PEN Knowledge Pathway Template

Knowledge Pathway: Cardiovascular Disease - Dyslipidemia
Subcategory: Intervention

Question
   1. What effect do tropical oils (palm oil and coconut oil) have on blood lipids?

Search strategy (end of each question or the document if search terms are the same for multiple questions)

Question key words:
trans saturated heart cholesterol triglycerides lipids CVD tropical oil palm coconut kernel medium chain long LDL HDL antithrombotic butter basal metabolic rate energy expenditure fat oxidation adipose body composition MCT overweight hyperlipidemia dyslipidemia cardiovascular hypercholesterolemia coconut Cocos nucifera palm

Key Practice Point 1

   Recommendation
   (1-2 sentence take-home message)
   Compared with the consumption of low saturated fat vegetable oils, the consumption of palm oil can modestly increase total cholesterol and LDL-cholesterol (LDL-C) levels and is therefore not recommended as an alternative to non-hydrogenated vegetable oils to promote a positive lipid profile.

   Evidence Summary
   (Concise summary of evidence points described in the Evidence section, below. Include evidence grades)
   A meta-analysis of short-term experimental studies indicated that palm oil compared to low saturated fat vegetable oils (providing 12-43% of energy intake for two to 16 weeks) increased total cholesterol (0.35 mmol/L), LDL-C l (0.24 mmol/L) and HDL-C (0.02 mmol/L), but had no effect on triglyceride levels in adults with both normal blood cholesterol levels and hypercholesterolemia. Palm oil can increase HDL-C compared to trans-fat containing partially hydrogenated oils (0.09 mmol/L), but does not affect other lipid levels.

   Grade of Evidence: B
   (List of all evidence grades used in the evidence summary)

   No differences were observed in blood lipid levels in studies that compared palm oil to animal fat.
   Grade of Evidence: C

   Remarks
   (Contextual information helpful in understanding and applying the recommendation)
   The included studies used palm oil or palm olein (a fraction of palm oil with a higher concentration of oleic acid). Commercial food production often uses processed palm oil that is oxidized or palm kernel oil, which has a much higher amount of saturated fatty acids than palm oil (81% versus 49%).

Evidence
(Each lettered point is typically a separate study. Studies are usually ordered by first by type (secondary → primary → grey literature), then publication date (newest to oldest).
   a. A systematic review and meta-analysis of clinical trials (searched to 2014) examined the effect of palm oil on blood lipids (1).
      • Palm oil versus non-hydrogenated cooking oils: 27 trials (n=807 participants) compared palm oil with low saturated fat vegetables oils; most were crossover trials and included meals or foods cooked with the oil, providing 12-43% of energy intake for two to 16

weeks. Overall results showed that compared with vegetable oils, palm oil increased total cholesterol (0.35 mmol/L; 95%CI, 0.23 to 0.47), LDL-C (0.24 mmol/L; 95%CI, 0.13 to 0.35 mmol/L) and HDL-C (0.02 mmol/L; 95%CI, 0.01 to 0.04) and had no effect on triglyceride levels. Results showed significant heterogeneity between studies. Subgroup analysis identified that palm oil increased LDL-C to a greater extent in randomized studies and in high quality studies (as assessed by Jadad Score) compared to low quality studies, in government-funded studies compared to industry-funded studies, and in studies conducted in Western countries compared to studies in Asia. In addition, greater reductions in LDL-C were apparent in studies conducted in women compared to men; however, participants' baseline cholesterol levels did not impact results.

- Palm oil versus partially hydrogenated vegetable oils: nine trials (n=260 participants) compared palm oil with trans-fat containing partially hydrogenated vegetable oils, providing 0.7 to 7% of energy intake. Palm oil increased HDL-C (0.09 mmol/L; 95%CI, 0.06 to 0.11) but had not effect on other lipid levels.
- Palm oil versus animal fat: two studies (n=61 participants) compared palm oil to lard or butter and observed no significant differences in blood lipid levels.

Comments
(Additional information relevant to the key practice point)

The potential health benefits of palm oil have been attributed to fresh, non-oxidized palm oil; however, commercial food production often uses processed palm oil that is oxidized or palm kernel oil (2). Oxidation alters the fatty acid profile and results in adverse effects on plasma lipid profile. In contrast to palm oil that is derived from the pulp of the oil palm fruit, palm kernel oil is derived from kernel of the oil palm.

