

Cochran 2022

Explore Experience Inspire





 **The World without Livestock**

About Us



“Meat Avatar” using the innovative food technology to develop our Plant-Based Meat products to be as tasty and nutritious as real meat at affordable prices.

We hope that people will enjoy their dishes with our Plant-Based Meat products, at the same time, feeling nice about their health and environmental sustainability.



KEY INGREDIENTS



Bean



Shitake



Pea



Pomegranate



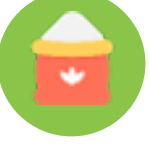
Rice



Coconut Oil



Beetroot



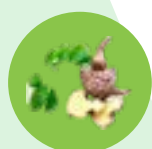
Yeast



Carrot



Malt



Konjac



Pumpkin



100%
PLANT BASED
INGREDIENTS



PRODUCTS





Patty & Meat Ball



Supply Side West

39/26



What consumers seek

- Fats and oils – no longer 4-letter words to be shunned
- The amount of fat (70%) and the type of oil (67%) steer purchases of packaged foods
- Olive, avocado, and coconut oils top impact on purchase because of perceptions of healthfulness
- "No saturated" claim is very influential
- Ketogenic concepts: high-fat, low-carbohydrate
- "Fried" continues to be a bad word but people LOVE fried foods
- Sustainability sets the standard for consumers

38/26



**CLEAN
FOOD
GROUP**

Palm oil alternative made from fermented yeast prepares for 2023 launch in Europe



GO RESOURCES

Bio-based super high oleic safflower oil to replace replacing petroleum and palm oil-based ingredients



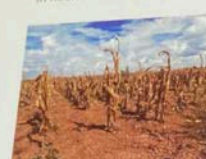
Algarithm®

**NATURESCROPS
INTERNATIONAL**

Regenerative agricultural practices with fish-free DHA to create an all-in-one omega-3 solution



In fact, global warming and greenhouse gas concerns continue to cause disruption within the food category as food production is currently responsible for 26% of greenhouse gases and plays a major part in habitat destruction and freshwater consumption which is prompting consumer behavior change



"I have personally changed my behavior to minimize my affect on global warming"

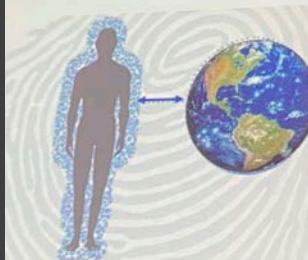
General population: 61%
❖ Up from 41% in 2012

"I am interested in learning what companies are doing to prevent global warming and reduce greenhouse gases"

General population: 39%
❖ Up from 36% in 2012

68% of the population feel "global warming is a major problem that needs to be addressed quickly", a +20% growth from 57% in 2013

The market movement toward plant-based products has expanded from beverages to supplements and even to packaging



Drivers of this movement stem from two foundational beliefs:

- ✓ plant-based nutrients are healthier for my body
- ✓ plant-based solutions are healthier for the planet

40/26



Product developer needs

- Functionality – can it replace animal fats?
- Mimic traditional textural and flavor experiences – succulence!
- Nutrition and fortification (micronutrients)
- Source and how it is sourced/processed
- Sustainability claims
- Clean label implications
- Cost and availability
- Resonance with consumer expectations

