A Brief Introduction of 3-MCPD Esters and Glycidol Esters in Edible Oils

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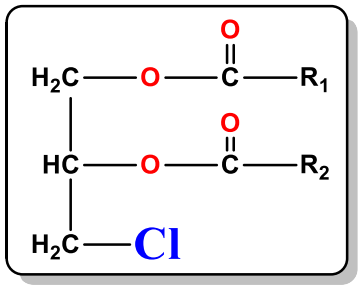
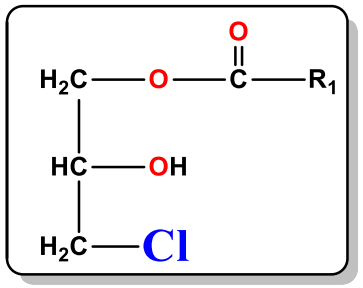
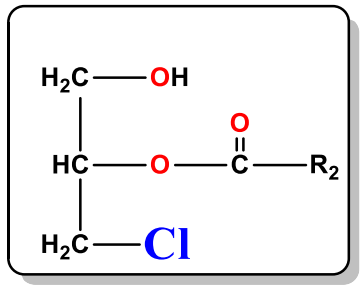
What are 3-MCPD & GE ?



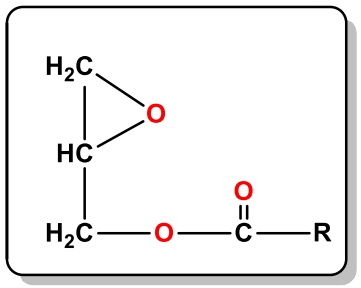
3-MCPD-di-ester



3-MCPD-mono-ester



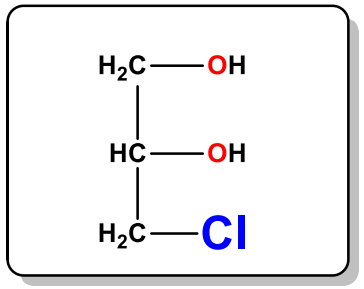
3-MCPD-2-mono-ester



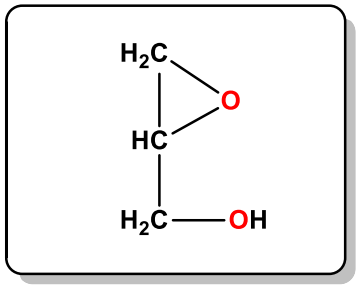
Glycidol ester

3-MCPD

3-monochloropropanediol



Glycidol



Almost all of the bound esters can be hydrolyzed into the free form in the body.

Toxicological Assessment

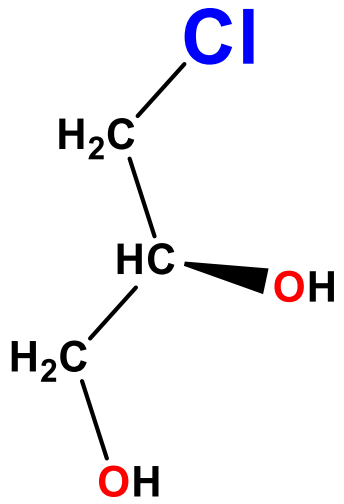
International Agency for Research on Cancer

World Health Organization

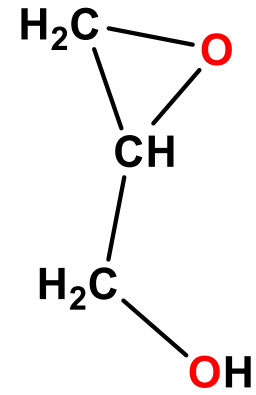
- **IARC** classifies 3-MCPD as possibly carcinogenic to humans (2B)

  2-MCPD：no official classification available

- **IARC** classifies Glycidol as probably carcinogenic to humans (2A)



