4\) suggest that, regardless of the source of soy protein, soy protein-containing foods when replacing animal protein foods may contribute to a modest LDL-cholesterol lowering effect.
Soy protein in a nutshell

Soybean and soy-derived products represent a healthy way to obtain vegetable proteins and add variety when moving towards a more plant-based diet.

According to scientific evidence and as also stated in the ESC/EAS guidelines, soy protein has a modest LDL-cholesterol lowering effect (3-4%) when replacing animal protein foods. Nevertheless, soy foods can be a valid substitute for foods rich in animal protein and high in saturated fats.

Although the LDL-cholesterol lowering effect of soy protein is modest, including soybean and soy-derived products in the daily diet can be taken into account as one of the possible options for managing elevated LDL-cholesterol levels.

REMEMBER: Soy protein modestly lowers LDL-cholesterol and may be an alternative for foods high in animal protein. Soy-based foods can be consumed as part of a plant-based diet.
References


Quit Smoking

Smoking is a considerable lifestyle risk factor for CVD. According to estimations from SCORE, the 10-year fatal CVD risk is approximately doubled in smokers¹.

Cigarette smoking is destructive and even exposure to passive smoking has been shown to increase the risk of CVD² and should be avoided.

Smoking may cause CVD through several mechanisms. For instance, nicotine, an addictive substance in cigarettes, indirectly increases heart rate and blood pressure, thus forcing the heart to a greater struggle, which can result in organs and blood vessels damage. Additionally, smoking increases blood TG levels and LDL-cholesterol while decreasing HDL-cholesterol².

The JBS “HeartAge” risk calculator emphasizes the benefits for early smoking cessation even at an older age. Patients should be encouraged to quit smoking at every available opportunity and supported during the smoking-cessation process³.

Consult the Joint European Guidelines on CVD prevention in clinical practice⁴ to know more about smoking cessation therapies.

Smoking is a reversible CVD risk factor: quit as soon as possible!

Many of the key principles for behavior change also apply to smoking cessation and remembering the “five A” can be a helpful strategy:

<table>
<thead>
<tr>
<th>Ask about smoking status</th>
<th>Systematically inquire about smoking status at every opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise on quitting</td>
<td>Unequivocally urge all smokers to quit</td>
</tr>
<tr>
<td>Assess readiness</td>
<td>Determine the person’s degree of addiction and readiness to quit</td>
</tr>
<tr>
<td>Assist with a strategy</td>
<td>Agree on a smoking cessation strategy, including setting a quit date, behavioral counselling, and pharmacological support</td>
</tr>
<tr>
<td>Arrange follow-up</td>
<td>Arrange a schedule of follow-up</td>
</tr>
</tbody>
</table>

Changing smoking behavior is important in lowering CVD risk.
Other lifestyle changes in CVD prevention

Although this online learning tutorial focuses mainly on the dietary management of dyslipidemias, other lifestyle factors, such as smoking cessation, increasing physical activity, alcohol consumption in moderation and body weight management are also important factors contributing to the prevention of CVD.

This section will provide advice and a few practical tips you can suggest to your patients when talking about the importance of diet and lifestyle changes in CVD prevention.
Physical exercise

An inactive lifestyle is another major risk factor for CVD. An increase in overall levels of physical activity and aerobic exercise is also suggested by several guidelines as a very important non-pharmacological tool for primary CVD prevention.

Physical activity has a positive effect on many of the established risk factors for CVD such as preventing and reducing BP, helping to control body weight, improving blood lipids (reducing LDL-cholesterol without consistent effects on HDL-cholesterol and TG) and lowering the risk of developing type 2 diabetes.

Daily physical activity, at moderate intensity should be emphasized as a part of an active lifestyle!

Primary care is an important setting for the promotion of physical activity. Recommendations should be tailored to patient's needs and range from simple lifestyle advice through to the roll-out of targeted programs for harder-to-reach individuals. It is recommended that individuals accumulate at least 30 min/day, on 5 days per week, of moderate intensity physical activity (i.e. 150 min/week) or 15 min/day, on 5 days per week, of vigorous intensity physical activity (75 min/week), or a combination of both, performed in sessions with a duration of at least 10 min.