Supply Side West

- Gummy
- Capsule
- Supplementary
- Immune



Food Ingredients 21th Century

Food Processing Industry

U.S Business model: low-cost food

- 4% gross
- 2% net profit

Large Volume / low margin

- Process adds a greater Value

Major differences between fresh and processed

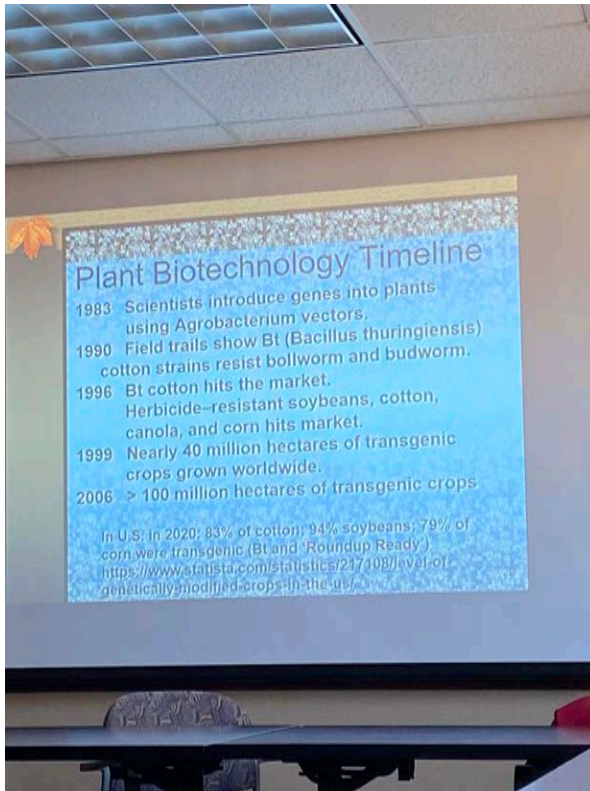
- control of handling and **retail losses => what can we do with this business => make it sustainable business model**

Recent yearly trends for new food products entries

(7 years data to 2018)

