Enzyme Applications in Food Industry

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Processed Foods for Nutrition Security

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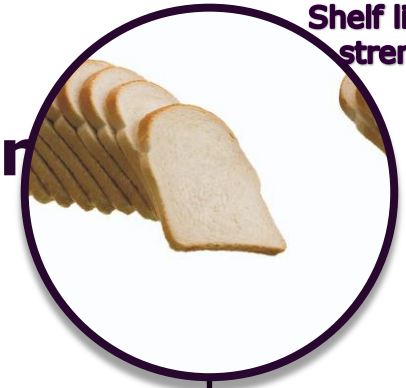
Strong winds of change in the food industry – demand for New Product Development

- ***Health and Wellness:Ourselves and environment***
  - Obesity is becoming *the* dominating public health concern.
  - Consumers increasingly link food to health – and act accordingly!
- ***Food Safety:***
  - Contaminations get strong media headlines.
  - New knowledge can force industry changes (i.e. trans-fats).
  - Perceived risks of global pandemics and bioterrorism.
- ***Sustainability***
  - Soaring input prices (food raw materials and energy).
  - Climate concerns – food production contributes substantially to CO_2 emissions (FAO)

Food Preservation



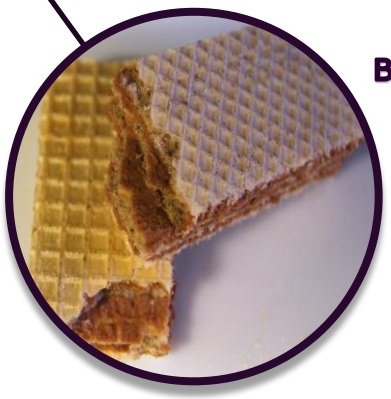
Shelf life and dough strengthening

Fruit firming

Shelf life in cakes

Bioinnovative solutions in food

Inclusion of wholegrain



Batter viscosity

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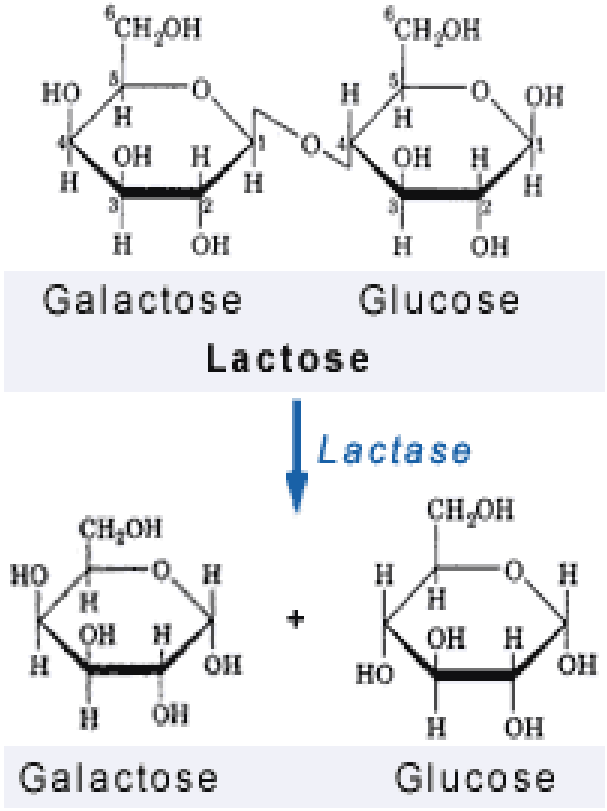
Opportunities in Dairy Industry

***Lactase*-Solution For Lactose Intolerant Consumers**

- Milk can be tolerated by lactose intolerant consumers using ***Lactase***
- The milk becomes sweeter
- **Lactozyme ® Pure** treated milk can be consumed by lactose intolerant consumers.



