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## Confectionery Fats

Kevin W. Smith,  
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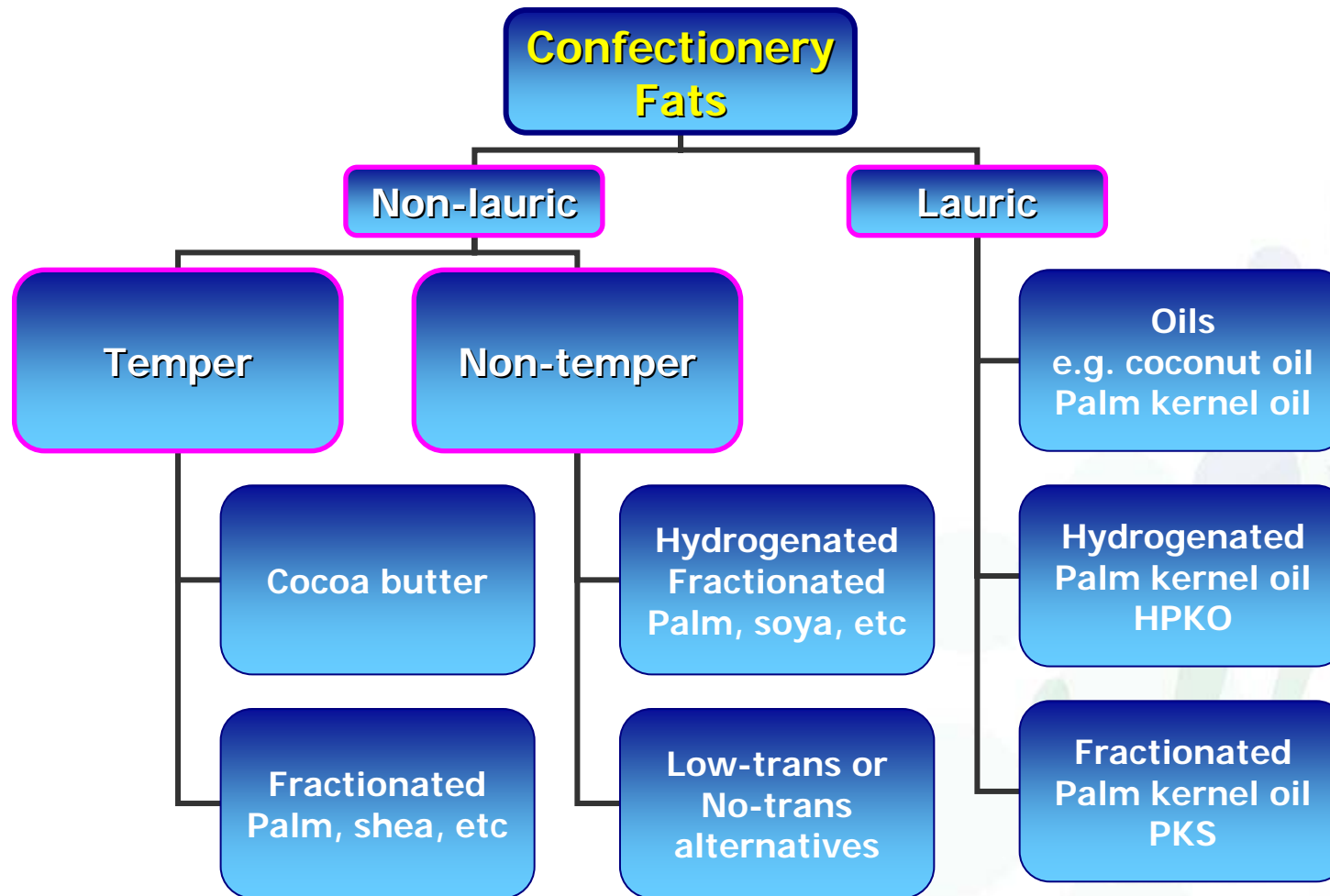
# Uses of Confectionery Fats



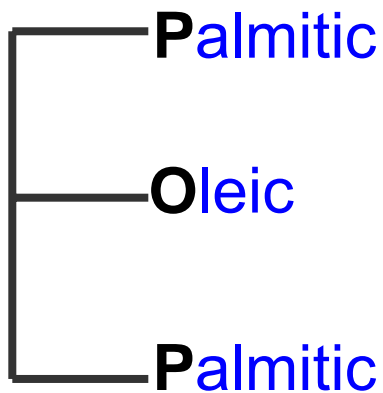
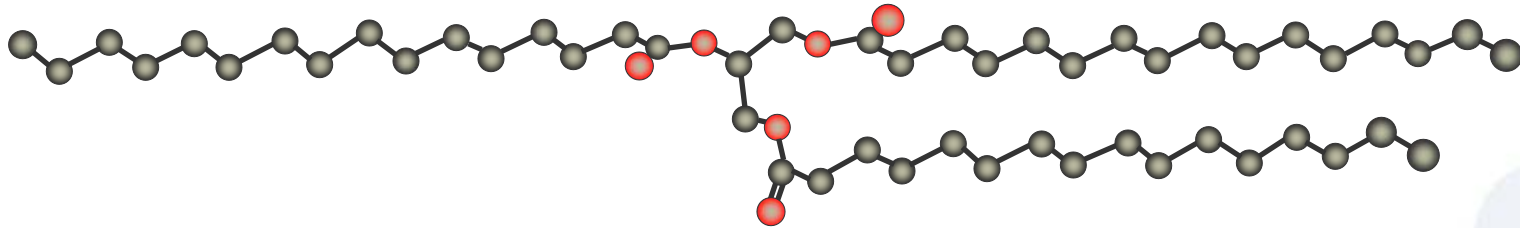
- Coatings
- Fillings
- Toffees and caramels
- Ice cream