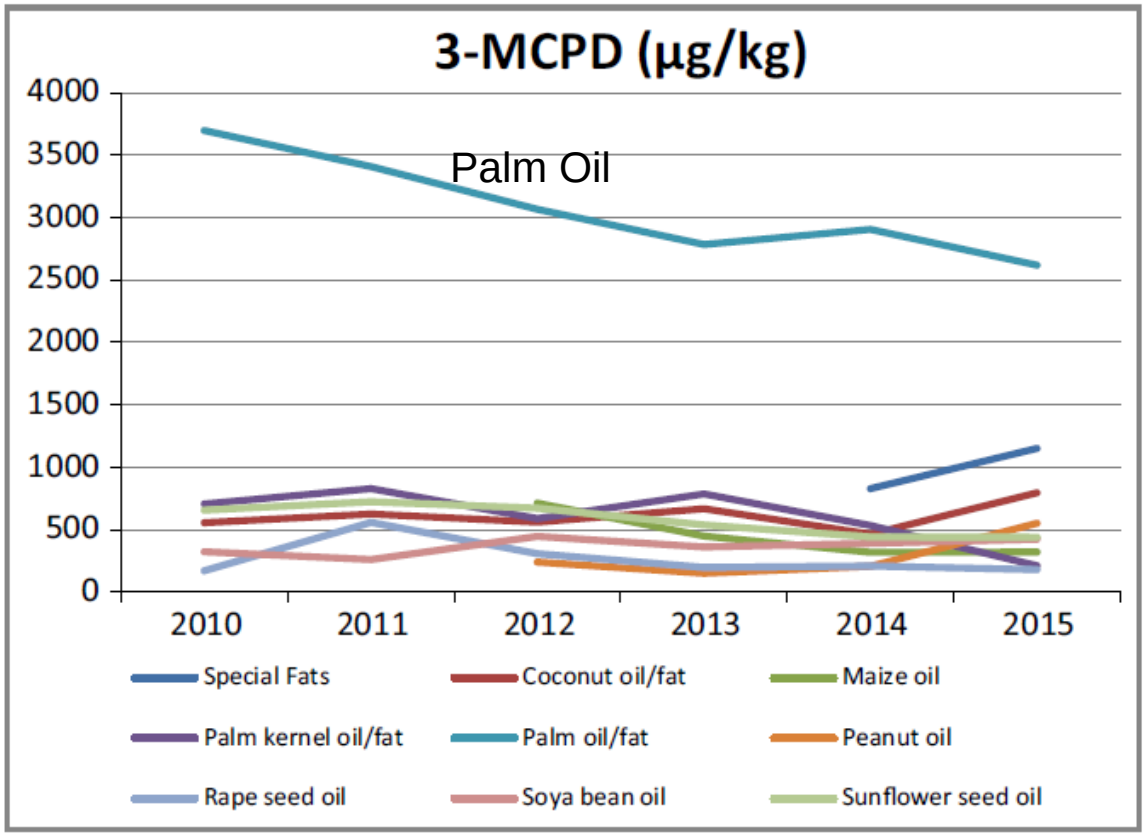
3-MCPD

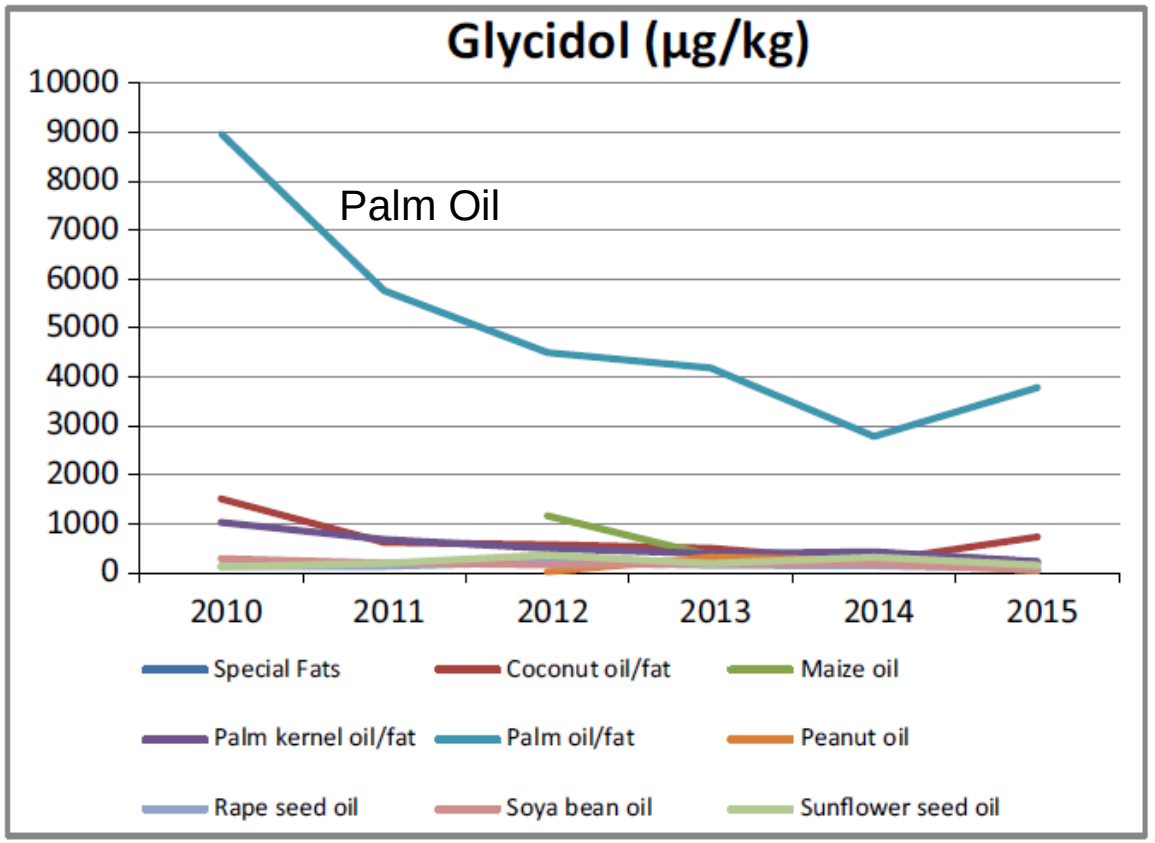


Glycidol

→ Glycidol is a little more toxic than 3-MCPD.

Levels of 3-MCPD and Glycidol in different types of oils and fats across 2010-2015