Blue Zones => Geographic for longevity living people in that zone

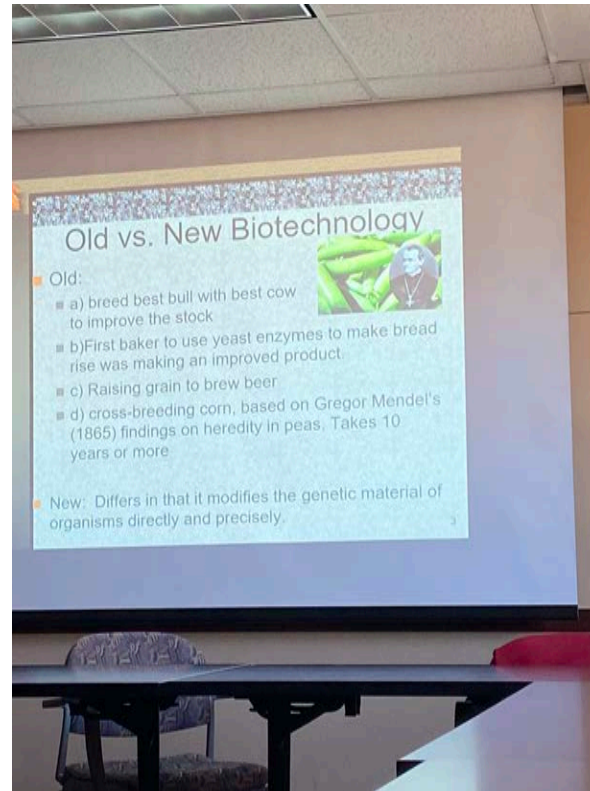
BIO TECHNOLOGY & GMO



Plant Biotechnology Timeline

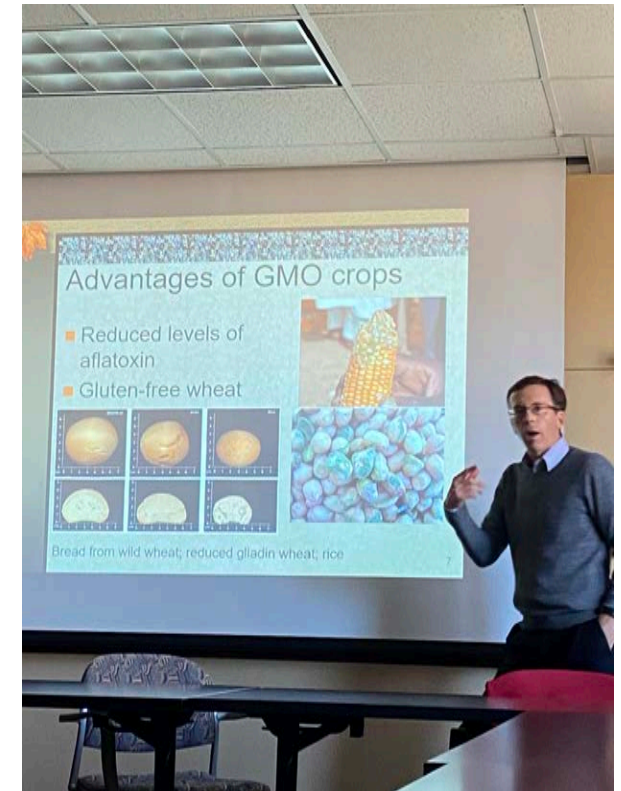
- 1983 Scientists introduce genes into plants using *Agrobacterium* vectors.
- 1990 Field trials show Bt (*Bacillus thuringiensis*) cotton strains resist bollworm and budworm.
- 1996 Bt cotton hits the market. Herbicide-resistant soybeans, cotton, canola, and corn hits market.
- 1999 Nearly 40 million hectares of transgenic crops grown worldwide.
- 2006 > 100 million hectares of transgenic crops

In U.S. in 2020: 83% of cotton; 94% soybeans; 79% of corn were transgenic (Bt and 'Roundup Ready')
<https://www.statista.com/statistics/217108/level-of-genetically-modified-crops-in-the-us/>



Old vs. New Biotechnology

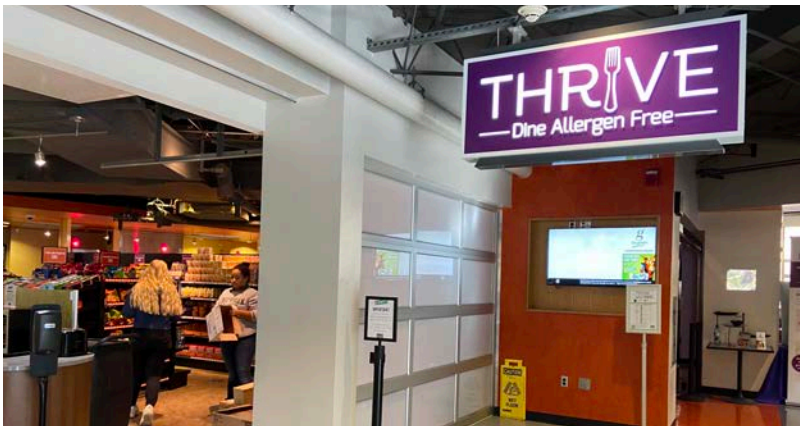
- Old:
 - a) breed best bull with best cow to improve the stock
 - b) First baker to use yeast enzymes to make bread rise was making an improved product
 - c) Raising grain to brew beer
 - d) cross-breeding corn, based on Gregor Mendel's (1865) findings on heredity in peas. Takes 10 years or more
- New: Differs in that it modifies the genetic material of organisms directly and precisely.