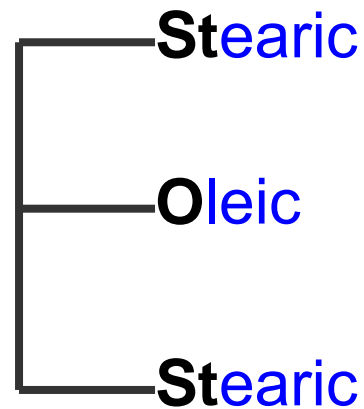
# Confectionery Fat Groups



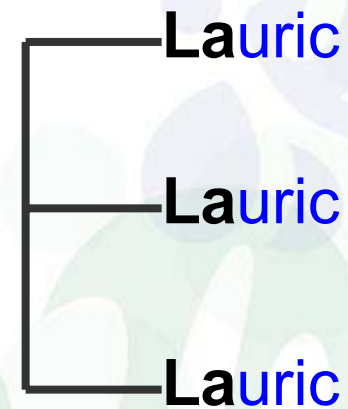
# Triacylglycerols – Nomenclature



**POP**

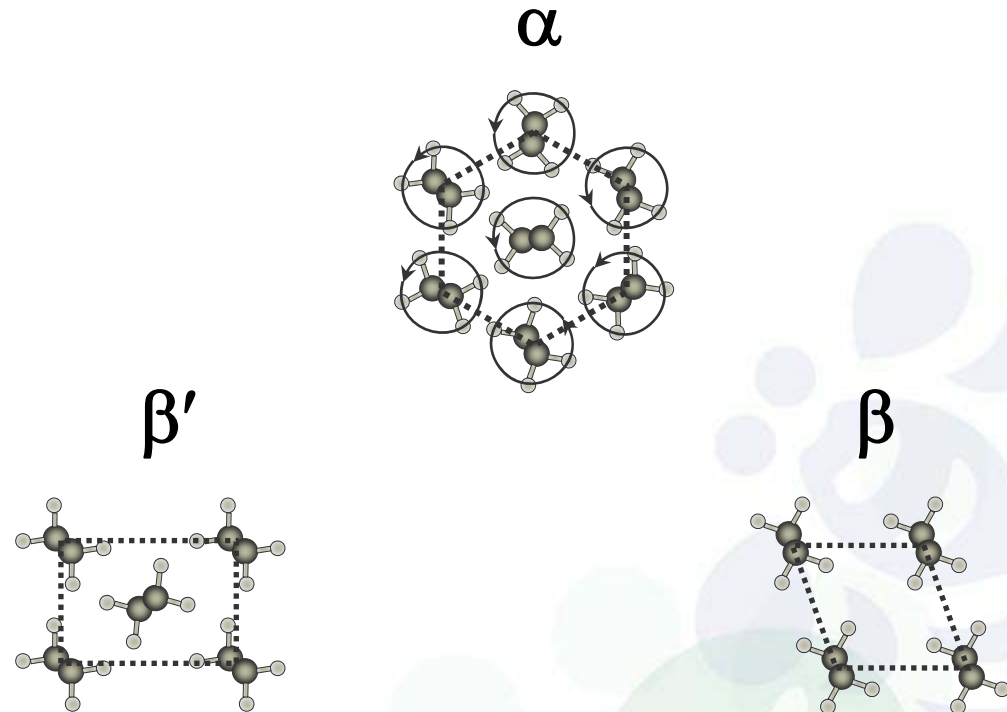
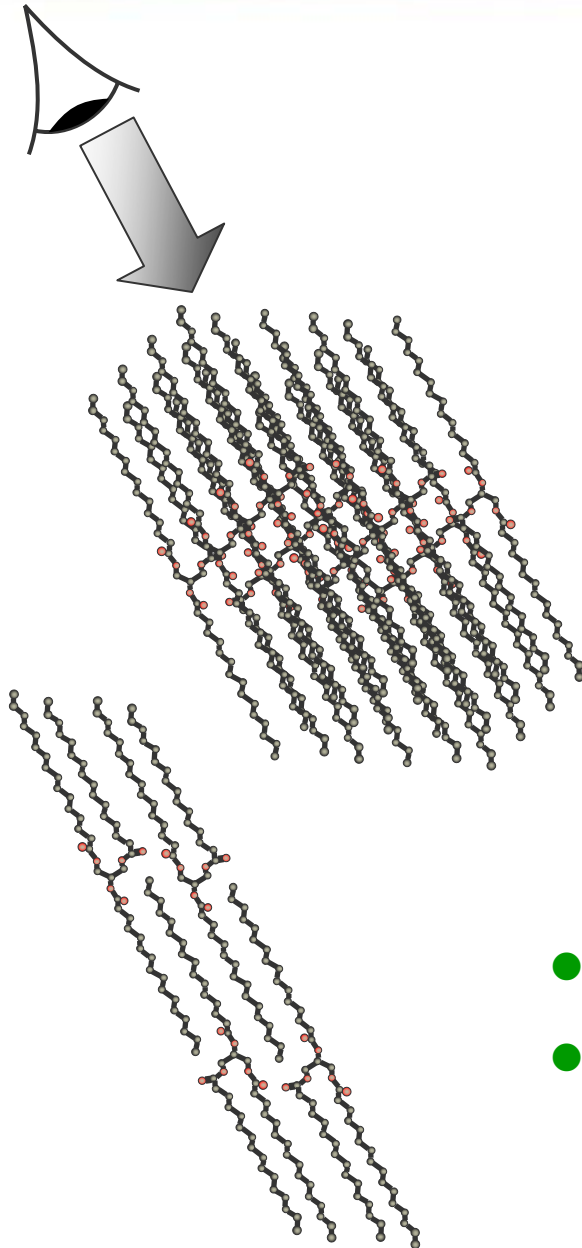


**StOSt**



**LaLaLa**

# Triacylglycerol Polymorphism



- Temper fats are stable in the  $\beta$  form
- Non-temper (and lauric fats) are stable in the  $\beta'$  form

# Cocoa Butter



- Mainly symmetrical, monounsaturated triacylglycerols: POP, POSt, StOSt
- Relative purity gives a very sharp melting profile
- But cocoa butter is stable in the  $\beta$  form, i.e. it is polymorphic and needs to be tempered.

# Cocoa Butter Polymorphism



- Still some debate as to the true number of polymorphs, five or six.
  - Named Form I to Form VI, or...
  - Sub- $\alpha$ ,  $\alpha$ ,  $\beta'$  range,  $\beta_V$  and  $\beta_{VI}$
- The important thing is to crystallise cocoa butter in its second most stable form:
  - Form V or  $\beta_V$
  - Not possible to crystallise directly into the most stable form (Form VI or  $\beta_{VI}$ )



# Cocoa Butter Equivalents



- Permitted in EU and some other countries for use as 'vegetable fats' in chocolate
- Restricted to maximum 5% of the chocolate (with some added restrictions which can reduce this even further)
- Based on the same symmetrical, monounsaturated triacylglycerols found in cocoa butter
- Highly compatible with cocoa butter

# CBE Fat Composition



- Mainly sourced from the following oils:
  - Palm
  - Shea
  - Illipe
  - Sal
  - Kokum
  - Mango Kernel