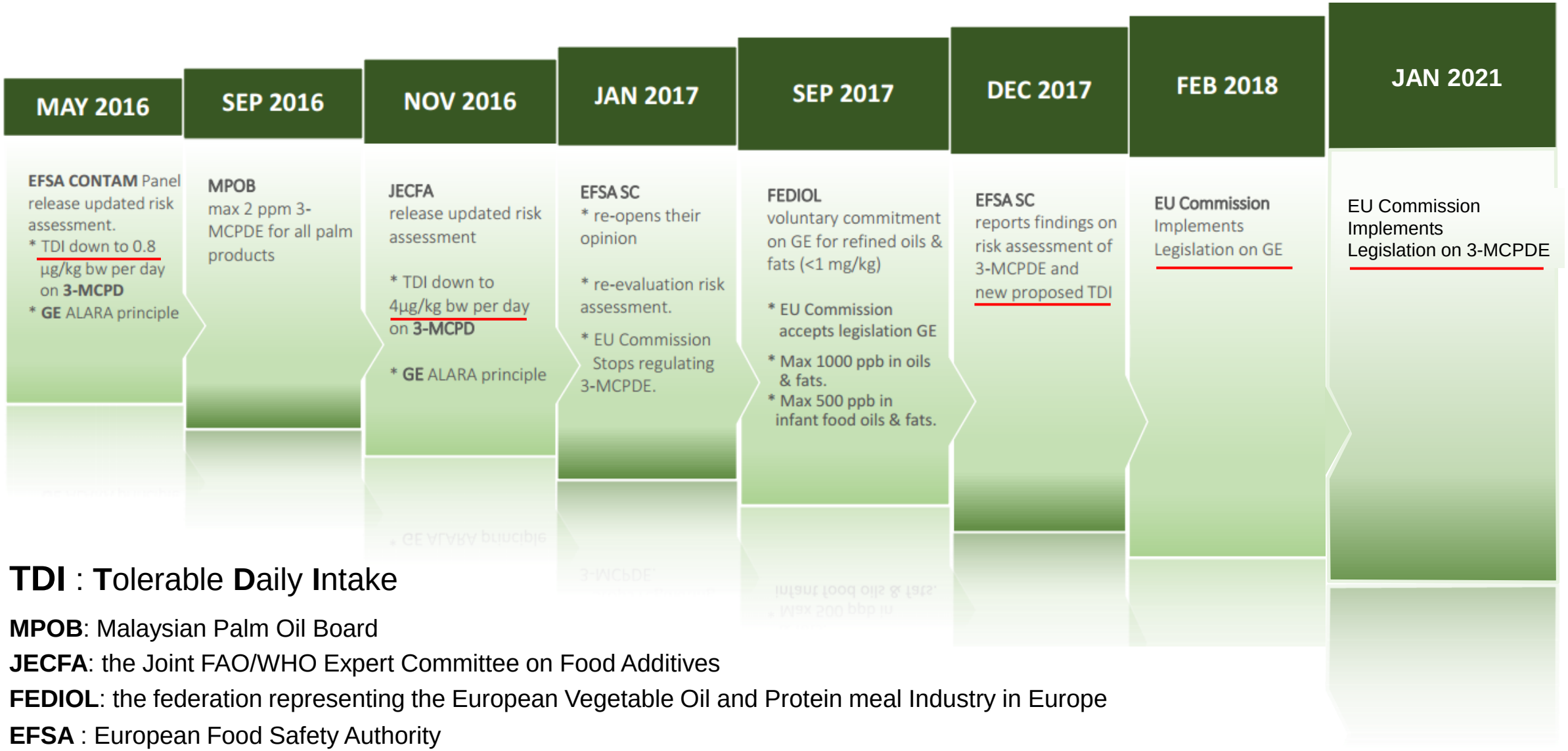




*Samples of EU Market

*EFSA Journal 2016;14(5):4426

Evaluation of TDI of 3-MCPD



TDI : **T**olerable **D**aily **I**ntake

MPOB: Malaysian Palm Oil Board

JECFA: the Joint FAO/WHO Expert Committee on Food Additives

FEDIOL: the federation representing the European Vegetable Oil and Protein meal Industry in Europe

EFSA : European Food Safety Authority

3-MCPDE Maximum Level (2021.1)

