

Palsgaard®

EMULSIFIERS IN ICE CREAM

The Magic of Emulsifiers



Emulsifiers and stabilisers for food

100% plant-based performance power

FUNCTIONALITIES:

- Emulsion stability (oil/water/air)
- Viscosity control
- Faster aeration
- Uniformity
- Product stability
- Suspension of particles
- Influence sensory attributes

BENEFITS:

- Improved product quality
- Improved texture and mouthfeel
- Fat reductions
- Better-for-you products
- Extended shelf-life
- Less food waste
- Optimised production
- Better raw material utilisation
- Reduced need for eggs in bakery products



Plant-based emulsifiers and stabilisers for



CAKE PREMIXES



CAKE GELS



CONDIMENTS



CONFECTIONERY



DAIRY



ICE CREAM



INDUSTRIAL BAKERY



OILS & FATS



PLANT-BASED PRODUCTS



PROCESSED MEAT



PERSONAL CARE



POLYMERS

A typical ice cream recipe

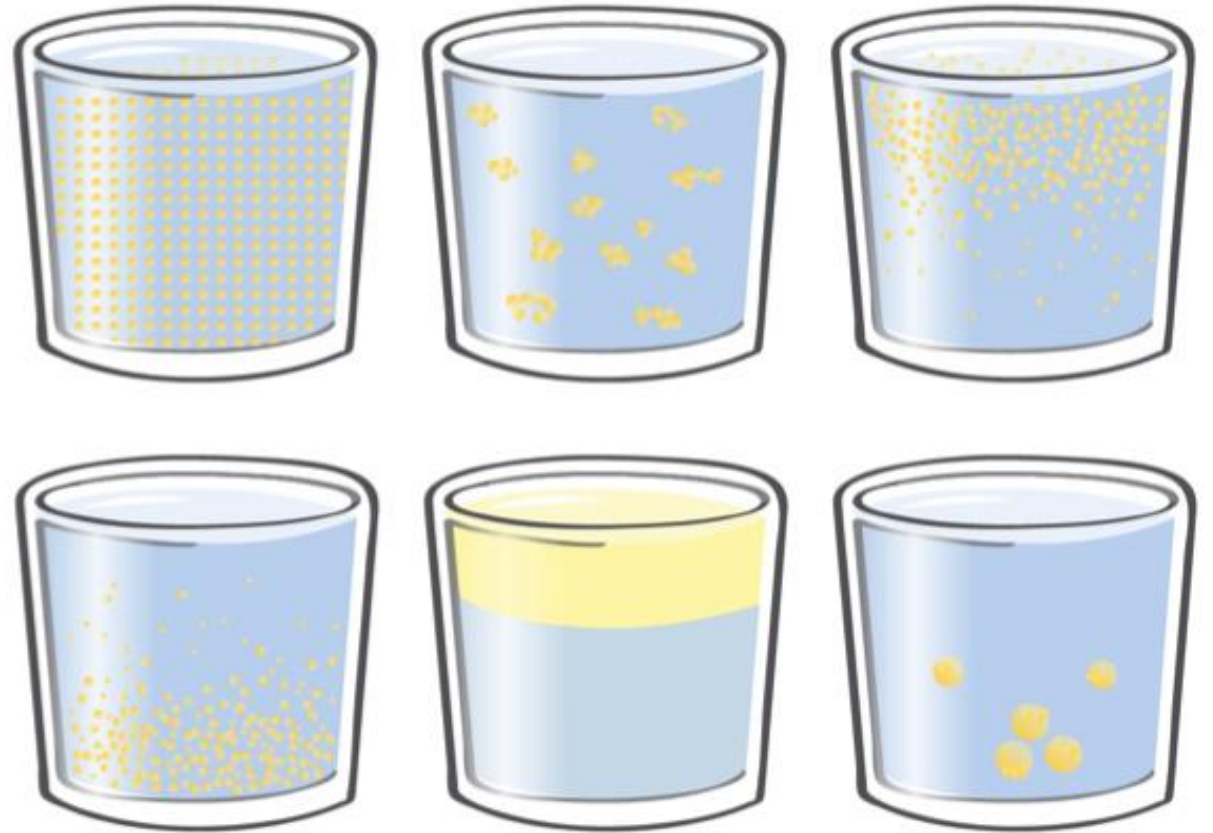
- 35% total solids, 17% MSNF in water
- 10% fat
- 11.4% skim milk powder
- 11.5% sugar
- 3.35% glucose syrup, 42 DE
- 0.35 – 0.65% (Palsgaard®) emulsifiers/stabilizers
- Up to 100% with water



