REPLACE
TRANS FAT

REPLACE TRANS FAT: AN ACTION PACKAGE TO ELIMINATE INDUSTRIALLY PRODUCED TRANS-FATTY ACIDS

MODULE 2: PROMOTE

How-to guide for determining the best replacement oils and interventions to promote their use

World Health Organization

REPLACE trans fat: an action package to eliminate industrially produced trans-fatty acids. Module 2: Promote. How-to guide for determining the best replacement oils and interventions to promote their use

ISBN 978-92-4-001082-6 (electronic version)
ISBN 978-92-4-001083-3 (print version)

This publication was originally published under WHO reference number WHO/NMH/NHD/19.13.

Suggested citation. REPLACE trans fat: an action package to eliminate industrially produced trans-fatty acids. Module 2: Promote. How-to guide for determining the best replacement oils and interventions to promote their use. Geneva: World Health Organization; 2020. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at http://apps.who.int/iris.

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ACKNOWLEDGEMENTS

The REPLACE modules benefited from the dedication, support and contributions of a number of experts from the World Health Organization (WHO); Resolve to Save Lives (an initiative of Vital Strategies); Vital Strategies; Global Health Advocacy Incubator (a programme of the Campaign for Tobacco-Free Kids); and the United States Centers for Disease Control and Prevention. WHO thanks the contributing organizations and individuals for their technical inputs to the development of some or all of the modules of the REPLACE action package. WHO also thanks the numerous international experts who contributed their valuable time and vast knowledge to the development of these modules.

REPLACE ACTION PACKAGE

Elimination of industrially produced *trans*-fatty acids (TFA) from the global food supply by 2023 is a priority target of the World Health Organization (WHO). The REPLACE action package provides a strategic approach to eliminating industrially produced TFA from national food supplies, with the goal of global elimination by 2023. The package comprises:

- an overarching technical document that provides a rationale and framework for this integrated approach to TFA elimination;
- six modules; and
- additional web resources to facilitate implementation.

The REPLACE modules provide practical, step-by-step implementation information to support governments to eliminate industrially produced TFA from their national food supplies. To achieve successful elimination, governments should implement best-practice legal measures (outlined in modules 3 and 6). Strategic actions outlined in the other modules are designed to support this goal, but it may not be necessary to implement each module.

The modules will be most useful to national governments, including policy-makers, food control or safety authorities, and subnational government bodies that advocate for, and enforce, policies relating to nutrition or food safety. Other audiences that may find these modules and accompanying web resources useful include civil society organizations, academic and research institutions, nutrition scientists and laboratories, and food industry associations and food companies.

MODULES OF THE REPLACE ACTION PACKAGE

SIX STRATEGIC ACTION AREAS		OBJECTIVE
RE	**REVIEW** dietary sources of industrially produced TFA and the landscape for required policy change	Introduce the REPLACE action package, and provide guidance on initial scoping activities and drafting of a country roadmap for TFA elimination. Initial scoping activities rely on information that is already known, or can be obtained through desk review or discussions with key stakeholders, with reference to other modules as needed
P	**PROMOTE** the replacement of industrially produced TFA with healthier oils and fats	Describe oil and fatty acid profiles, and available replacement oils and fats, including feasibility considerations and possible interventions to promote healthier replacements
L	**LEGISLATE** or enact regulatory actions to eliminate industrially produced TFA	Describe policy options and the current regulatory framework to eliminate industrially produced TFA. Provide guidance on assessment steps to guide policy design, and development of regulations suitable to the country context or updating of the existing legal framework to match the approach recommended by the World Health Organization
A	**ASSESS** and monitor TFA content in the food supply and changes in TFA consumption in the population	Describe the goals and methods for TFA assessment. Provide guidance on designing and carrying out a study of TFA in food and human samples
C	**CREATE** awareness of the negative health impact of TFA among policy-makers, producers, suppliers and the public	Describe approaches to advocacy and communications campaigns to support policy action. Provide guidance on key steps to design and implement effective advocacy and communications campaigns, and evaluate progress
E	**ENFORCE** compliance with policies and regulations	Describe TFA policy enforcement approaches, offences and roles. Provide guidance on mapping existing and creating new enforcement powers and mechanisms, public communications, penalties, funding and timelines

1. BACKGROUND

The most effective and consistent way to eliminate industrially produced TFA from the global food supply is by implementing legislative or regulatory actions to prohibit or strictly limit their use in any food. TFA legislation and regulations generally do not specify what types of oils or fats should replace industrially produced TFA. Replacement with healthier oils and fats will maximize population health benefits. This module provides guidance on determining the best replacement oils for industrially produced TFA, and on designing and implementing strategies to promote use of these healthier replacements. These strategies include government support to industry to accelerate the transition to replacement oils, and agricultural policies and incentives to support the production of oilseeds and prioritize healthier replacement options.