Moderate activity raises the heart rate and make the breath go faster. Examples of moderate-intensity physical activity include common activities such as walking briskly, gardening work, riding a bike on level ground or with a few hills, and hiking.

150 minutes of moderate-intensity physical activity are equivalent to 75 minutes of vigorous aerobic activity, such as running or jogging or a game of singles tennis every week.

INITIAL LIFESTYLE STEPS TO HELP PATIENTS TO BECOME MORE PHYSICALLY ACTIVE ARE:

- Encouraging patients to walk to the next station or bus stop rather than taking the usual one, taking the stairs rather than a lift.
- Simple exercise programmes that can be worked into a daily schedule, such as gardening, house cleaning and walking to the shops.
- Riding a bike on level ground or with some hills.
- Encouraging spending less time watching TV and opting for outdoor recreational activities.
- Muscle strengthening exercises such as lifting weights or working with resistance bands.
Moderate alcohol consumption

It is well known that heavy alcohol drinking is harmful for health. Excessive alcohol intake and binge drinking are also associated with increased CVD risks.

In contrast, accumulating scientific evidence from epidemiological studies indicates that light to moderate drinking may reduce CVD risk, especially CHD and all-cause mortality. It is hypothesized that the cardiovascular protective effect of alcohol is attributable to several mechanisms, including reducing platelet aggregation (alcohol is a natural anticoagulant) and lowering BP, and increasing levels of HDL-cholesterol.

Non-drinkers should not be encouraged to start drinking. There are no health-related reasons for non-drinkers to start drinking.

For instance, moderate wine consumption (1-2 glasses per day for men and 1 glass per day for women), preferably during the meal, is an optional part of the Mediterranean dietary pattern.

Nevertheless, a recent Mendelian randomization study based on analyses from 59 epidemiological studies has questioned any beneficial effect of moderate alcohol consumption, suggesting that the lowest CVD risk was seen in non-drinkers and that any amount of alcohol is associated with elevated blood pressure and body mass index.

ONE DRINK EQUALS

1 alcoholic drink is approximately equivalent to 10 g of alcohol = 330 ml of beer (5% alcohol) or 140 ml of wine (12% alcohol) or 42 ml of distilled spirit (40% alcohol)
Weight management

Both overweight and obesity are associated with an increased risk of CVD mortality. Obesity, especially abdominal obesity, increases the likelihood of developing diabetes, dyslipidemia, hypertension, CHD, stroke, and it has been clearly linked to poor health outcomes and all-cause mortality.

An increase in the BMI is associated with adverse changes in the blood lipid profile resulting in elevated TC, LDL-cholesterol, and TG levels and low HDL-cholesterol levels. The risk of comorbidities starts already with a BMI in the range of 25.0–29.9 kg/m² (overweight) and it further increases with a BMI greater than 30 kg/m² (obesity). Weight loss has a beneficial influence on HDL-cholesterol levels and also on TC and LDL-cholesterol in the long term.

In this context, weight reduction in the presence of overweight, obesity and abdominal adiposity is recommended as it is associated with favorable effects on BP and dyslipidemia.

When present, excess intra-abdominal fat has been associated with several metabolic abnormalities, which may lead to CVD. Assessing and monitoring changes in waist circumference over time may be helpful, in addition to measuring BMI, since it can provide an estimate of increased abdominal adiposity even in the absence of a change in BMI, thus screening for possible health risks.

If the waist circumference is ≥ 94 cm in men and ≥80 cm for women no further weight should be gained.

If the waist circumference is ≥102 cm in men and ≥88 cm for women weight reduction should be advised.

To achieve optimal health, a BMI 18.5–24.9 kg/m² should be maintained.

Focusing on dietary and lifestyle interventions is the core of weight management.

Making healthy food choices, being physically active (see above), and reducing sedentary time should be encouraged.

Additionally, personal motivation plays a decisive role in switching toward a healthier diet and lifestyle.

REMEMBER: Even moderate weight loss may have a great impact on general and cardiovascular health, encourage it when needed.