Multi-phase systems

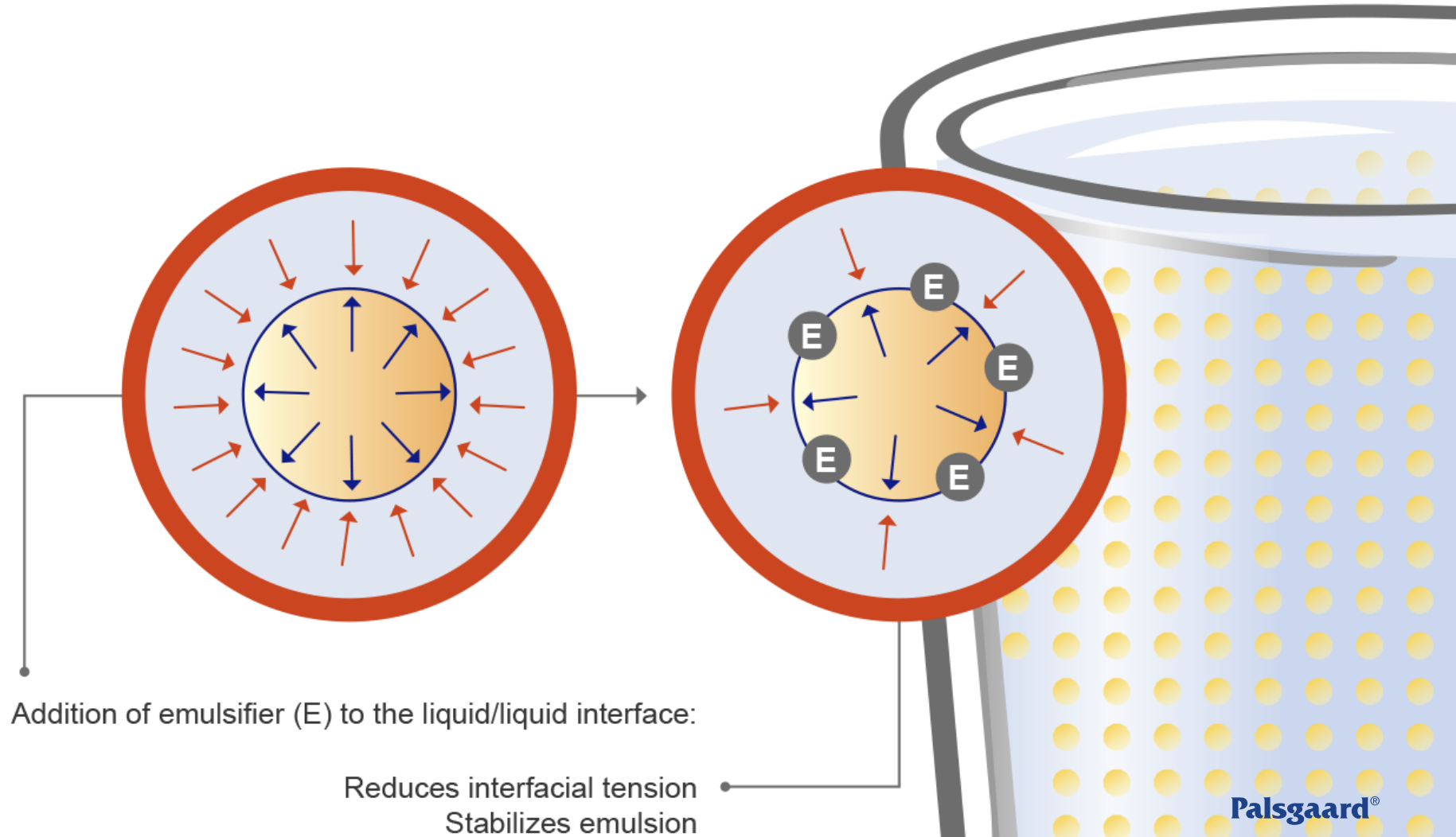
- Water in oil (w/o)
- Oil in water (o/w)
- Solid in oil
- Gas in liquid
- Gas, solid, oil in water, etc.

- Inherently unstable



What is an emulsifier?