Advantages of GMO crops

- Reduced levels of aflatoxin
- Gluten-free wheat

Bread from wild wheat; reduced gliadin wheat; rice



Non-Allergen Canteen



Dairy Plant

Value Added Processing of Dairy Products

Vitamin in the dairy product

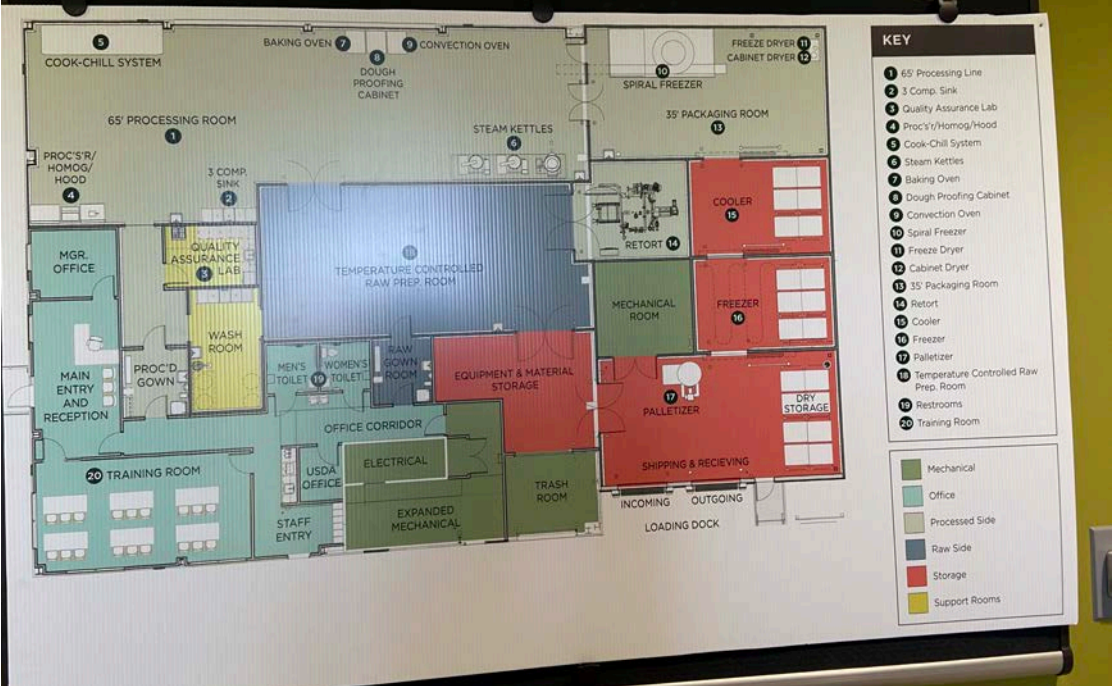
Vit D

Vit B12

Sentenarian Leaf (Seaweed)