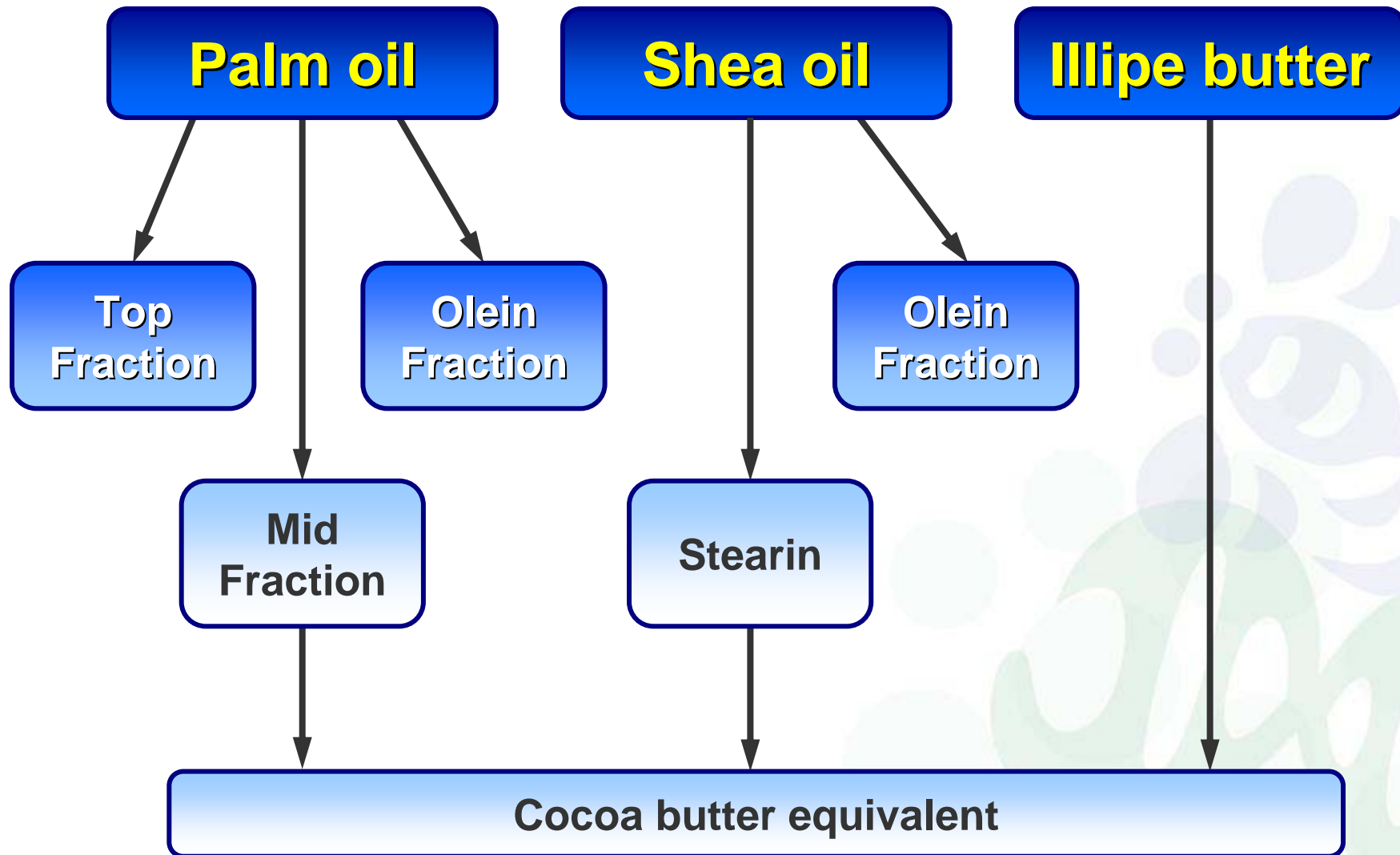


# CBE Processing



- Only permitted processes in EU are:
  - Fractionation
  - Refining
- In non-EU countries that permit the use of CBEs, enzymically-catalysed interesterification may be permitted in their production
- Hydrogenation is not generally used, hence CBEs do not normally contain trans fatty acids

# CBE Composition



# Cocoa Butter and CBE Composition

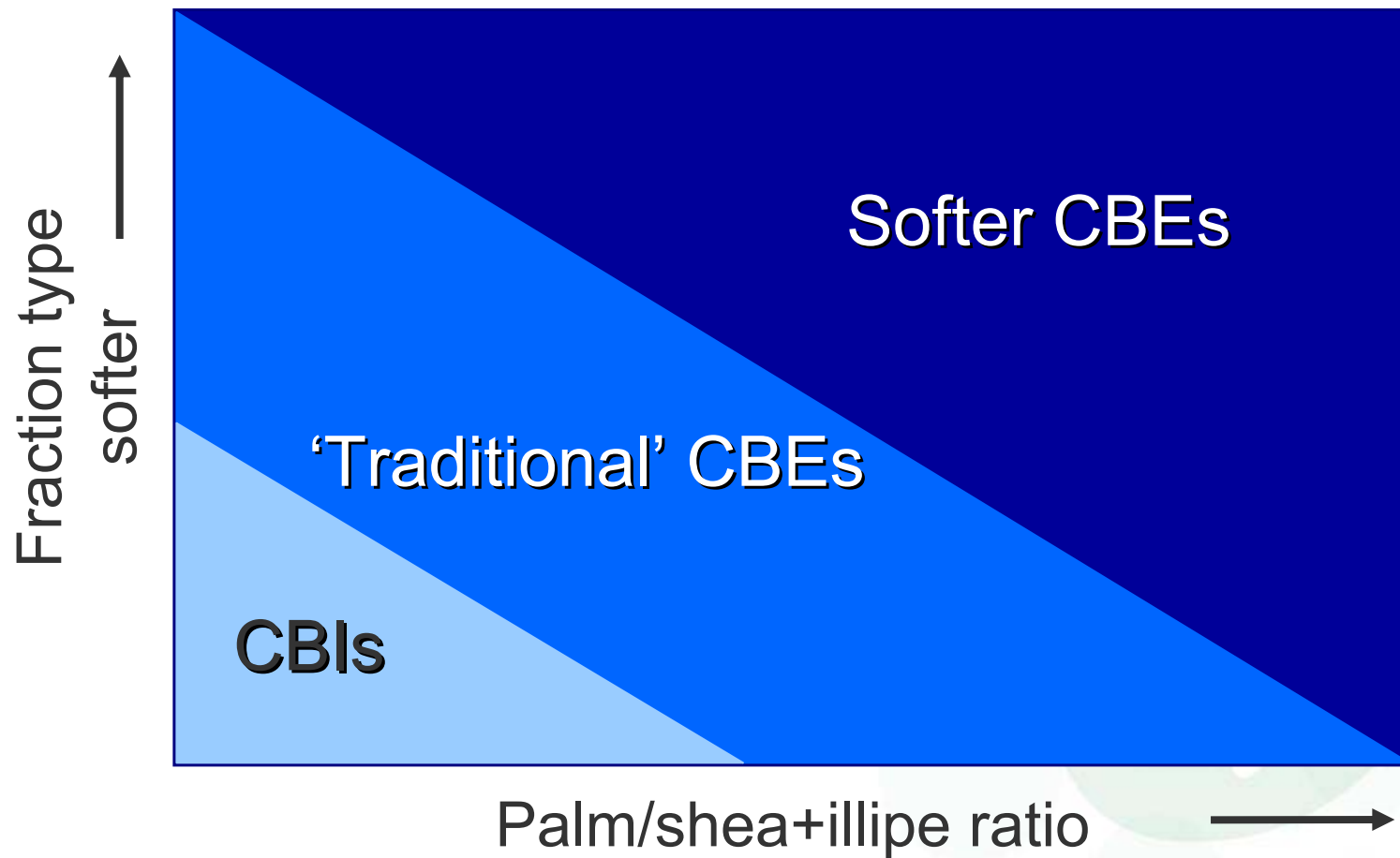


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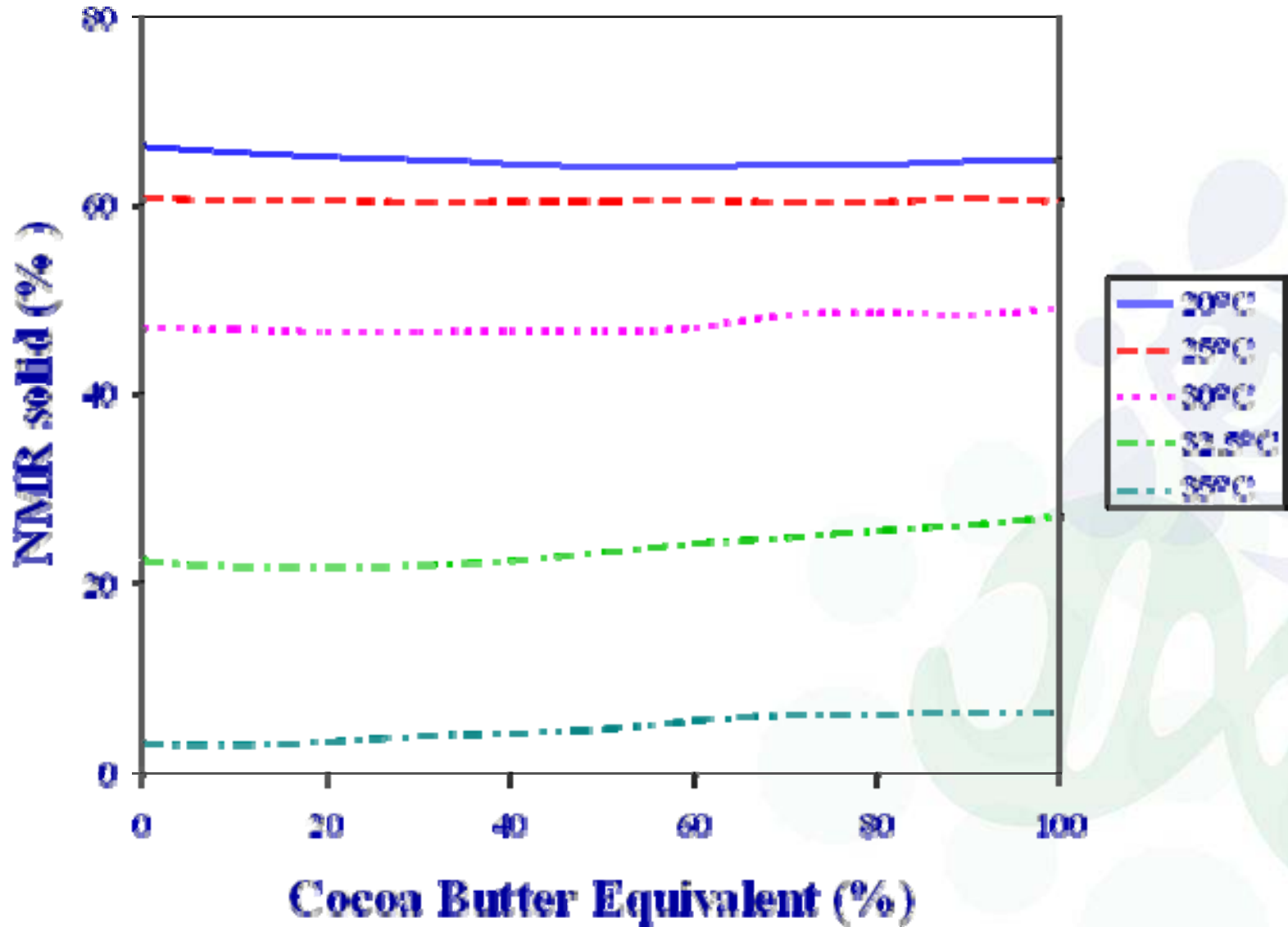
	<b>Cocoa butter</b>	<b>Palm fraction</b>	<b>Shea fraction</b>	<b>Illipe</b>	<b>Sal fraction</b>	<b>Kokum</b>	<b>Mango kernel fraction</b>
<b>POP</b>	<b>16</b>	<b>66</b>	<b>1</b>	<b>7</b>	<b>Trace</b>	<b>Trace</b>	<b>1</b>
<b>POSt</b>	<b>37</b>	<b>12</b>	<b>7</b>	<b>34</b>	<b>10</b>	<b>6</b>	<b>16</b>
<b>StOSt</b>	<b>26</b>	<b>3</b>	<b>74</b>	<b>45</b>	<b>60</b>	<b>72</b>	<b>59</b>