Many of the unfavorable effects of excess body weight on blood lipid profile can be reversed with weight reduction.
**Lifestyle and dietary changes in a nutshell**

Lifestyle and dietary modifications are the cornerstone in CVD prevention. Here you find a summary (see Table 14) of the different lifestyle and dietary approaches which are recommended\(^1,10\) to manage the major modifiable CVD risk factors and hence CVR risk:

**Table 14: Recommendations for a healthy diet and lifestyle**

<table>
<thead>
<tr>
<th>Recommendations for a healthy diet</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use a foods group approach</td>
<td>Diet patterns like the DASH, the Portfolio diet, or the Mediterranean diet, are more likely to meet balanced nutrient requirements than those diets that are selectively restricted in calories or nutrients.</td>
</tr>
<tr>
<td>Reduce saturated fats by replacing them with mono- and polyunsaturated fats</td>
<td>Saturated fat should be replaced with MUFA or PUFA to reduce LDL-cholesterol.</td>
</tr>
<tr>
<td>Consider foods with added plant sterols/stanols</td>
<td>Foods with added plant sterols/stanols are effective in reducing LDL-cholesterol when consumed in recommended amounts (1.5-3 g/day).</td>
</tr>
<tr>
<td>Increase dietary fibre intake especially intake of foods rich in soluble fibres</td>
<td>Consume 25-45 g of dietary fibre per day of which 5-15 g of soluble fibres from foods rich in these fibres for a cholesterol-lowering effect</td>
</tr>
<tr>
<td>Limit salt intake</td>
<td>Salt intake should be reduced below 5 g/day by avoiding table salt and limiting salt in cooking and by choosing foods low in added salt</td>
</tr>
<tr>
<td>Limit sugar intake</td>
<td>The intake of beverages and foods with added sugars, particularly soft drinks, should be limited, particularly for patients with hypertriglyceridemia. Sugar intake should not exceed 10% of total energy.</td>
</tr>
</tbody>
</table>

**Recommendations on lifestyle changes**

<table>
<thead>
<tr>
<th>Recommendations on lifestyle changes</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep being physical active</td>
<td>Physical activity should be encouraged, aiming at regular physical exercise for at least 30 minutes a day</td>
</tr>
<tr>
<td>Reduce body weight if overweight/obesity occurs</td>
<td>A BMI of &lt; 25 kg/m(^2) is associated with favorable effects on BP and dyslipidemia</td>
</tr>
<tr>
<td>Moderate alcohol intake</td>
<td>For those who drink alcoholic beverages, moderation should be advised (no more than 1 drink/day for women and 1-2 drinks/day for men) and patients with hypertriglyceridemia should abstain</td>
</tr>
<tr>
<td>Avoid tobacco and quit smoking</td>
<td>Use and exposure to tobacco and even passive smoking has to be avoided</td>
</tr>
</tbody>
</table>

Table adapted from 2016 ESC/EAS Guidelines for the management of dyslipidemias\(^1,10\) and the 2016 European Guidelines on CVD prevention in clinical practice\(^1\).
References


Modification of Diet

In addition to general steps on motivating patients to undertake and maintain behavior changes, it can be helpful to also consider the following points when addressing diet:

- Dietary modifications should form the basis of CVD prevention.
- Work closely with your patient and his/her family to understand their diet history, food preferences, meal patterns and ethnic background.
- Consider asking your patient to keep a food diary for a few days before their next appointment to enable a meaningful discussion about their dietary habits.
- Use a diet sheet that can be tailored and other visual support material (such as the Eatwell plate, and patient fact sheet) to educate your patient about the importance of making small changes to their diet and how those changes could have a big effect on their cholesterol levels.
- Involve your patient as much as possible in this process by letting them choose the foods they think they can include healthier options - then have a discussion around these as a basis.
  - Discuss replacing saturated fats with unsaturated fats and provide foods examples.
  - Discuss increasing dietary fibre intake, with a special focus on soluble fibre and beta-glucan intake.
  - Discuss adding a food with added plant stanols/sterols.
- Make sure the patient understands how quickly they could expect to see these changes affecting their cholesterol levels.
- Consider referring the patient to a registered dietician.
- Ensure a follow-up schedule is in place to help support your patient through this time of habitual change.
- Repeat if necessary.
Motivating patients to make diet and lifestyle changes