- A molecule with ambiphilic properties (part of the structure is hydrophilic and other moieties are lipophilic)
- In a multiphase system the emulsifier will adopt a favourable position with respect to energy
- The emulsifier reduces surface tension between the phases



Emulsifiers often used in ice cream

- Mono-diglycerides (E471)
- Lactic acid esters (E472b)
- Propylenglycol esters (E477)
- Blends of the above

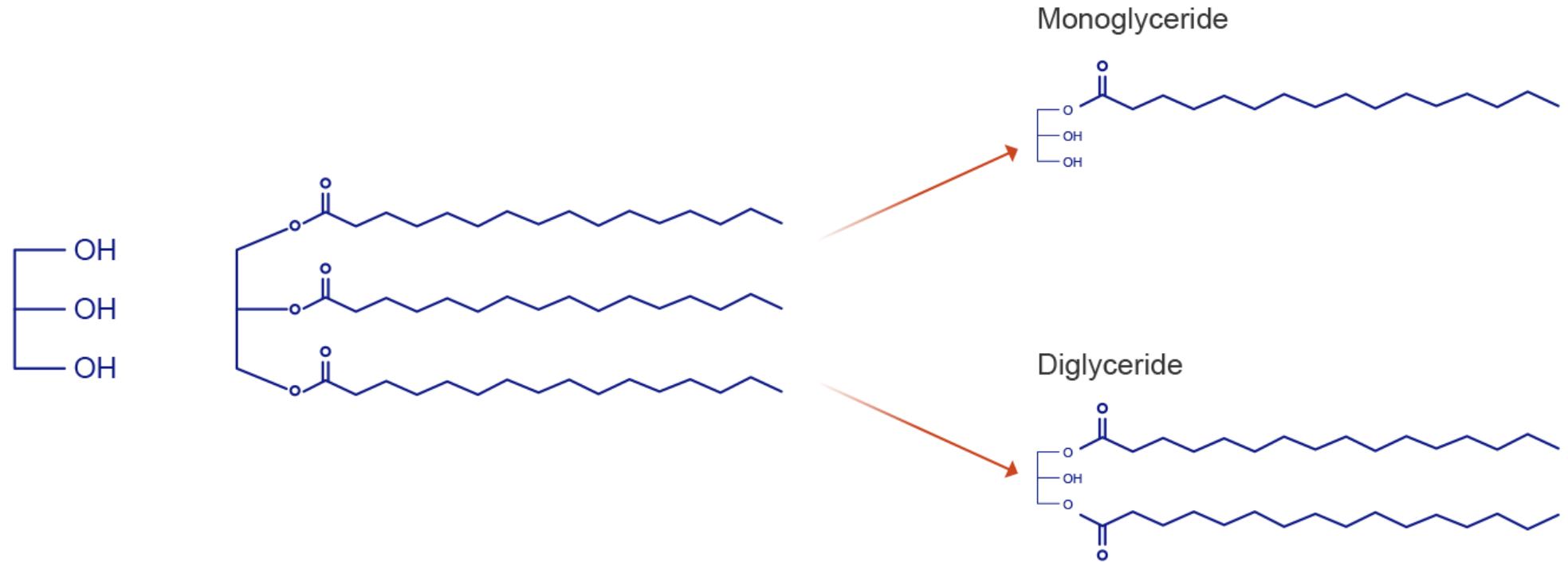


Producing mono-diglycerides

- Direct esterification
 - Reaction between FA and glycerol
 - Used when specific FA profile is desired
- Interesterification
 - Reaction between triglyceride and glycerol
 - Cost-effective and fast