Brewer yeast

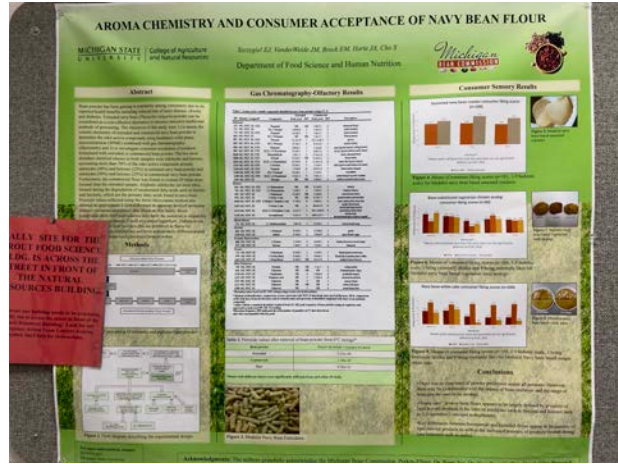
Food Processing Innovation Center



Sensory

- Clear scent
- Carbonate water
- Warm water
- Cracker
- Carrot
- Milk

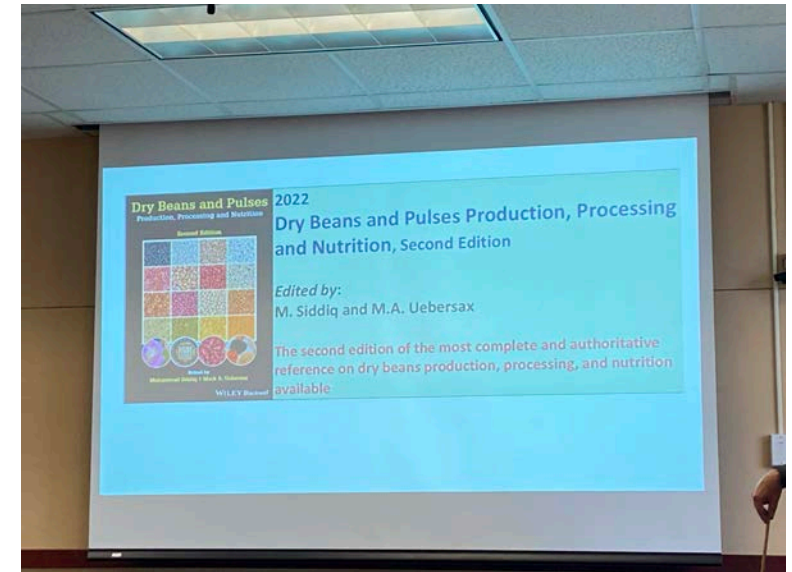
Goodscents.com
Flavornet.com



Global Bean and Pulse Industry

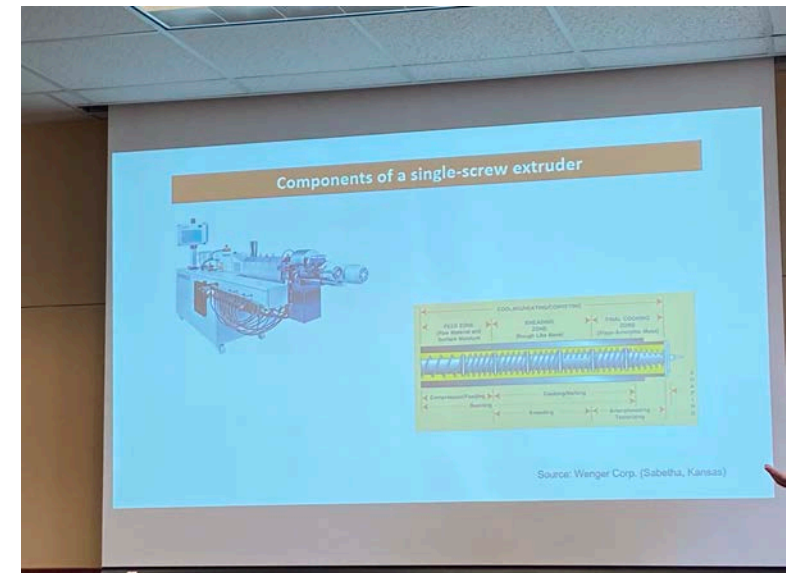
Nutritional profiles of dry beans and major grains (per 100g)

Energy & Nutrients	Dry Beans	Wheat	Oat	Corn	Sorghum
Energy (Kcal)	333	339	389	361	339
Protein (g)	23.58 ↑	13.7	16.89	6.93	11.3
Carbohydrates (g)	60.01 ↓	72.57	66.27	76.85	74.66
Dietary fiber (g)	24.9 ↑	12.2	10.6	7.3	6.3
Fat (g)	0.83 ↓	1.87	6.9	3.86	3.3
Iron (mg)	8.2 ↑	3.88	4.72	2.38	4.4
Potassium (mg)	1406 ↑	405	429	315	350
Folate (μg)	394 ↑	44	56	25	0



Functions of Protein in Foods

Functionality	Applications
Solubility	Beverages
Water absorption & binding	Meats, sausages, breads, cakes
Viscosity	Soups, gravies
Gelation	Meats, curds, cheese
Cohesion-adhesion	Meats, sausages, baked goods, pasta products
Elasticity	Meats, bakery
Emulsification	Sausages, bologna, soups, cakes
Fat absorption	Meats, sausages, donuts
Flavor binding	Simulated meats, bakery
Foaming	Whipped toppings, chiffon desserts, angel food cake