While the benefits of a healthy lifestyle, including diet modifications, stopping smoking, weight management and regular exercise for maintaining optimal LDL-cholesterol levels and reducing CVD risk are clear it can be hard to motivate patients to undertake these changes. The ESC/EAS guidelines highlight a few key steps that are crucial to influence any behavior change. These include:

1. Spending enough time with the individual to create a therapeutic relationship even just a few more minutes can make a difference
2. Asking questions to check that the individual has understood the advice and has any support they require to follow it
3. Acknowledging the individual's personal view
4. Encouraging the expression of worries and anxieties, concerns and self-evaluation of motivation for behavior change and chances of success
5. Speaking to the individual in his/her own language and being supportive of every improvement in lifestyle
6. Accepting that individuals may need support for a long time and that repeated efforts to encourage and maintain lifestyle change may be necessary in many individuals
7. Making sure that all healthcare professionals involved provide consistent information

Using the JBS “HearthAge” risk calculator could be helpful to make your patient aware of his/her current estimated heart age and especially to motivate him/her, showing the benefits that may be achieved by sustained, long-term reduction of CVD risk factors through diet and lifestyle changes.
References

# What should I eat?

## Try to move from red to green

Dietary recommendations to help lower cholesterol

<table>
<thead>
<tr>
<th><strong>Bread, cereals and potatoes</strong></th>
<th><strong>Fruit and vegetables</strong></th>
<th><strong>Meat, fish and alternatives</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Refined (white) cereals, for example, bread, biscuits, mashed potatoes.</td>
<td>Canned fruit in syrup (drain off syrup), fruit juices.</td>
<td>Lean cuts of meat and reduced fat products including sausages, burgers and meatballs. (Extra) lean pork, ham, lamb, minced beef, chicken and turkey (without skin) All fish: cod, plaice, sole, whiting, (fresh, canned) tuna shellfish. Oily fish: (fresh, canned) mackerel sardines, pilchards, salmon, trout, herring. Soya mince, beans, tofu.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Beans, pulses, nuts &amp; seeds</strong></th>
<th><strong>Dairy products and eggs</strong></th>
<th><strong>Oils and fats</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Semi-skimmed milk, reduced fat evaporated milk. Half-fat yogurt. Half-fat cheddar, mozzarella, feta, light’ cheese spread, quark.</td>
<td>Soft spreads, lower fat, unsaturated fat spreads (with plant sterols/stanols). Liquid margarine. Vegetable oil such as rape seed or sunflower seed and olive oil.</td>
</tr>
</tbody>
</table>
## Dietary change

### Replace saturated fats with mono- and polyunsaturated fats
- Replace full-fat dairy products (for example, cheese, cream, milk, yoghurt) with fat-free or low-fat versions
- Decrease the intake of fatty meat and meat products, such as sausages by replacing them with lean meat options
- Replace butter or other animal fats like lard with:
  - soft vegetable oil spreads in spreading
  - vegetable oils or liquid “bottle” margarines in cooking
  - soft vegetable oil based spreads or liquid “bottle margarines” in baking
- Use vegetable oil based dressings in salads
- Even small amounts of nuts and seeds bring unsaturated fats to the daily diet

### Increase the intake of soluble dietary fibre
- Use whole grain products instead of refined grains
  - oatmeal or rye porridge, brans
  - bread, pasta, rice, muesli and cereals in whole grain versions
- At least 500g daily of a combination of:
  - root vegetables and other vegetables
  - berries and fruit
- Beans, lentils, potatoes, peas and seeds also bring fibre into the diet
- Eat cooked and raw vegetables with every meal

### Include foods with added plant stanols/sterols as part of the daily diet
- Replace your normal spread with a spread containing plant sterols or stanols OR
- Include dairy foods like milk, yoghurt or a yoghurt drink with added stanols/sterols as part of your daily meals

### Other features of a heart-healthy lifestyle
- Eat fish at main meals 2–3 times a week
  - oily fish at least once per week
- Make low-salt food choices
- If overweight, reduce energy (calorie) intake so that weight is reduced by 5–10%
- Increase in energy expenditure by doing exercise that fits with your routine
Case 2: A 44-year old male

March 2011

Case study 2: A 44-year old male patient, 185 cm tall with a body mass index of 28.6 kg/m²

CARDIOVASCULAR RISK FACTORS IDENTIFIED:

- Known hypertension - blood pressure fluctuating around 140/100 mmHg
- Smoker until two years ago (approximately 40 pack years)
- Moderate alcohol consumption, occasionally moderate physical exercise (jogging, swimming)
- Regular snoring;
- No significant family history of cardiovascular disease

TREATMENT APPROACH:
The patient was already being treated for hypertension sporadically using beta-blockers, which have now been stopped following abnormal fatigue and orthostatism.