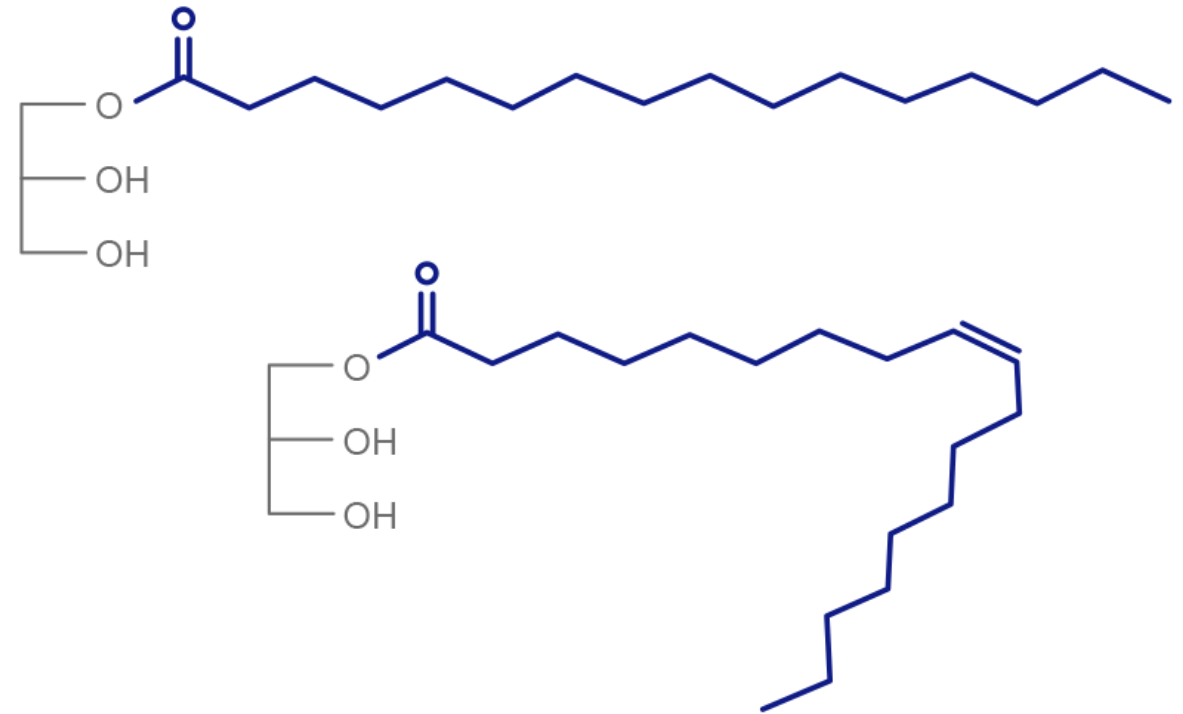
Producing mono- and diglycerides



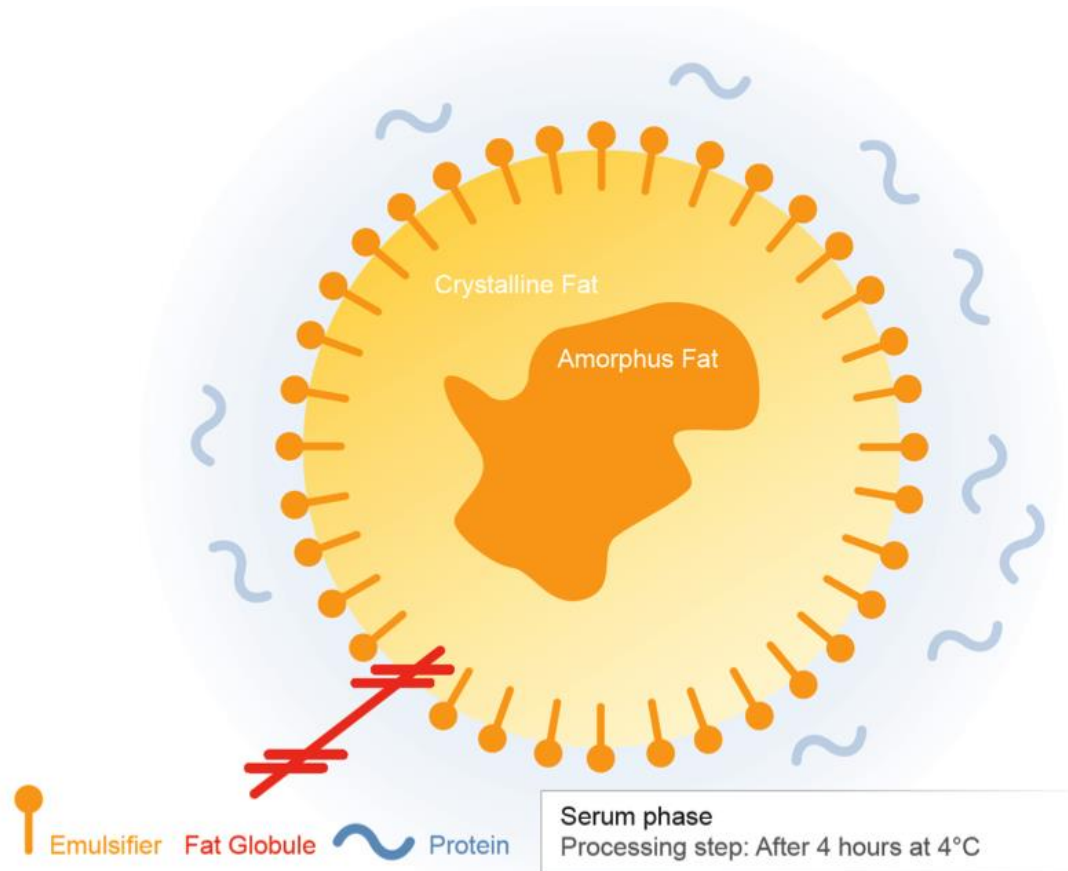
Saturated vs. non-saturated

- Glycerolmonostearat – C18
 - HLB 3.8
 - m.p. 65 °C

- Glycerolmonooleat – C18:1
 - HLB 3.4
 - m.p. 30 °C