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# Variables in CBE Formulation



# Cocoa Butter – CBE Interactions



# CBE Supercoatings



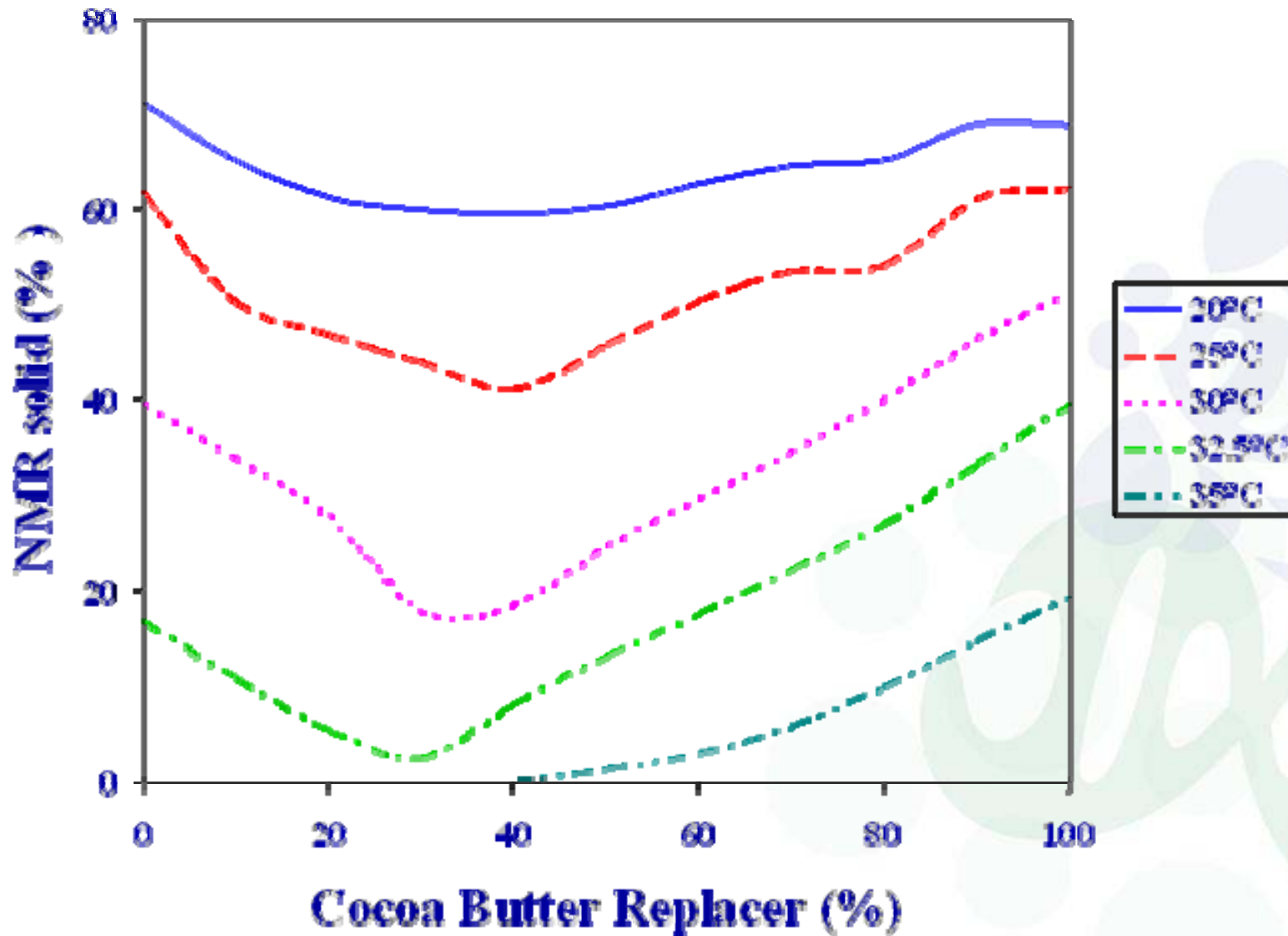
- In many countries (even those which do not permit the use of CBEs at the 5% level in chocolate) it is possible to use these types of fat at much higher levels
- In these applications the vegetable fat replaces all the added cocoa butter that would be in a chocolate
- **The end product cannot be labelled 'chocolate'**
- Suitable labelling would be for example: 'chocolate flavoured coating'



# Non-Lauric Cocoa Butter Replacers

- Produced from oils such as palm, rapeseed and soyabean – usually by hydrogenation and fractionation
- New versions are either non-hydrogenated or lightly hydrogenated to keep the trans content as low as possible
- Contain palmitic, stearic and oleic acids but in a different configuration from that found in cocoa butter
- Limited compatibility with cocoa butter