DIAGNOSES FOLLOWING INITIAL TESTS (SEE TABLE 8 - MARCH):

- Essential arterial hypertension grade I, impaired fasting glucose, suspected non alcoholic fatty liver disease (NAFLD), mild hyperuricemia, vitamin D deficiency, metabolic syndrome
- Risk for a fatal cardiovascular event according to SCORE (www.heartscore.org): 1 percent in 10 years. The risk for fatal cardiovascular disease is low in absolute terms due to the young age of the patient, but it is still four times higher than it could be in this age group.
- Treatment targets according to ESC, ESH and EAS: blood pressure less than 140/90 mmHg; LDL cholesterol less than 115 mg/dl (2.98mmol/l).
Case study 1: A 55-year old female patient, normal weight

Cardiovascular disease risk factors identified:
- Hypercholesterolaemia (serum total cholesterol 228mg/dl (5.9mmol/l), elevated, LDL-cholesterol 174mg/dl (4.5mmol/l), elevated)
- Age - 55 years
- Smoker
- Elevated blood pressure, despite medication (145/95mmHg)
- Father had died of an acute myocardial infarction at the age of 45 years

**TREATMENT APPROACH:**
According to the EAS and ESC guidelines for the management of dyslipidaemia, lifestyle changes together with statin treatment should be considered. Patient was reluctant to start medication, so a three step approach was undertaken.

### Step 1

### Step 2

### Step 3
Food diary...

Completing a food diary will let you see patterns in your eating habits and help you to understand where changes to your diet can be made.

Use the diary below to write down everything you eat and drink each day.

Do try to be as honest as possible, noting down everything you eat over 4 or 5 days.

<table>
<thead>
<tr>
<th>Day of the week</th>
<th>Time of day / meal</th>
<th>What I ate or drank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wed</td>
<td>8.30am</td>
<td>porridge oats, semi-skimmed milk - 1 large bowl</td>
</tr>
</tbody>
</table>

Include how much e.g.
1 cup, 2 slices
<table>
<thead>
<tr>
<th>Day of the week</th>
<th>Time of day/meal</th>
<th>What I ate or drank</th>
</tr>
</thead>
</table>
|                 |                  | *Include how much e.g.*  
|                 |                  | *1 cup, 2 slices*      |
## What should I eat?

Try to move from red to green

Dietary recommendations to help lower cholesterol

<table>
<thead>
<tr>
<th>Bread, cereals and potatoes</th>
<th>Croissants, waffles, fried potatoes, roast potatoes, sugar-coated breakfast cereals.</th>
<th>Refined (white) cereals, for example, bread, biscuits, mashed potatoes.</th>
<th>Whole grain cereals, bread, rice, pasta, non-sugar added breakfast cereals oats, boiled potato.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit and vegetables</td>
<td>Vegetables fried in batter, prepared in butter, or creamy sauce.</td>
<td>Canned fruit in syrup (drain off syrup), fruit juices.</td>
<td>Fresh, frozen, dried fruit and vegetables.</td>
</tr>
<tr>
<td>Meat, fish and alternatives</td>
<td>Fatty cuts of meat, belly pork, lamb, duck, goose. Sausages, salami, bacon, spare ribs, chicken nuggets. Meat pies, sausage rolls and pasties. Fish in creamy sauces. Fried fish or meat in batter.</td>
<td>Lean cuts of meat and reduced fat products including sausages, burgers and meatballs.</td>
<td>(Extra) lean pork, ham, lamb, minced beef, chicken and turkey (without skin) All fish: cod, plaice, sole, whiting, (fresh, canned) tuna shellfish. Oily fish: (fresh, canned) mackerel sardines, pilchards, salmon, trout, herring. Soya mince, beans, tofu.</td>
</tr>
<tr>
<td>Oils and fats</td>
<td>Butter, solid margarines, palm and coconut oils, lard, bacon fat.</td>
<td></td>
<td>Soft spreads, lower fat, unsaturated fat spreads (with plant sterols/stanols). Liquid margarine. Vegetable oil such as rape seed or sunflower seed and olive oil.</td>
</tr>
</tbody>
</table>
### Dietary change Practical changes in the diet