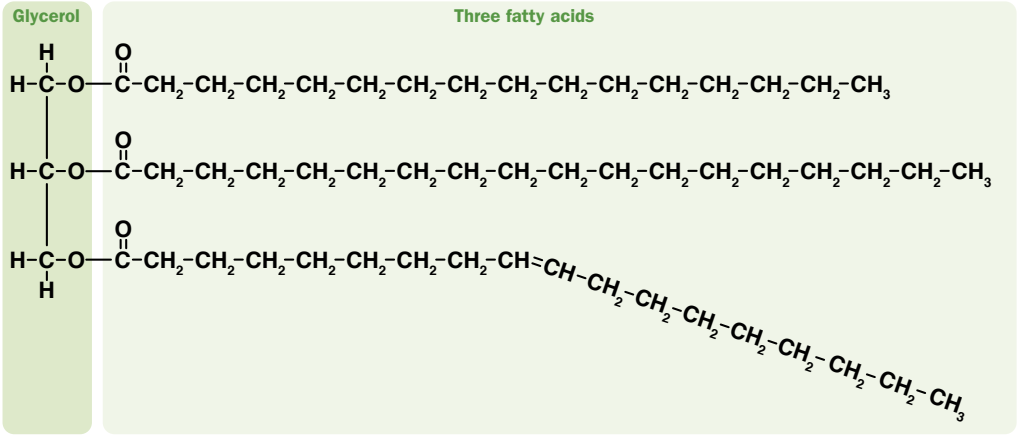
2. BASICS OF OILS AND FATS

2.1 OVERVIEW

Oils and fats are made up of triglycerides, which consist of a glycerol molecule attached to three chain-like molecules that mostly consist of carbon and hydrogen, called fatty acids. Oils and fats are mixtures of different types of fatty acids as components of triglycerides. Both the type of fatty acid and the placement can affect the functional properties of oils and fats, including melting temperature (temperature at which the mixture is liquid rather than a solid – higher melting temperatures mean that the fat is more likely to be solid at room temperature), crystallization characteristics and resistance to oxidation (a reaction with oxygen that leads to off-flavours and dark colours). Rules of thumb for how fatty acid composition affects the properties of oils and fats are as follows.

1. Longer fatty acids (bigger fat molecules) have higher melting temperatures.
2. Straight fatty acids can pack closely together in crystals and have a higher melting point.
3. 'Kinked' fatty acids (rather than straight) cannot pack. Fatty acids can have 0-3 kinks, called *cis* unsaturated bonds. Higher numbers lead to lower melting points.
4. Oxygen reacts easily with unsaturated bonds. More unsaturated bonds mean more oxidation and spoilage.

Unsaturated bonds are also called double bonds, and form when adjacent carbon atoms bond twice with each other rather than with a hydrogen atom. Fatty acids with no double bonds are "saturated" with hydrogen and therefore called saturated fatty acids (SFA). Fatty acids with one double bond are called mono-unsaturated fatty acids (MUFA). Fatty acids with more than one



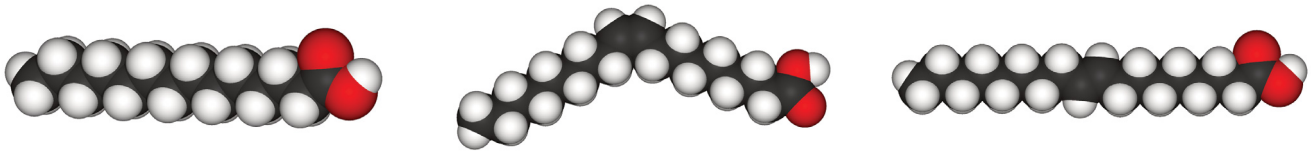
▲ **Fig 1:** Molecular structure of a fat molecule with two saturated fatty acids and one *cis* mono-unsaturated fatty acid

double bond are called poly-unsaturated fatty acids (PUFA). In food processing, SFA give solidity and texture, and high resistance to oxidation. MUFA oil is liquid and has good resistance to oxidation. PUFA oil is liquid and not resistant to oxidation.

Fatty acids are identified by a code that gives the number of carbon atoms in the molecular chain and the number of double bonds. For example, oleic acid, a common MUFA in many oils that has an 18-carbon chain, is labelled C18:1; palmitic acid, a common SFA in palm oil that has a 16-carbon chain, is C16:0. Two types of PUFA are "essential fatty acids": the human body cannot make them out of other dietary components, and the required amount needs to be in the diet. These are linoleic acid (C18:2), an omega-6 or *n*-6 PUFA; and alpha-linolenic acid (C18:3), an omega-3 or *n*-3 PUFA.