Compared to palm oil, palm kernel oil has higher amounts of saturated fatty acids (81% versus 49%), of which lauric acid (C12:0) makes up the highest amount (47%) (3). Palm oil contains about 49 g/100 g saturated fatty acids (primarily palmitic fatty acid (C16:0; 88%)), 37 g/100 g monounsaturated fatty acids (primarily oleic acid (C18:1)) and 9.3 g/100 g polyunsaturated fatty acids (primarily linoleic acid (C18:2)) (3). Palm olein is a fraction of palm oil with a higher concentration of oleic acid. Palm olein contains oleic acid (C18:1; 46%). The other abundant fatty acids include the saturated fatty acids, palmitic acid (C16:0; 34.3%) and the polyunsaturated fatty acid, linoleic acid (C18:2; 13.9%).

In contrast, palm kernel oil is much higher in saturated fat, containing 81.5 g/100 saturated fatty acids (comprised of lauric (C12:0; 58%), myristic (C14:0; 20%) and palmitic (C16:0; 10%) fatty acids); the remainder is comprised of 11.4 g/100 g oleic acid and 1.6 g/100 g linoleic acid (3).

Rationale
(Explanation for mechanisms of action / research hypotheses / theories)

References

1. Sun Y, Neelakantan N, Wu Y, Lote-Oke R, Pan A, van Dam RM. Palm oil consumption increases LDL cholesterol compared with vegetable oils low in saturated fat in a meta-analysis of clinical trials. J Nutr. 2015 Jul;145(7):1549-58. doi: 10.3945/jn.115.210575. Epub 2015 May 20. Abstract available from: https://www.ncbi.nlm.nih.gov/pubmed/25995283
2. Edem DO. Palm oil: biochemical, physiological, nutritional, hematological, and toxicological aspects: a review. Plant Foods Hum Nutr. 2002;57(3-4):319-41. Abstract available from: https://www.ncbi.nlm.nih.gov/pubmed/12602939
3. Health Canada. Canadian Nutrient File, version 2015. 2015. Available from: https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/nutrient-data.html

….. example:
http://www.pennutrition.com/KnowledgePathway.aspx?kpid=2878&pqcatid=146&pqid=2946

KP Category:
Knowledge Pathway:
Subcategory:

Question
1.

Key Practice Point
   Recommendation:

   Evidence Summary

   Grade of Evidence: A, B, C, or D

   Remarks

Evidence
a.

Comments
If applicable: Additional information relevant to the KPP

Rationale
If applicable: Rationale of why the question is being asked

References
1.

PEN Question:

SEARCH TERMS (PubMed MeSH Database to help and any additional terms used)

MeSH Terms

Text words

Databases and Grey Literature Sources (e.g. international guidelines) Searched (Consider PubMed, TRIP database and international government and organizational guidelines)

Reasons for excluding reviews or studies identified using a hierarchical literature search

Date Search Completed:

Search Limits (e.g. date, language):

KP Category:
Knowledge Pathway:
Subcategory:

Question
2.

Key Practice Point
   Recommendation:

   Evidence Summary

   Grade of Evidence: A, B, C, or D

   Remarks

Evidence
a.

Comments
If applicable: Additional information relevant to the KPP

Rationale
If applicable: Rationale of why the question is being asked

References
1.

Key Practice Point
   Recommendation:

   Evidence Summary

   Grade of Evidence: A, B, C, or D

   Remarks

Evidence
a.

Comments
If applicable: Additional information relevant to the KPP

Rationale
If applicable: Rationale of why the question is being asked

References
1.

Glossary Items (with reference)

Tools and Resources

Tool name
Description
URL
Key words
Target Country
Developer/Publisher
Author

<mark>Other examples of Knowledge Pathways (KP) to look at:</mark>

[Hepatic Disorders - Pediatrics](#)
[Food and Nutrition Labelling](#)

Additional Author information

Search Strategy

Disease (specify) Background

Topic (specify) Background – Non Disease–Related