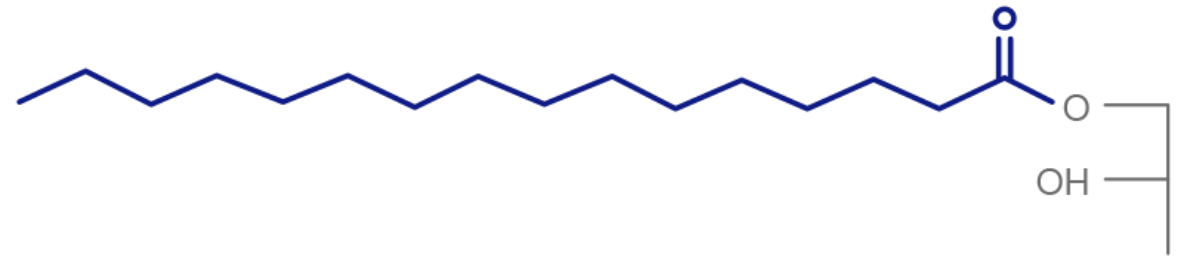
Effects of mono- and diglycerides



- Optimum fat globular membrane composition
- Protein desorption from fat globule surface
- Squeeze liquid fat out of fat globules
- Fat globule agglomeration
- 3D network construction