# Cocoa Butter – CBR Interactions



# Non-lauric CBR coatings

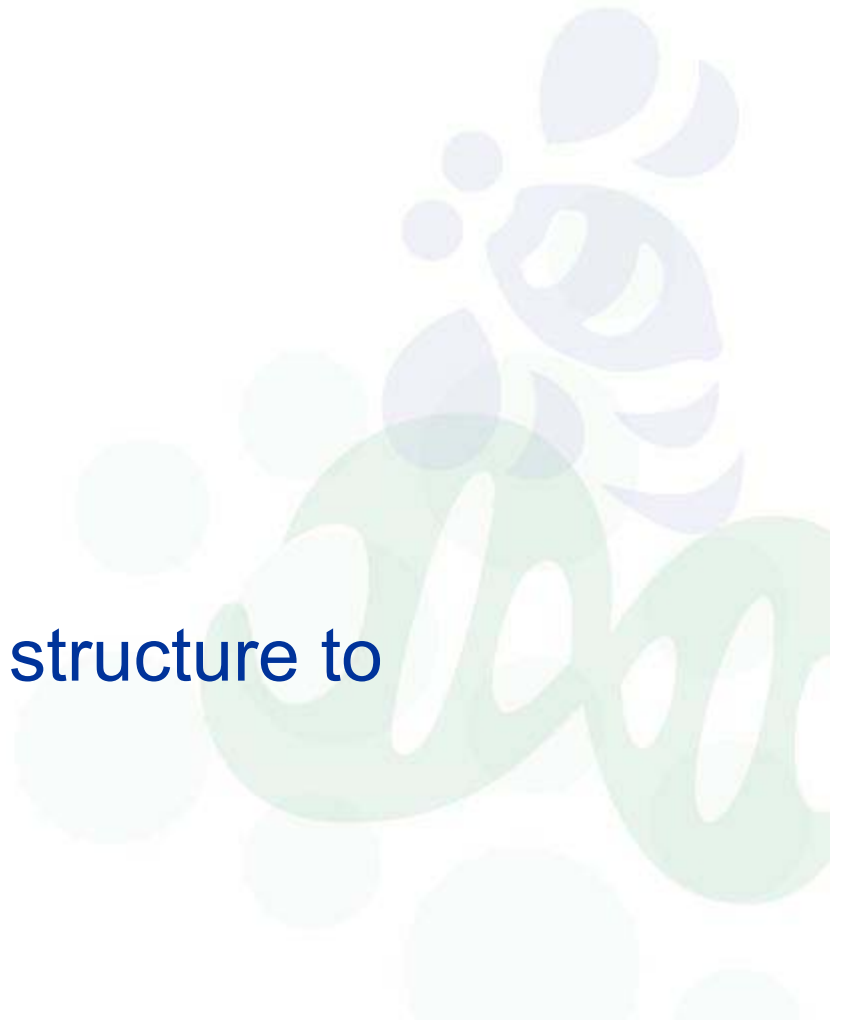


- Some tolerance to cocoa butter
- Allows up to 10% cocoa mass in the formulation (i.e. 15-17% cocoa butter on the fat phase)
- In milk coatings, the amount of milk fat plus cocoa butter in the fat phase should not exceed 20%
- Cocoa butter and milk fat have a softening effect on the end product

# Non-lauric CBRs Attributes



- Non-brittle coatings
- Flexibility in processing
- Glossy appearance
- Long shelf-life
- Sometimes used to give structure to confectionery fillings

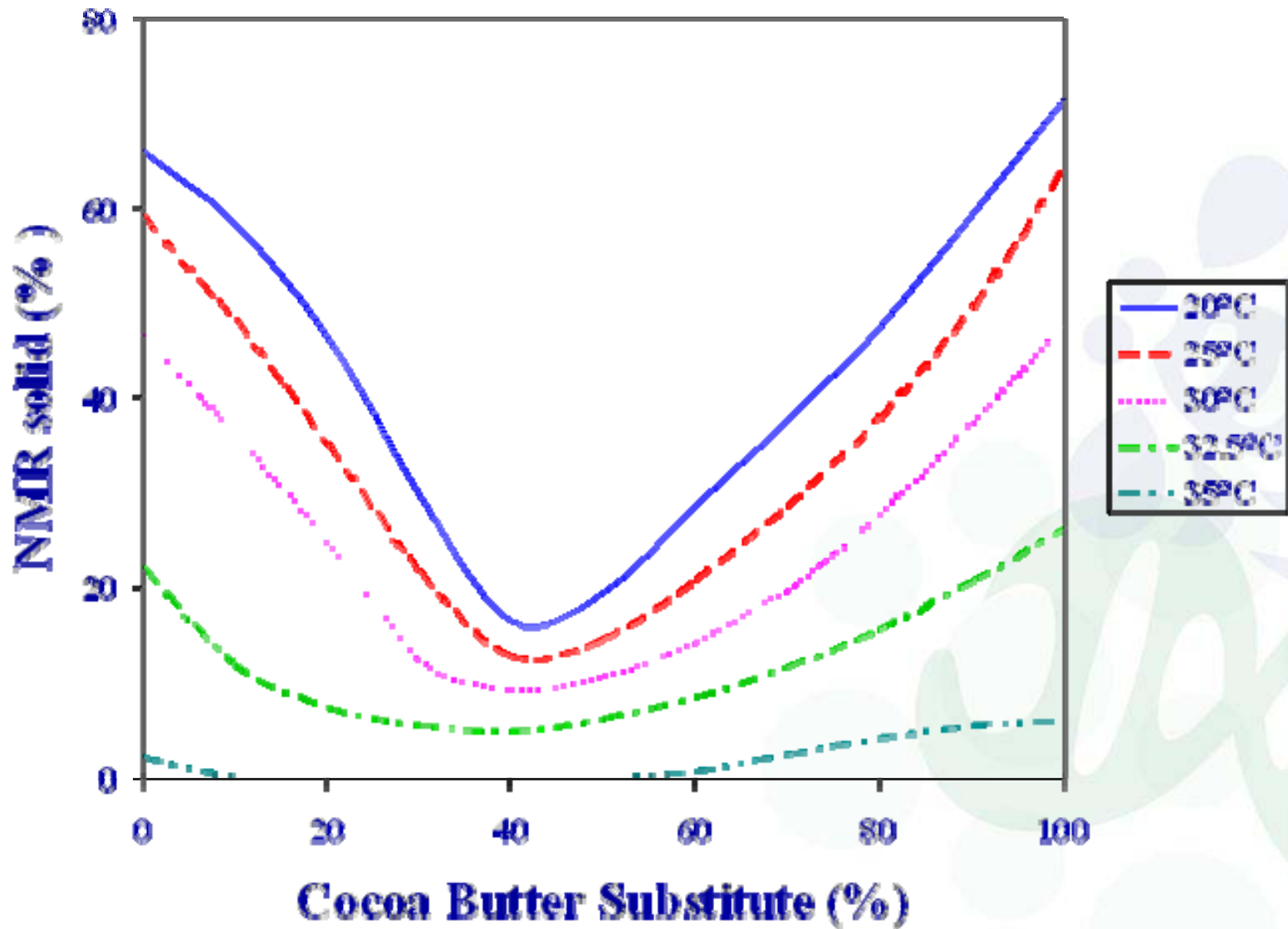


# Lauric Cocoa Butter Substitutes



- Based on palm kernel or coconut oil
- Produced by fractionation and/or hydrogenation
- Trans content either zero or low
- Completely different triglyceride composition to cocoa butter
- Incompatible with cocoa butter

# Cocoa Butter – CBS Interactions



# Lauric CBS coatings



- Effectively no tolerance to cocoa butter
- Prevents cocoa mass being used in formulation and restricts cocoa usage to low-fat cocoa powder
- Milk fat also has a softening effect – full cream milk powder should be kept to a maximum of 10%

# CBS Contamination with Chocolate



- Produce and process lauric CBS coatings in chocolate-free clean equipment
- Thoroughly clean machines, pipelines, pumps when changing between lauric coatings and chocolate
- Flush out with fat



# Problem of Hydrolysis



- Lipases cause hydrolysis of fats in the presence of moisture
- Hydrolysis liberates free fatty acids
- Main liberated acid in lauric fats is lauric acid
- Lauric acid has a soapy taste
- A soapy taste in compound chocolate based on lauric CBS occurs only in the presence of active lipase and sufficient water