2.2 TFA

Like the unsaturated fatty acids described above, trans fats are also unsaturated and have at least one double bond. However, the arrangement of the molecule is different and no longer kinked; the resulting TFA is almost as straight as an SFA (see Fig. 2). The resulting trans fat behaves more like an SFA than like an unsaturated fat.



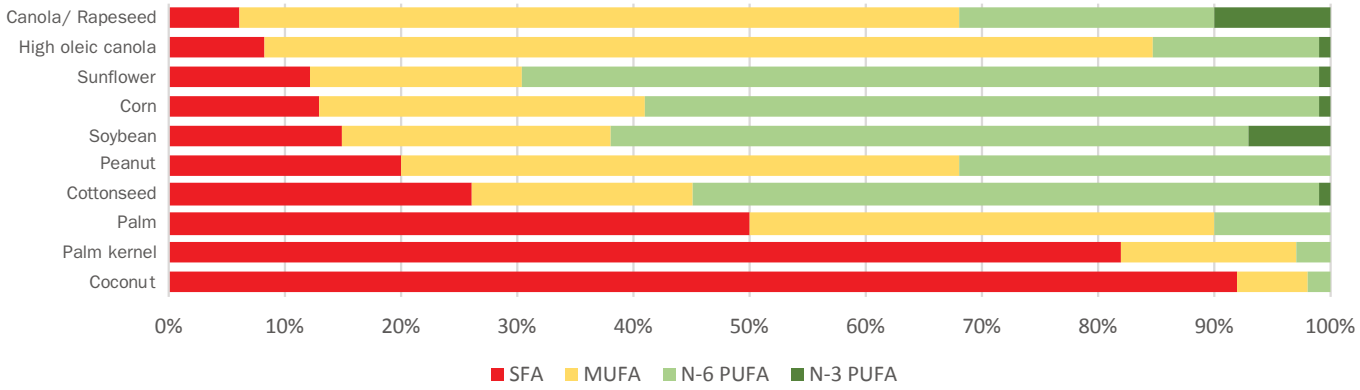
▲ **Fig. 2.** Models of fatty acids
Source: Wikimedia Commons (2014, 2015)

Unsaturated fatty acids, as found in commodity and gourmet oils and fats, naturally only have *cis* double bonds. The primary source of TFA targeted by the REPLACE action package is partially hydrogenated oils (PHO), which are created through a chemical process called partial hydrogenation. This process breaks up unsaturated bonds, and converts them partly to saturated bonds and partly to *trans* unsaturated bonds. This raises the melting point, so liquid oil can be turned into a liquid, semi-solid or solid fat at room temperature. PUFA are usually turned into MUFA TFA, so PHO have increased resistance to oxidation. The partial hydrogenation process can be adapted to create oils and fats with a variety of properties, regardless of the starting materials.

TFA are also formed in nature. Bacteria that can convert *cis* double bonds into *trans* double bonds live in the digestive system of ruminant animals (for example, cows and sheep); as a result, their meat and milk fat can contain 2–6% TFA. In addition, commercially refined oils may also contain low levels of TFA (0.5–2%), resulting from the high temperatures used to refine edible oils.

2.3 HEALTH EFFECTS OF DIFFERENT CLASSES OF FATTY ACIDS

▼ **Fig. 3.** Approximate fatty acid composition of selected vegetable oils[a]



[a] Oils such as olive, safflower and sesame are not used extensively because of their limited availability and high cost.

Sources: Kodali (2014a); Orsavova et al. (2015)

When partial hydrogenation was invented, the assumption was that all unsaturated fatty acids were healthier than SFA, and that replacing SFA with TFA would lead to lower cholesterol levels and lower incidence of cardiovascular disease. It is now known that TFA are less healthy than SFA (Mozaffarian & Clarke, 2009). It is also clear that reducing SFA intake is only beneficial if it is replaced with healthier alternatives. Replacing SFA with unsaturated fat – in particular, with PUFA – will have the most beneficial effect. Hence, current WHO advice (WHO, 2003, 2018; FAO, 2010) is to eliminate PHO from the diet, to limit intake of TFA to less than 1% of total energy intake, to limit SFA intake to less than 10% of total energy intake, and to replace energy from SFA with energy from unsaturated fat (in particular, PUFA). Since people do not consume fatty acids alone but rather consume food items that contain a mixture of nutrients and fatty acids, the general advice is to use liquid plant oils, nuts and seeds that are high in PUFA, and eat products made with these healthy oils. Fig. 3 shows the approximate fatty acid composition of selected vegetable oils.

3. REPLACEMENT OILS AND FATS

3.1 USES OF FATS AND PHO IN THE FOOD