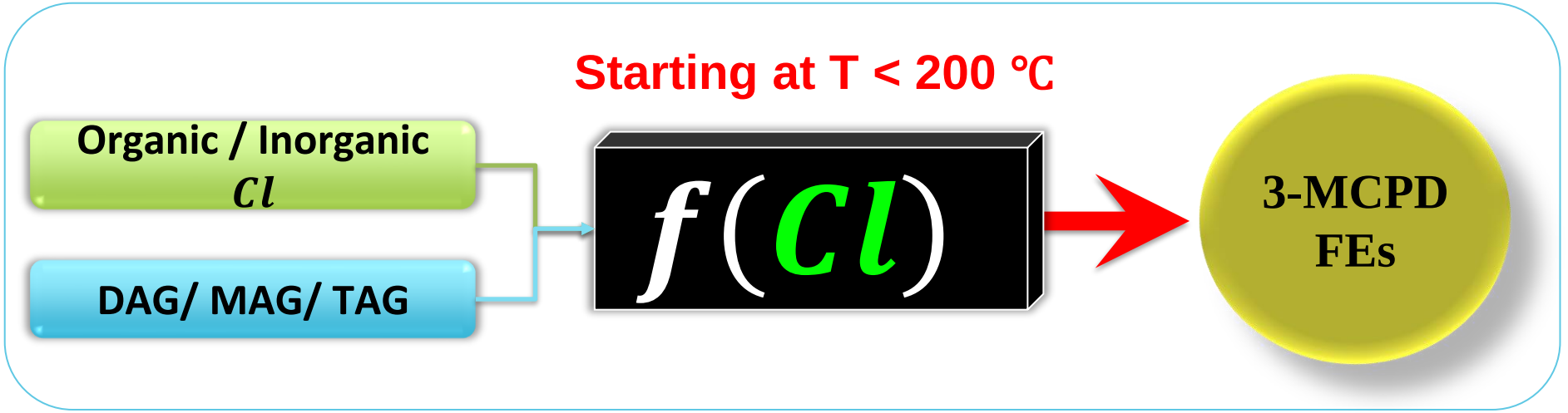
	Foodstuffs (1)	Maximum level (µg/kg)
4.3	**Sum of 3-monochloropropanediol (3-MCPD) and 3-MCPD fatty acid esters, expressed as 3-MCPD** (****)	
4.3.1.	Vegetable oils and fats, fish oils and oils from other marine organisms placed on the market for the final consumer or for use as an ingredient in food falling within the following categories, with the exception of the foods referred to in 4.3.2 and of virgin olive oils (*):	
	— oils and fats from coconut, maize, rapeseed, sunflower, soybean, palm kernel and olive oils (composed of refined olive oil and virgin olive oil) (*) and mixtures of oils and fats with oils and fats only from this category,	1 250
	— other vegetable oils (including pomace olive oils (*)), fish oils and oils from other marine organisms and mixtures of oils and fats with oils and fats only from this category,	2 500
	— mixtures of oils and fats from the two abovementioned categories.	— (*****)
4.3.2.	Vegetable oils and fats, fish oils and oils from other marine organisms destined for the production of baby food and processed cereal-based food for infants and young children (3)	750 (******)
4.3.3	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (3) (29) and young-child formula (29) (**) (powder)	125 (*******)
4.3.4	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (3) (29) and young-child formula (29) (**) (liquid)	15 (*******)

GE Maximum Level (2018.1)

	Foodstuffs (1)	Maximum level (µg/kg)
4.2	**Glycidyl fatty acid esters, expressed as glycidol**	
4.2.1.	Vegetable oils and fats, fish oils and oils from other marine organisms placed on the market for the final consumer or for use as an ingredient in food, with the exception of the foods referred to in 4.2.2 and of virgin olive oils (*)	1 000 (***)
4.2.2.	Vegetable oils and fats, fish oils and oils from other marine organisms destined for the production of baby food and processed cereal-based food for infants and young children (3)	500 (***) (******)
4.2.3	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (3) (29) and young-child formula (29) (**) (powder)	50 (***)
4.2.4	Infant formula, follow-on formula and foods for special medical purposes intended for infants and young children (3) (29) and young-child formula (29) (**) (liquid)	6,0 (***)