***Phospholipase*-Diverse Applications In Dairy**

- Reduction of surface tension in milk
- Improves cheese yield (**YieldMAX®**)
- Improves heat stability of beta-lactoglobulin
- Improves emulsion stability
- Improved milk powder / concentrated condensed milk production and its properties

Lactose Oxidase-Improves Shelf life of milk

- Eliminating oxygen
- Produces H_2O_2
  - Must be eliminated in final product

Lactose oxidase: $Lactose + O_2 \rightarrow Lactobionic\ acid + H_2O_2$

Catalase: $H_2O_2 \rightarrow H_2O + ½\ O_2$

Lacto YIELD® is promoted by Chr Hansen

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Opportunities in Fruit Preservation and Juice Industry

Control of aesthetics is essential in many processed foods containing fruits and vegetables

During processing and/or freezing most fruits and vegetables looses most of their natural firmness

- Product will splatter out
- Syneresis will make the product look watery
- The bite will be bland

- Citrate and hydrocolloids can strengthen the structure
- Must be labeled in most countries

Fruit Firming Using Enzyme

Benefits

Higher yield of good-quality fruit after processing

Improved retention of the natural shape of the fruit

Fewer texturants needed

Increased juice retention

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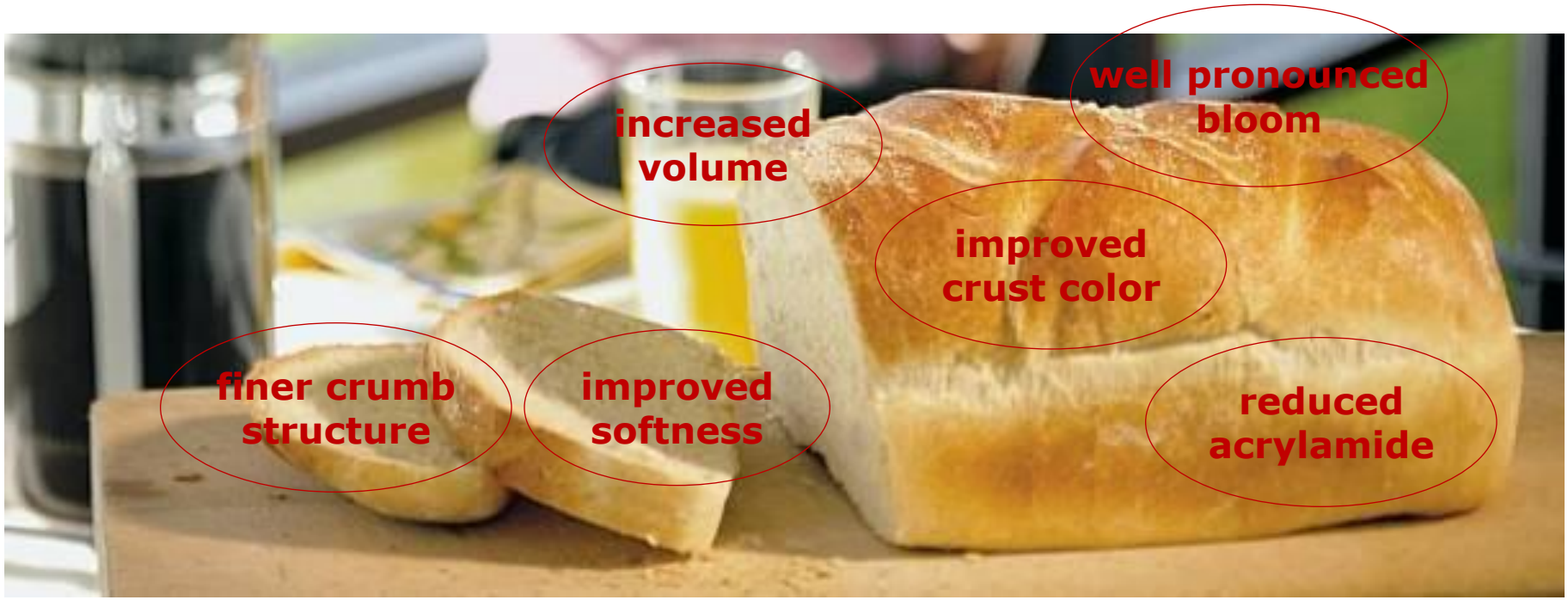
Baking

Baking Applications-Bread, rolls, buns

- Many properties can be affected



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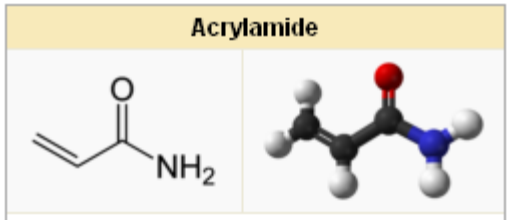
Acrylaway®