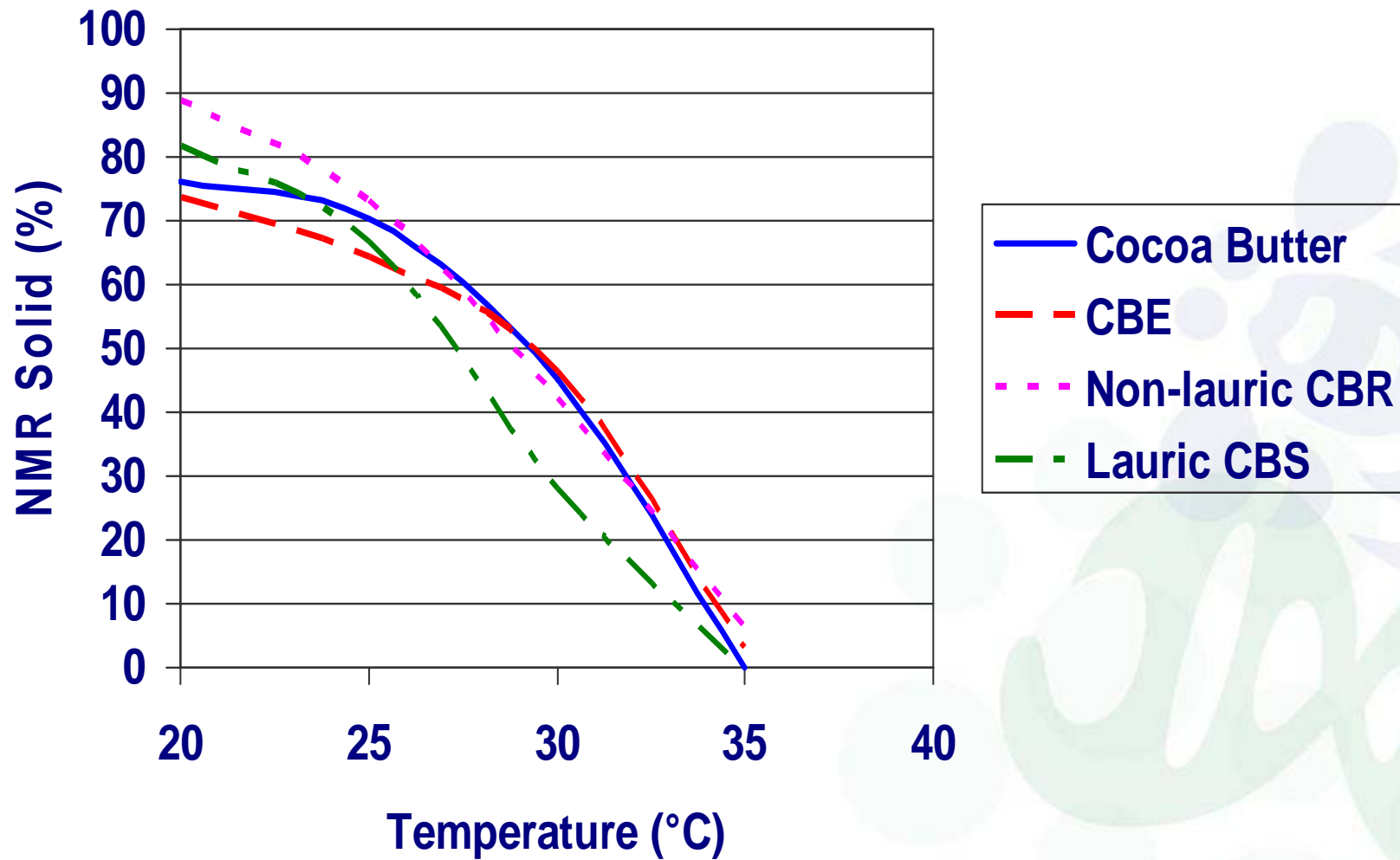
# Uses of lauric CBS coatings



- Wafer and biscuit coatings
- Home bakery coatings
- Ice cream coatings
- Thin moulded candy bars



# Melting Profiles



# Advantages and Disadvantages



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	<b>Cocoa Butter Equivalents (CBEs)</b>	<b>Non-Lauric Cocoa Butter Replacers (CBRs)</b>	<b>Lauric Cocoa Butter Substitutes (CBSs)</b>
<b>Advantages</b>	<ul style="list-style-type: none"><li>● Fully compatible with cocoa butter</li><li>● Gives desired hardness, snap, mouthfeel</li><li>● Improved heat resistance with CBIs</li><li>● Stable consistency and taste</li><li>● Non-hydrogenated</li></ul>	<ul style="list-style-type: none"><li>● Non-temper</li><li>● Taste Stability</li><li>● Possibility to incorporate chocolate or cocoa mass</li></ul>	<ul style="list-style-type: none"><li>● Non-temper</li><li>● Texture and melting characteristics like cocoa butter</li></ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"><li>● Requires sophisticated tempering</li></ul>	<ul style="list-style-type: none"><li>● Tend to become harder on storage giving inferior flavour release</li><li>● Hardness and snap not like cocoa butter</li><li>● Often hydrogenated</li></ul>	<ul style="list-style-type: none"><li>● Recipe must be virtually free of cocoa butter</li><li>● Risk of soapy off-taste and bloom</li><li>● Sometimes hydrogenated</li></ul>

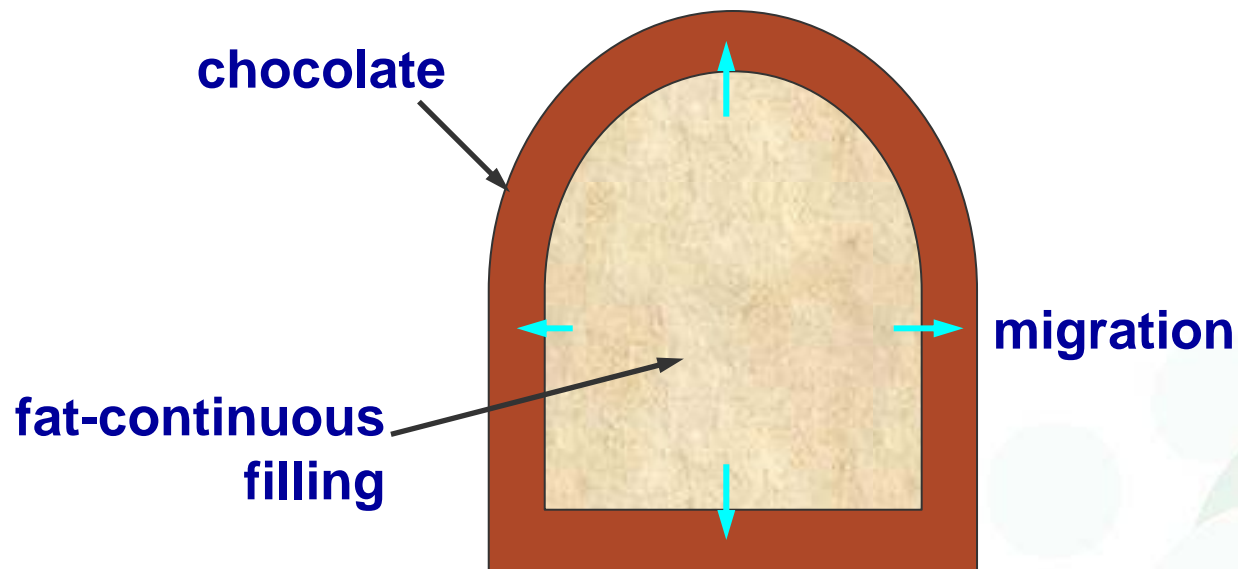
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# Filling Fats