Formation of 3-MCPD FEs in Fats & Oils

$$\sum(3-MCPD\ FEs) = f(Cl)$$



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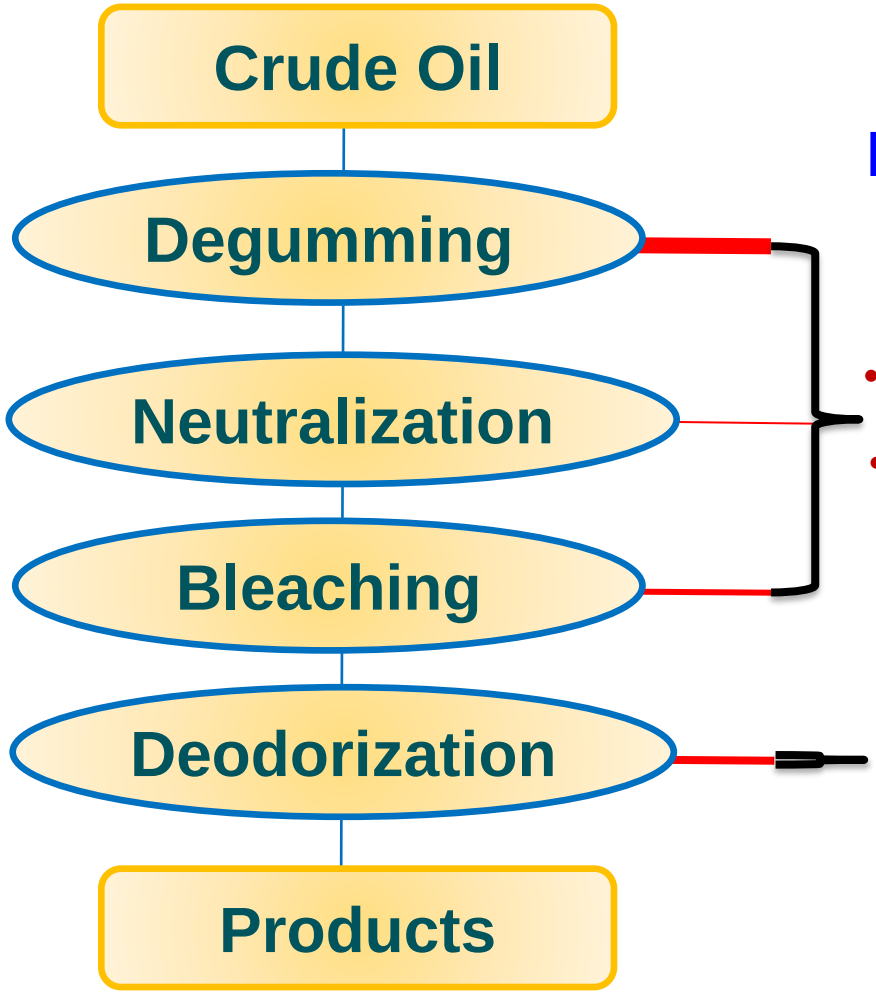
*J. Am. Oil Chem. Soc.*1991, 68, 785−790