-a natural solution to a natural problem

An update on acrylamide in food and global implementation of Acrylaway

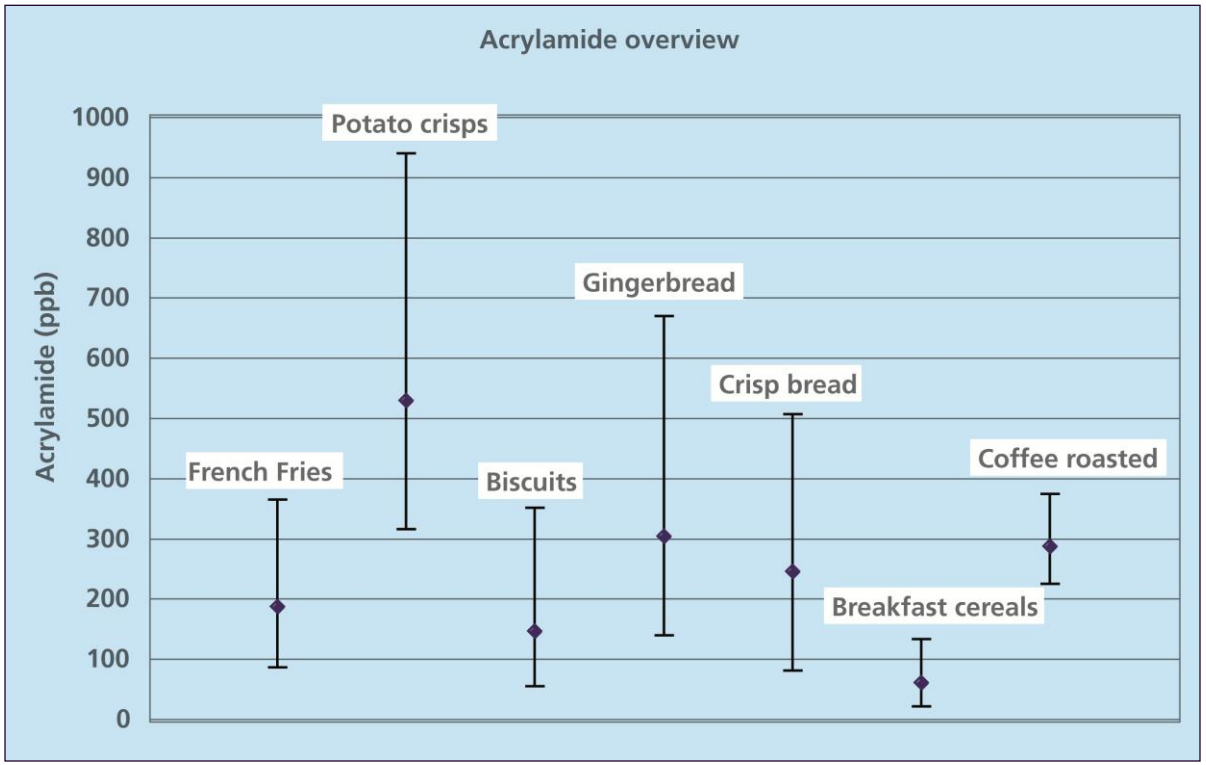
Acrylamide is a contaminant naturally formed in many food products

- Acrylamide is formed naturally in foods as a by-product during frying or baking at temperatures in excess of 250 °F/ 120 °C and at low moisture



IUPAC name : prop-2-enamide

Acrylamide is found in many food products

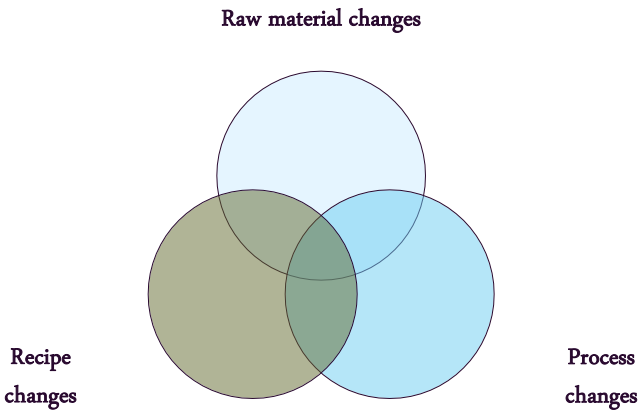


Measured acrylamide content (ppb) in different food categories. Legends shown: Median, 1st quartile, and 3rd quartile.

