

Concise Overview – Saturated Fats

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„Assumptions about benefits of reducing saturated fat intake do not have a consistent support in available data, and it has not yet been convincingly shown that it reduces mortality.“

Saturated fatty acids (SFs, see Appendix 1), also referred to as saturated fats, are typically discussed in connection with the risk of cardiovascular disease. Since 1950s, it has been suggested that excessive consumption of fat/saturated fat/cholesterol increases the risk of heart attacks and strokes.

Also for this reason the 1977 US and 1983 UK dietary recommendations included a specific upper limit for intake of fats, saturated fats and cholesterol in connection with the prevention of cardiovascular disease. These recommendations, however, do not have an unequivocal support in clinical or epidemiological studies, and should be revised. SFs are contained in almost all basic foods of animal origin, including fish, but also in foods of plant origin, particularly in tropical oils (coconut, palmtree, palm), and in smaller quantities also in other plant foods (nuts, olive oil).

The objective of this concise overview is to offer a comprehensive summary of selected studies which we consider important to decide whether consumption of SFs per se is risky, or perhaps whether also the context of the diet as a whole (and its quality) matters. The overview summarises data, on which current dietary recommendations are based, and queries if these recommendations are unequivocally supported. This report is not an uncritical „rehabilitation“ of unlimited or excessive consumption of SFs.

The reference to each of the paper includes an information on the type of evidence in the hierarchy of evidence based medicine (EBM, see Appendix 2). Observational (also called epidemiologic) studies offer hypothesis, which are often tested in interventional clinical trials, with randomised controlled trials (RCT) as the golden standard. When Bradford-Hill criteria are met (Hill 1965, Hoffer 2005, Kedaik 2015), causality can also be inferred from observational studies, as was the case eg. in with smoking and lung cancer. Meta-analysis and systematic reviews pool together data from multiple studies, and well performed MA/SRs represent the strongest evidence within EBM.

We also include basic information about each of the studies, size of the study population and their comorbidities, duration and follow-up, source of the data, hazard ratios as well as a link to the electronic source in the list of references. For RCT studies, we always note if it tracked patient outcomes (eg. mortality or morbidity), or merely clinical/lab results (eg. glycaemia, blood lipids, blood pressure etc.) In this context, improvement in clinical results without any effect on mortality/morbidity is less relevant from a public health/patients perspective than reduced mortality/morbidity.

The papers are ordered from the most recent to the oldest.

Quick summary:

Some more recent RCT studies or their re-evaluations (Womens Health Initiative, LookAhead, re-evaluation of Minnesota Coronary Survey and Sydney Diet Heart Study), systematic reviews of RCT studies (Ajala, Dyson, Hooper, Hamley) or epidemiological studies (INTERHEART, PURE, Grasgruber, Guo) suggest that the original theories that SF per se increases CVD risk and that CVD or total mortality can be reduced by reducing intake of SF, might not be correct nor unequivocal. This conclusion, however, should not be interpreted as an invitation for an unlimited/excessive consumption of SFs.