The Optimized Process



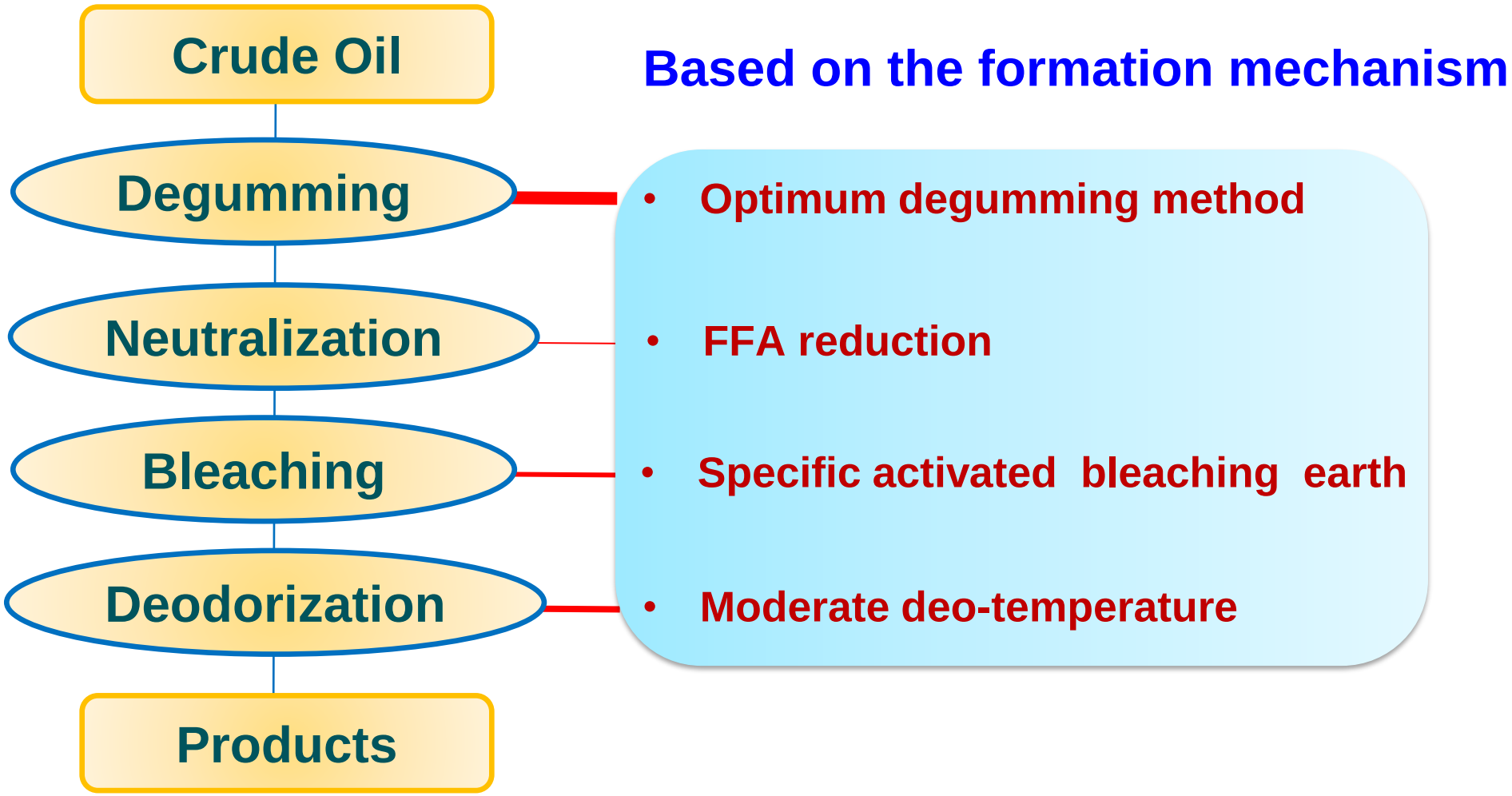
Strategy

Based on the formation mechanism

- Remove the Cl-precursors as many as possible
- Reduce FFA as low as possible

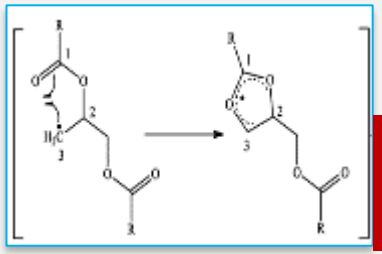
Moderate deo-temperature

The Optimized Process

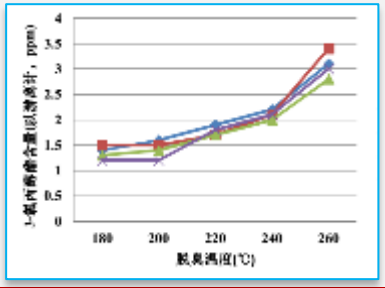


Research & Industrial Applications in Wilmar

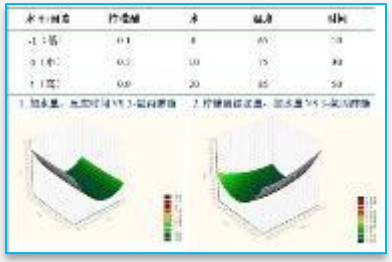
2008-present: from fundamental research to industrial application



Fundamental Research



Application Research



Breakthroughs in key technologies

Industrial Application

Thank you for your attention!