**Replace saturated fats with mono- and polyunsaturated fats**

- Replace full-fat dairy products (for example, cheese, cream, milk, yoghurt) with fat-free or low-fat versions
- Decrease the intake of fatty meat and meat products, such as sausages by replacing them with lean meat options
- Decrease the intake of bakery products rich in saturated fat (for example, Danish pastries, cookies)
- Replace butter or other animal fats like lard with:
  - soft vegetable oil spreads in spreading
  - vegetable oils or liquid “bottle” margarines in cooking
  - soft vegetable oil based spreads or liquid “bottle margarines” in baking
- Use vegetable oil based dressings in salads
- Even small amounts of nuts and seeds bring unsaturated fats to the daily diet

**Increase the intake of soluble dietary fibre**

- Use whole grain products instead of refined grains
  - oatmeal or rye porridge, brans
  - bread, pasta, rice, muesli and cereals in whole grain versions
- At least 500g daily of a combination of:
  - root vegetables and other vegetables
  - berries and fruit
- Beans, lentils, potatoes, peas and seeds also bring fibre into the diet
- Eat cooked and raw vegetables with every meal

**Include foods with added plant stanols/sterols as part of the daily diet**

- Replace your normal spread with a spread containing plant sterols or stanols OR
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**Other features of a heart-healthy lifestyle**

- Eat fish at main meals 2–3 times a week
  - oily fish at least once per week
- Make low-salt food choices
- If overweight, reduce energy (calorie) intake so that weight is reduced by 5–10%
- Increase in energy expenditure by doing exercise that fits with your routine
## Tips for healthy cooking

Next to making healthy food choices it is also important to pay attention to the way of preparing meals. Healthy cooking can be easy.

<table>
<thead>
<tr>
<th>General suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit (deep) frying foods. Vary among the different cooking methods (e.g. stir-frying, roasting, grilling, steaming, baking, braising, poaching or microwaving);</td>
</tr>
<tr>
<td>When grilling avoid over cooking and remove the burned part of the food;</td>
</tr>
<tr>
<td>Include raw vegetables in each meal;</td>
</tr>
<tr>
<td>Replace highly refined foods (e.g. white flour, white bread) with whole grains (e.g. whole wheat flour, brown rice, oat, barley) whenever possible;</td>
</tr>
</tbody>
</table>

| Choose the right fats to cook and pay attention to the quantities; |
| Reduce saturated fats intake as from using animal fats by preferring vegetable plant oils/ derived margarines to cook; |
| Use low-fat yoghurt/ milk instead of full fat yoghurt/milk, cream; |
| Trim visible fat from meat and ham; take the skin off from chicken; |

| Minimize the nutrient loss |
| When boiling foods (especially vegetables), use as little water as possible; don’t over boil the food; |
| Microwaving and steaming can be a valid alternative to boiling to preserve vitamins and minerals; |
| Steaming is one of the healthiest cooking methods that allows the food to retain the maximum amount of vitamins and minerals; |

| Cutting down salt |
| Taste the food before adding salt; |
| Herbs and spices can be used in recipes to partially or wholly replace salt. They also enhance the food taste; |
| Prefer vinegar or lemon juice over salt for seasoning |
| Prefer fresh or frozen vegetables and legumes since canned vegetables and legumes tend to be packed with salt; |
| Choose reduced salt bread and breakfast cereals (read the nutritional facts); |
| Avoid high-sodium seasoning like soy sauce; |
| Limit the consumption of salty processed meat (read the nutritional facts); |
| Avoid herb and spice mixes because they often contain a lot of salt. Use fresh/ dried herbs whenever possible; |