We welcome all suggestions, comments and critique on: margit@margit.cz

Overview of publications included in this summary

| ID | Reference | Title/description | Type | n | FUP (years) | Lab | CVD MB | CVD Mort | All-C Mort |
|----|--------------------|----------------------------------|------|---------|-------------|-----|--------|----------|------------|
| 1 | Stout (1964) | Roseto Study | EPI | 27 355 | 7 | ● | ● | ● | --- |
| 2 | | Framingham Study | EPI | 859 | 4 | ● | ● | ● | --- |
| 3 | Rose (1965) | Rose Corn Oil Trial | RCT | 80 | 2 | ● | ● | ● | ● |
| 4 | Res Com (1965) | Low Fat Trial | RCT | 252 | 3 | ● | ● | ● | ● |
| 5 | MRC (1968) | Soy Bean Oil Trial | RCT | 386 | 3,4 | ● | ● | ● | --- |
| 6 | Dayton (1969) | Los Angeles Diet Study | RCT | 846 | 6 | ● | ● | ● | ● |
| 7 | Leren (1970) | The Oslo Trial | RCT | 412 | 11 | ● | ● | ● | ● |
| 8 | Keys (1970) | Seven Countries Study | EPI | 12 770 | 5 | ● | ● | ● | --- |
| 9 | Morris (1977) | London Bank and Bus Study | EPI | 337 | 20 | ● | ● | ● | --- |
| 10 | Woodhill (1978) | The Sydney Diet Study | RCT | 458 | 7 | ● | ● | ● | ● |
| 11 | Turpeinen (1979) | Finnish Psychiatric Hospitals | RCT | 676 | 12 | ● | ● | ● | --- |
| 12 | Shekelle (1981) | Western Electric Study | EPI | 1 900 | 4 | ● | ● | ● | --- |
| 13 | Gordon (1981) | Honolulu Heart Study | EPI | 7 272 | 6 | ● | ● | ● | --- |
| 14 | Gordon (1981) | Puerto Rico Heart Health Prog | EPI | 8 218 | 6 | ● | ● | ● | --- |
| 15 | Stamler (1982) | MRFIT | RCT | 12 866 | | ● | ● | ● | ● |
| 16 | Stamler (1986) | MRFIT | EPI | 356 222 | 6 | ● | ● | ● | --- |
| 17 | Frantz (1989) | Minnesota Coronary Exp (MCE) | RCT | 9 057 | 4,5 | ● | ● | ● | ● |
| 18 | Burr (1989) | DART | RCT | 2 033 | 2 | ● | ● | ● | ● |
| 19 | Watts (1992) | STARS | RCT | 90 | | ● | ● | ● | ● |
| 20 | Lorgeril (1999) | Lyon Heart Study | RCT | 423 | | ● | ● | ● | ● |
| 21 | Yusuf (2004) | INTERHEART study | EPI | 29 927 | | --- | ● | ● | --- |
| 22 | Sauvagat (2004) | Adult Health Study/LSS | EPI | 3 731 | 14 | --- | ● | ● | --- |
| 23 | Howard (2006) | Women's Health Initiative | RCT | 48 835 | 8,1 | ● | ● | ● | ● |
| 24 | Siri-Tarino (2010) | | SR | 347 747 | < 23 | --- | ● | ● | --- |
| 25 | Kuipers (2011) | | REV | --- | | --- | --- | --- | --- |
| 26 | LookAHEAD (2013) | LookAHEAD | RCT | 5 145 | 9,6 | --- | ● | ● | ● |
| 27 | Ajala (2013) | Revize RCT studii u DM2 | SR | 3 073 | | ● | --- | --- | --- |
| 28 | Ramsden (2013) | Sydney Study (ID 10) revize | RCT | 458 | 7 | ● | ● | ● | ● |
| 29 | Dyson (2015) | Revize RCT studii u DM2 | SR | 1 144 | | ● | --- | --- | --- |
| 30 | Hooper (2015) | Revize RCT studii | SR | 55 858 | | --- | ● | ● | ● |
| 31 | de Souza (2015) | | SR | 90 501 | | --- | ● | ● | ● |
| 32 | Li (2015) | | EPI | 127 536 | < 30 | --- | ● | ● | --- |
| 33 | Harcombe (2015) | Revize RCT studii (1977-1983) | SR | 2 467 | 6,5 | --- | ● | ● | ● |
| 34 | Dehghan (2016) | PURE Study | EPI | 145 275 | | ● | --- | --- | --- |
| 35 | Mensink (2016) | | SR | | | ● | --- | --- | --- |
| 36 | Harcombe (2016a) | Revize RCT studii (2015) | SR | 62 421 | < 8 | ● | ● | ● | ● |
| 37 | Harcombe (2016b) | Revize EPI studii (1977-1983) | SR | | 7,5 | --- | ● | ● | ● |
| 38 | Harcombe (2016c) | Revize EPI studii (2015) | SR | | | ● | ● | ● | ● |
| 39 | Wang (2016) | NHS/HPS | EPI | 126 233 | 32 | --- | ● | ● | ● |
| 40 | Zong (2016) | NHS/HPS | EPI | 115 792 | 25 | --- | ● | ● | --- |
| 41 | Grasgruber (2016) | | EPI | | | ● | ● | ● | --- |
| 42 | Ramsden (2016) | Minnesota Cor Exp (ID 17) revize | RCT | 9 423 | 4,5 | ● | ● | ● | ● |
| 43 | Guo (2017) | | EPI | 938 465 | | --- | ● | ● | ● |
| 44 | Hamley (2017) | | SR | 24 022 | | ● | ● | ● | ● |