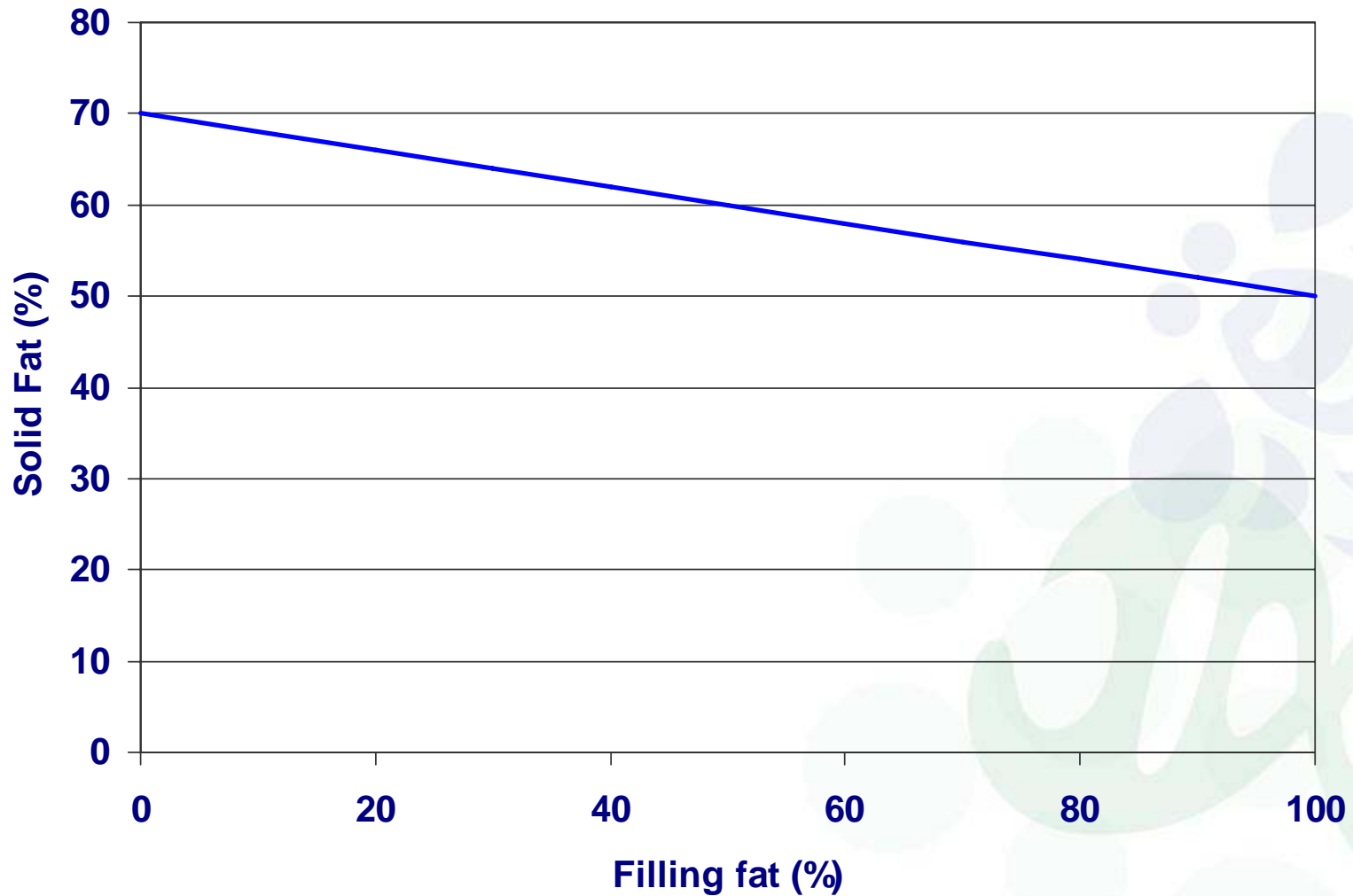
- Most confectionery filling fats fall within the same basic categories as the coating fats – **but they are softer**
  - Less solid than coating fats at the same temperature
- Based, for example, on:
  - Soft fractions of palm oil or shea oil
  - Lightly hydrogenated and fractionated soyabean or palm oil
  - Coconut oil or palm kernel oil