Global bean & Pulse Industry

Symbiotic Nitrogen Fixation (SNF)

rhizobia bacteria => ดึง N₂ จาก อากาศ

“Kidney Bean” *****

Production

Storage and Handling => water will effect

Physiological Properties

Nutritional Enhancement

Process Modification

Thermal inactivation:

Extraction / Concentration

- Air Classification
- Aqueous
- Membrane

Value-added Processing

Packing

Canning

Precooked Products (60%)

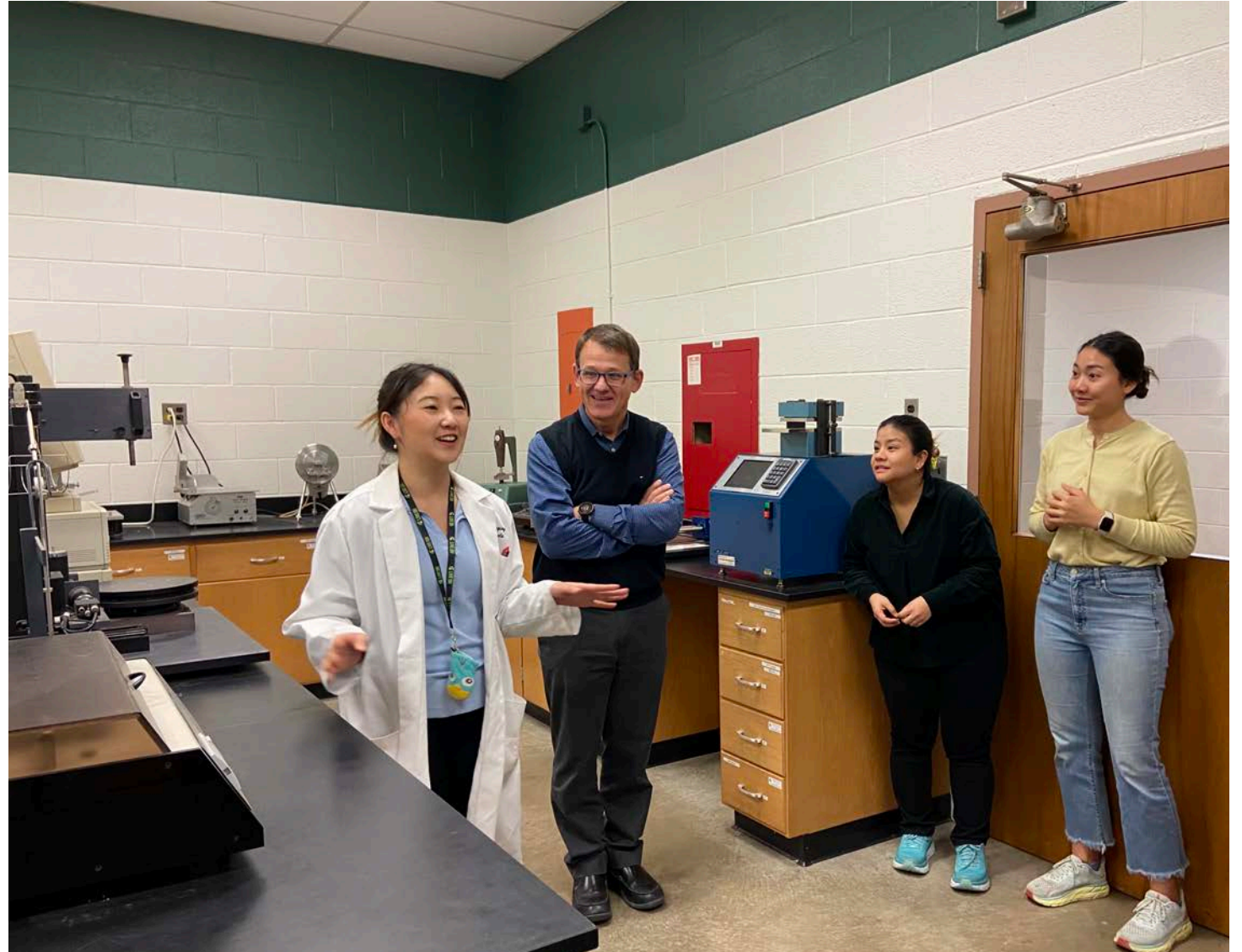
- Pin Milled
- Air Classified
- Fractions (Protein, Starch, Fiber)