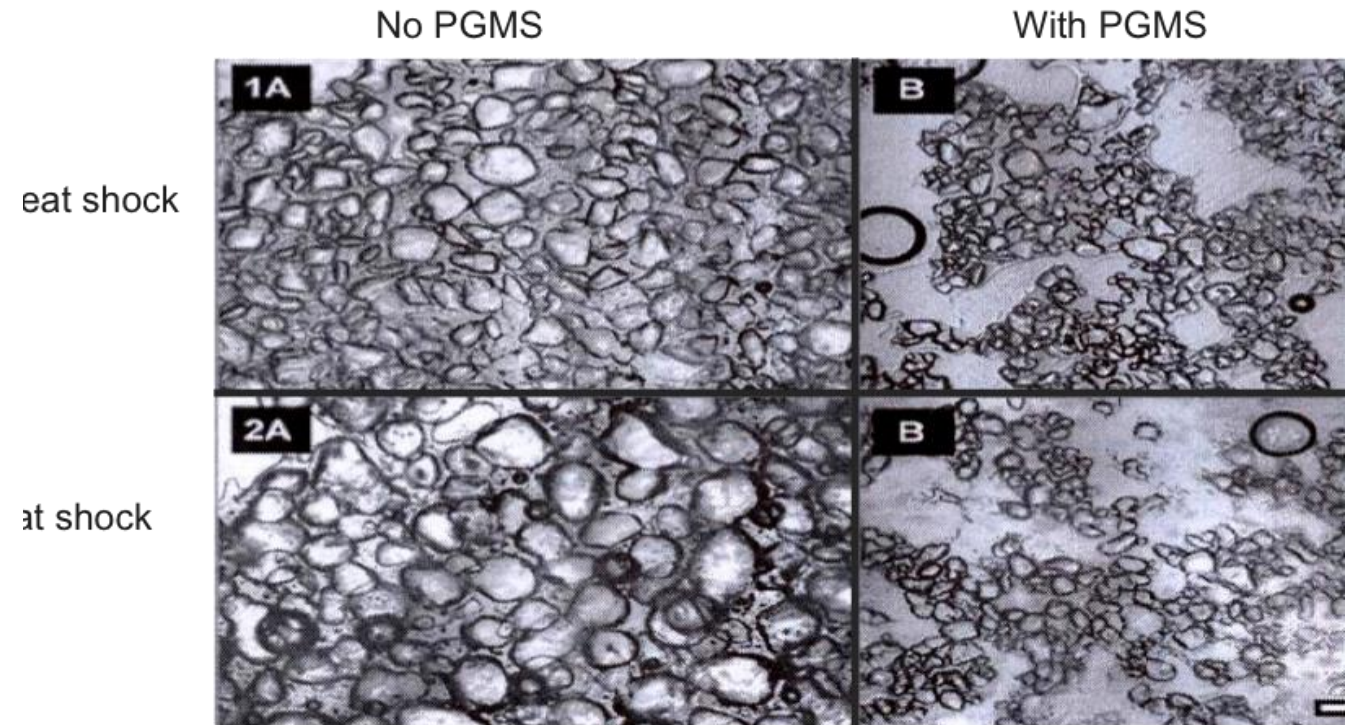
Effects of propyleneglycol esters

- Creation of small ice crystals during freezing
- Inhibition of ice crystal growth



Propylene glycol monostearate emulsifier

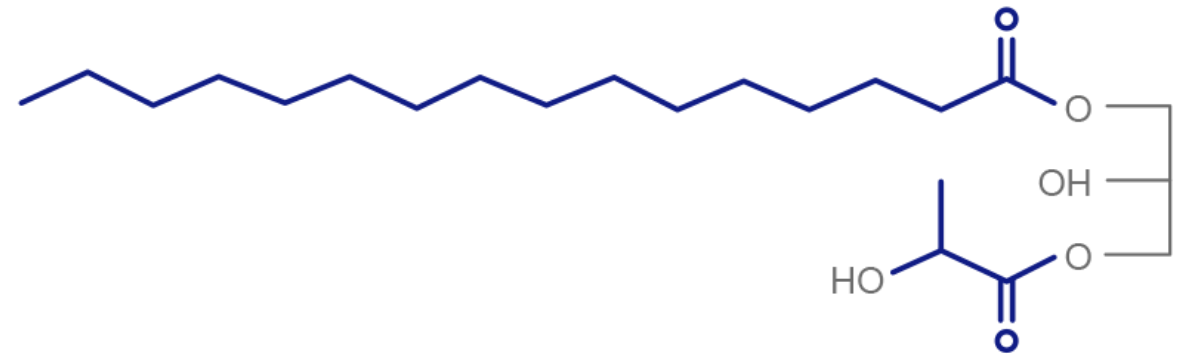
- Effect on ice crystal size



Ice Recrystallization Inhibition in Ice Cream by Propylene Glycol Monostearate; Aleong, J. M., Frochot, H. D., JFS

Lactic acid esters of mono- and diglycerides

- Enhance the foam's stiffness, also in ice creams with a high level of unsaturated fat
- Increase overrun



What are stabilizers?

- Water-soluble polysaccharide extracted from land or marine plants or from micro-organisms.
- Gums influence the viscosity or gelling behaviour of solutions.



Stabilizer overview

Stabilizer	Type	Source	Properties
Carrageenan	Polysaccharide	Red seaweed	Gelling, stabilizing
Alginate	Polymer of organic acids	Brown seaweed	Gelling, stabilizing
Locust bean gum	Polysaccharide	Carob tree	Thickening
Guar gum	Polysaccharide	Guar gum plant	Thickening
Xanthan gum	Polysaccharide	Metabolite	Thickening, stabilizing
MCC	Cellulose	Plant fibre	Thickening, stabilizing
CMC	Cellulose	Plant fibre	Thickening, stabilizing



What do stabilizers do?

- Optimize storage stability
 - Control ice crystal growth
 - Reduce risk of shrinkage
- Improve melting resistance
- Modify sensory properties



Palsgaard[®] E/S for ice cream

- Fully integrated compound
- Easy dispersible
- No pre-blending required
- No de-blending during storage
- No dust formation



An integrated mixture of emulsifier and stabilizer



Integrated product



Dry mixed product

Ice cream without emulsifiers lacks:

- Heat shock stability
- Creaminess and body
- Foam stability
- Stand up properties
- Melting resistance

Ice cream without stabilizers lacks:

- Body
- Melting resistance
- Stand up properties
- Heat shock stability



Palsgaard®



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