# Fat Migration: Chocolate-coated Pralines

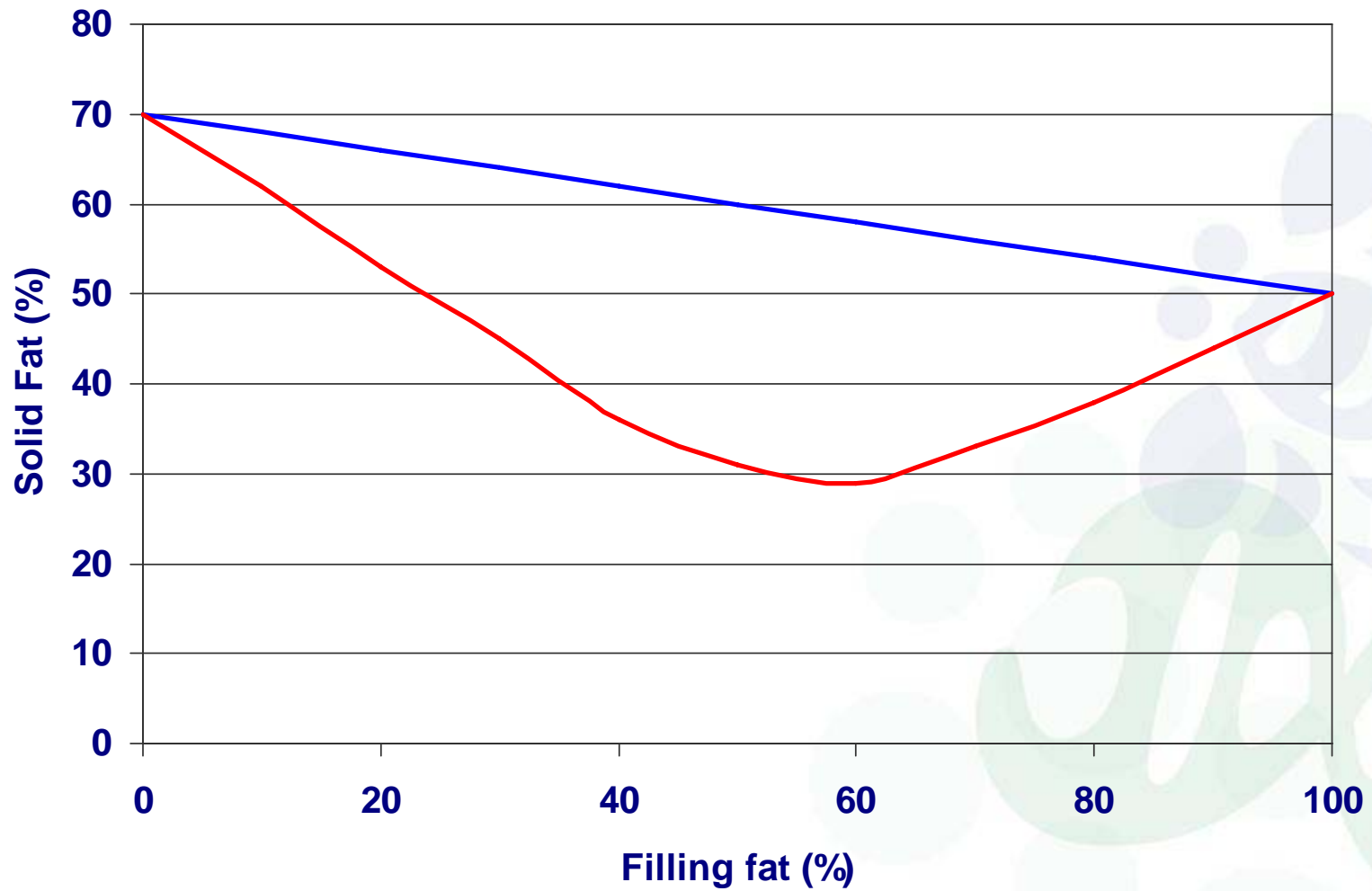


**Compatibility between filling and coating fats is very important**

# Filling Fat Migration: “Ideal”



# Filling Fat Migration: "Eutectic"

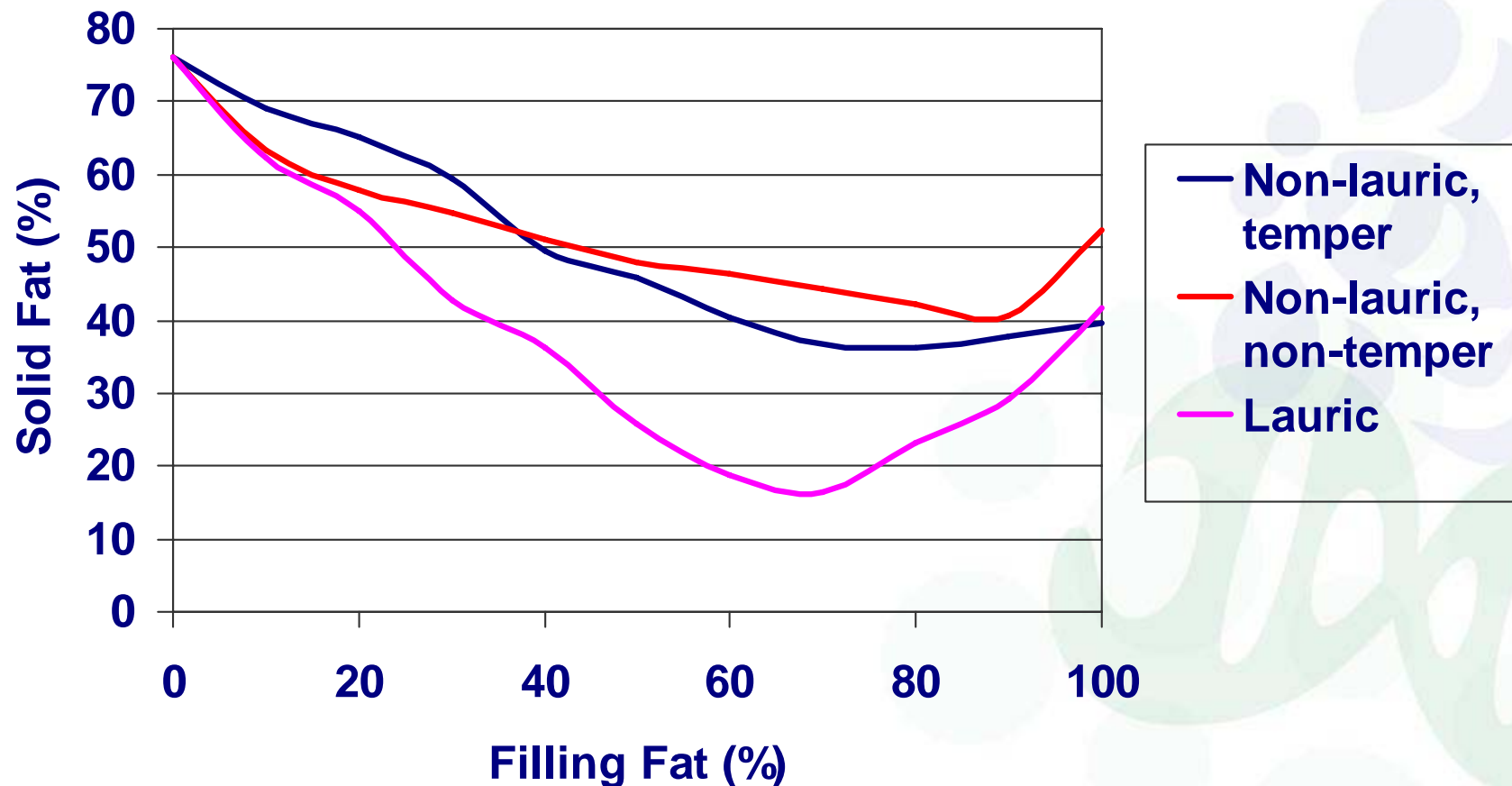




# Effect of Various Filling Fats



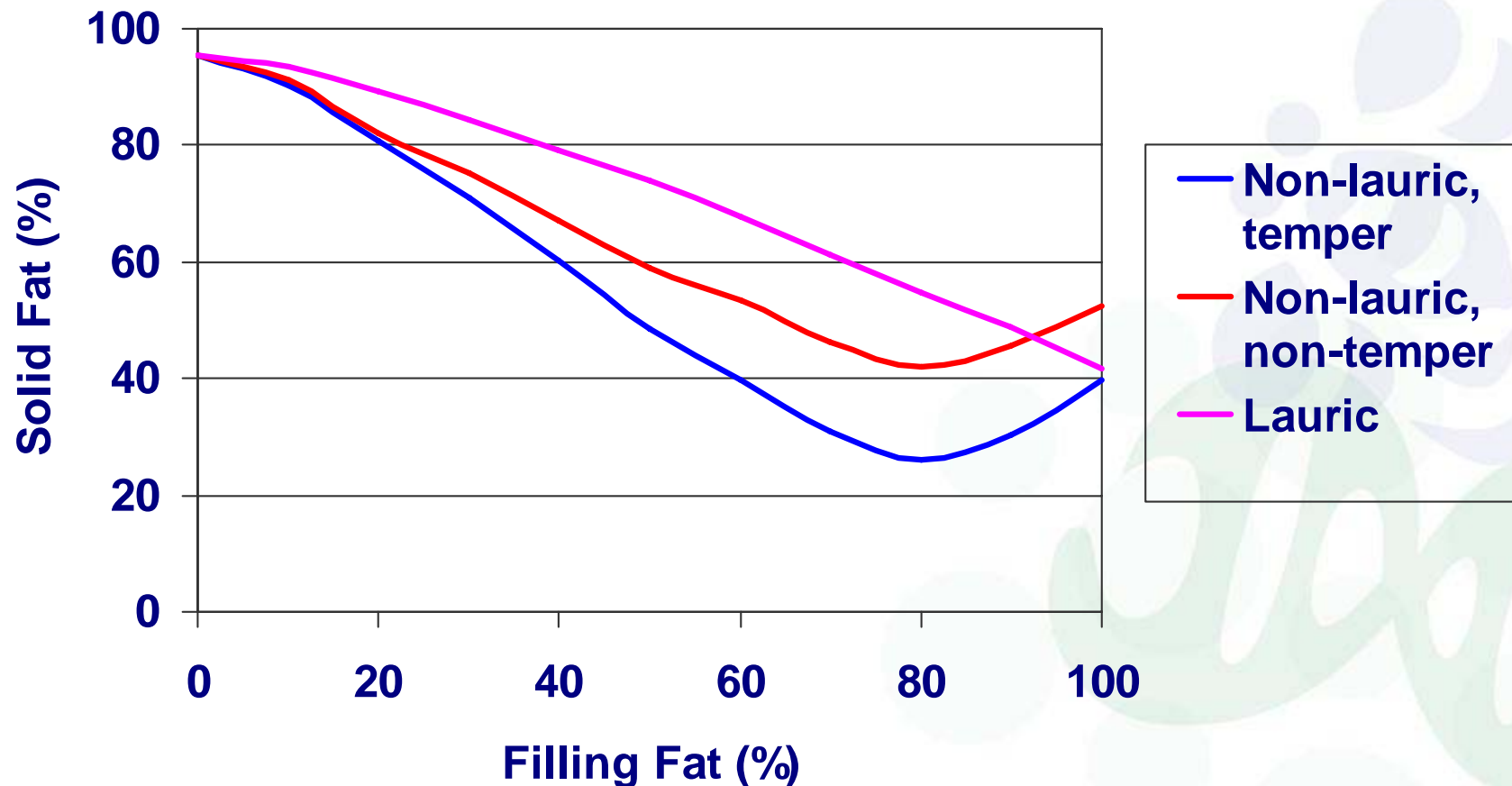
## Solid fat content (at 20°C) of **cocoa butter chocolate**



# Effect of Various Filling Fats



Solid fat content (at 20°C) of a **lauric coating**



# Coating/Filling Compatibility



- Interactions make it important to match fats used in coatings and fillings – to be same general type:
  - Chocolate with a non-lauric temper filling
  - Lauric coating with a lauric filling
  - Etc.

# Confectionery Fats

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**Thank You!**