

## **Atelier 2: Les concepts de l'industrie alimentaire**

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PhD in Plant Biochemistry (1987) – Univ. Fribourg, Switzerland

1989 – 1991 Nestlé Research Centre (NRC) Lausanne - Senior Research Scientist

1991 – 1997 NRC – Team Leader Plant Biochemistry & Microscopy

1997 – 2001 NRC Tours (France) - Team Leader Plant Biochemistry & Functionality. Group Manager of Cacao Biotechnology Research.

2001 – 2009 R&D Shanghai & NRC Beijing. Project Leader Chinese Functional Ingredients, HCN, Dairy & Innéov activities. Establish collaborations with Chinese Universities / Institutes.

From 2009 PTC Konolfingen – Ingredient Expert Vitamins & Micronutrients. Technical support to R&D & markets for premix handling, specification mastership and knowledge sharing

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## Nestlé Research

### Use of vitamin D in product formulation: technical considerations

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5<sup>th</sup> of September 2013

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## Agenda

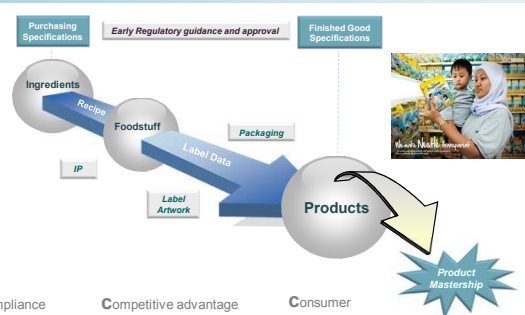
About the technical challenges to bring vitamin D fortification to consumers

- 1 Forms and synthesis of commercial vitamin D
- 2 Formulation and usage of vitamin D
- 3 Stability and potential technical issues with vitamin D

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### Product Mastery through global tracking



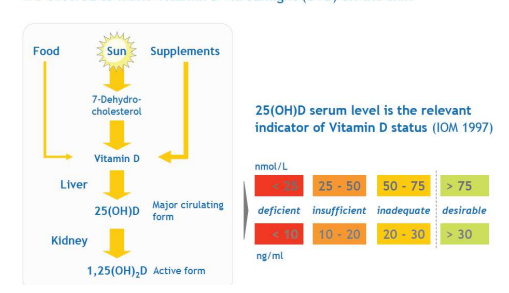
The diagram shows a process flow from **Ingredients** to **Products**. Key stages include **Recipe**, **Foodstuff**, **Label Data**, and **Packaging**. Supporting elements are **IP**, **Label Artwork**, and **Finished Good Specifications**. The process is governed by **Purchasing Specifications** and **Early Regulatory guidance and approval**. The final goal is **Product Mastery**, which impacts **Compliance**, **Competitive advantage**, and **Consumer** experience.

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### Vitamin D comes from different sources

We evolved to make Vitamin D via sunlight (UVB) on the skin



The diagram illustrates the synthesis of Vitamin D from **Food** and **Supplements** via **Sun** (UVB) on the skin. The process involves **7-Dehydro-cholesterol** in the skin, which is converted to **Vitamin D**. In the **Liver**, it is converted to **25(OH)D**, the **Major circulating form**. In the **Kidney**, it is converted to **1,25(OH)<sub>2</sub>D**, the **Active form**.

**25(OH)D serum level is the relevant indicator of Vitamin D status (IOM 1997)**

nmol/L	< 25	25 - 50	50 - 75	> 75
	deficient	insufficient	inadequate	desirable

ng/ml	< 10	10 - 20	20 - 30	> 30
	deficient	insufficient	inadequate	desirable

Source: DSM, 2012

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### 2 vitamin forms commercially used

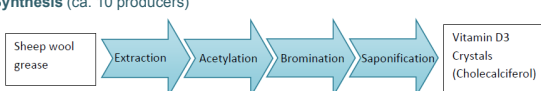
	Vitamin D3 (Cholecalciferol)	Vitamin D2 (Ergocalciferol) (essentially only for India)
<b>Description</b>	Clear oil Free flowing powder	Free flowing powder
<b>Chemical stability</b>	Ok	Unstable in presence of trace elements
<b>Bioavailability</b>	Ok	Ca. 100% less bioactive than D3 (Heaney et al. 2011)
<b>Classification</b>	Fat-soluble	
<b>Appearance</b>	Powder and oily liquid	
<b>Unit at Nestlé:</b>	µD/100g	
<b>International Unit:</b>	1 µg Vitamin D = 40 IU	
<b>Commercial availability of natural form</b>	<input type="checkbox"/> yes <input checked="" type="checkbox"/> no	
<b>Non - GMO</b>	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no	
<b>Allergen</b>	Pure Vitamin is non-allergenic.	

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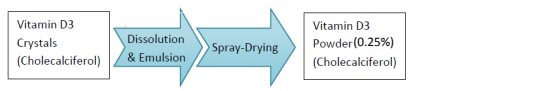
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### Synthesis and formulation of vitamin D3

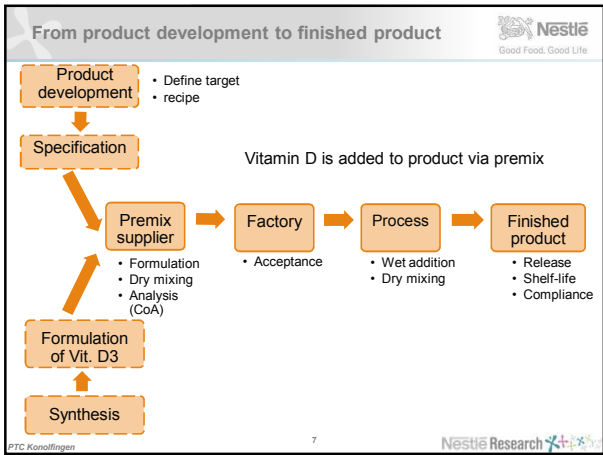
➤ **Synthesis** (ca. 10 producers)



➤ **Formulation**



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**Stability of vitamin D**

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**Vitamin D3**

- generally quite stable (heat)
- Sensitive to light, trace elements, oxygen




**Vitamin D2**

- Less stable than vitamin D3 (Huber & Barlow 1943; Houghton & Vieth 2006)
- Particularly sensitive to trace elements (oxidation)

**Vitamin D form can affect processability**

- Dispersible versus non-dispersible vitamin D
- loss of vitamin D in process (sedimentation)



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