Source: www.irmm.jrc.be/html/activities/acrylamide

Different tools exist to reduce acrylamide, however, so do other end product and brand considerations…

CIAA has issued an acrylamide mitigation "Toolbox"



- The enzyme *asparaginase* has its own section in the toolbox
- Toolbox endorsed by GMA (US)

CIAA : The Confederation of the Food and Drink Industries of the EU, see www.ciaa.be

End product and brand considerations

Maintain chemical safety

Maintain microbial safety

Maintain nutritional qualities

Maintain organoleptic properties and associated consumer acceptance

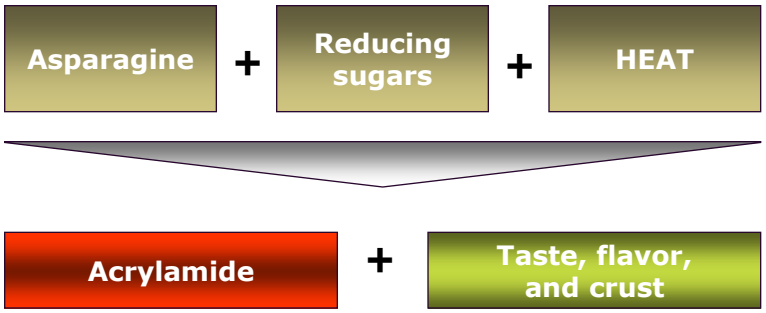
Texture
Taste
Flavor

Acrylaway® reduces acrylamide, but does not impact taste, flavor, and appearance

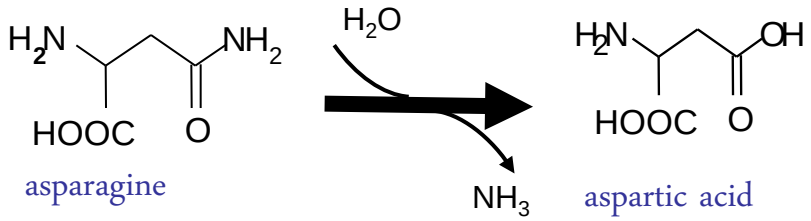
- Acrylamide is mainly formed in food as part of the Maillard reaction…

…and so is the desired brown crust, taste, and flavor which starchy baked and fried products are known for

Simplified Maillard principle



- By converting asparagine into aspartic acid, Acrylaway can effectively reduce the level of acrylamide without changing the taste and appearance of the end product



Reaction of Acrylaway

Conclusions

- Food enzymes and other white biotechnology products have already made a big impact and will help the food industry to meet consumers' demand for change.

- However, development of new biotechnological solutions takes some time – i.e. we must anticipate the future demands today and with Regulatory approvals in India can move for sustainable solutions!

Challenges

- Fragmented market in India
- Government mandate for sustainable solutions

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The benefits of using enzymes outbalance the environmental load of producing the enzymes

CO_2 COSTS PRODUCING 1KG ENZYME:
PLUS : 1-10 KG

CO_2 SAVINGS USING 1 KG ENZYME IN THE MANUFACTURING OF CONSUMER PRODUCTS :
MINUS :

30 KG

ANIMAL FEED

40 KG

LEATHER

100 KG

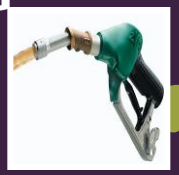
TEXTILES

150 KG

DETERGENT

200 KG

FOOD

300 KG

BIOETHANOL

UP TO 600 KG

PAPER

1,300 K

OILS & FATS

3,400 K

BIOCATALYSIS

3,800 K

CEREAL FOOD

Thank you

Enzyme Applications for Better life and Cleaner Environment

We All Can contribute Towards It by Awareness and Promotion