Epidemiological studies are greyed out, as on their own, they do not provide robust results, and need to be interpreted carefully, especially where they are in conflict with other studies.

Type

- RCT – randomised controlled trial,
- EPI – epidemiologic study
- SR – meta-analysis/systematic review,
- REV – review paper

Interpretation

- Significant association and/or benefit of reducing SF
 - No significant association and/or benefit of reducing SF
- Lab** – laboratory results
CVD-MB – cardiovascular morbidity (nonfatal complications, events)
CVD-Mort – cardiovascular mortality
All-C-Mort – all cause mortality

Overview of key findings [translation pending]:

List of references:

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Appendix 1 – Overview of saturated fats

[translation pending]

Termín nasycené znamená, že všechny vazby mezi uhlíky v mastné kyselině jsou jednoduché. Mastné kyseliny se v potravě i organismu nacházejí samostatně jen v malém množství. Většina je přítomna ve formě tzv. triacylglycerolů, ve kterých jsou na jeden glycerol navázány tři mastné kyseliny. Satureované tuky, živočišného i rostlinného původu, mají na glycerol navázány nasycené (satureované) mastné kyseliny.

Nasycené mastné kyseliny dělíme podle délky řetězce.

Rozeznáváme krátké mastné kyseliny (short chain fatty acids – SCFA), kam řadíme kyselinu octovou, propionovou a máselnou, se 2, 3, resp. 4 uhlíky. Jejich zdrojem jsou střevní bakterie, které tyto kyseliny tvoří z nestravitelných zbytků stravy (zejména vlákniny). Kyselina máselná je důležitým výživovým substrátem buněk sliznice tlustého střeva.

Mastné kyseliny se středním řetězcem (medium chain fatty acids – MCFA) mají 6–10, podle některých zdrojů 6–12 uhlíků. Jejich zdrojem je například mléčný tuk. Jsou rychlým zdrojem energie, neukládají se do tukových zásob.

Mastné kyseliny s dlouhým řetězcem (long chain fatty acids – LCFA) mají 12 a více uhlíků. Právě tyto mastné kyseliny jsou dávány do souvislosti s rizikem aterosklerózy – zejména kyselina laurová (12 uhlíků), myristová (14 uhlíků) a palmitová (16 uhlíků).

Satureované tuky při pokojové teplotě do cca 25 st. C tuhnou. Sádlo a máslo jsou nejtypičtějšími příklady nasycených živočišných tuků.¹ Kokosový, palmový a palmojádrový tuk jsou příkladem rostlinných nasycených tuků.

¹ [Grofová \(2010\)](#)

Appendix 2 – Traditional hierarchy of evidence based medicine



Source: Manchester University ([url](#)), Greenhalgh (2007)

Appendix 3 – Overview of the journals' impact factor

(to be amended)

Advances in Experimental Medicine and Biology

American Journal of Clinical Nutrition

Arteriosclerosis

BMJ (British Medical Journal)

Circulation

Diabetes Therapy

European Journal of Epidemiology

Food and Nutrition Journal

Global Heart Journal

International Journal of Epidemiology

JAMA (Journal of American Medical Association)

Journal of the American College of Cardiology

New England Journal of Medicine

Nutrition Journal

Open Heart

Stroke

The Cochrane Library (not applicable)

The Lancet

The Netherlands Journal of Medicine

WHO (not applicable)