Milled flours Concentrates (90%)

- Wet Extraction
- Ultra filtration Isoelectric ppt
- Protein Isolates

Protein Hydrolysis

Packaging



Design the right packaging for the right product To preserve environment (trade off between advance)

Innovative Food Ingredient Trends for Product Development

Current Trend

- Cut Sodium
- Low Sugar
- Gluten Free
- High Fiber Food

Innovative Food Ingredient Trends for Product Development

Salt

- metallic notes
- effect to texture: processed meat (extract meat protein from meat muscle), bread

How to lower salts content

- High purification & crystalline structure of NaCl (*lower density salt flake with greater surface area 33% reduction)
- Salt microspheres (20-25% Na reduction)
- Sea salt-reduce Na by Replacing it with other minerals K, Mg, Ca

Sodium Reduction Principles

- Wide range of salt replacers but the cost!!
- Taste modifiers
- ***Trick the sensory

Innovative Food Ingredient Trends for Product Development

Popular Option

- NaCl + KCl => 30-50% but bitter note / metallic note
- enchanting flavor
 - garlic, onion
 - low concentration of vinegar / citric
 - Dairy (whey or milk) permeates => calcium increase salty taste
 - Smoky note also help
- Umami
 - “Savory” (not salty) taste of broken down proteins (small peptides & amino acids) and nucleotides (Hydrolyze Proteins)
 - Naturally
 - cheese, meat , fish => protein
 - seaweed, tomatoes, mushrooms => high in glutamate
 - yeast extracts: => Cell => DNA => nucleotides
- “Toolbox” approach
 - KCl combine with other ingredients e.g. yeast extract about 20-30%

What harm people ? NaCl or Salty taste

Innovative Food Ingredient Trends for Product Development

Sugars & Sweeteners

- Develop color
- Texture or mouth feel
- Moisture retention
- Control A_w : shelf life, safety

Alternative sweetener

Sugar = Sucrose

Sugar replacement concern about Sweetness Equivalence (compare to sugar = 1 index) / Calories / Solubility / Glycemic Index

Monosaccharides e.g. Glucose, Fructose

Disaccharides e.g. Sucrose (sugar cane), Maltose,

Oligosaccharides e.g. Maltodextrins, Inulin

*** Polyols (Alcohol of sugar) e.g. Xylitol, Sorbitol => sweet as sugar, low cal, but cool sense

Innovative Food Ingredient Trends for Product Development

HIS (High intensity sweetener)

Issues with

- Slow onset or longer linger
- sugar is very quick gone sweet taste

Sweet Proteins (sweeter than sugar, heat & ph stable, no bitter aftertaste, GI = 0, water soluble)

Brazzein

Thaumatococcus

Monellin

Sweet Modifiers

Innovative Food Ingredient Trends for Product Development

Gluten & Gluten-free

2 Proteins (Gliadins, Glutenins)

Gluten free product

- Processing: machinability
- Taste, Texture & Appearance: Dry
- Shelf Life: shorter
- Nutritional profile:

Gluten Free Solutions

- Eggs => Elasticity, binding agent, thickening, Lecithin as emulsification
- Starch / Rice flour => Viscosity contributor but have to use with Pre-gelatinized starches,
- Hydrocolloids: Gums (Guar, locust bean, xanthan), TIC Gum, Chia and flax have natural gums
- Fibers
- Fats and Emulsifiers
- Enzymes
- Grains: flax, quinoa, chai, buckwheat

Innovative Food Ingredient Trends for Product Development

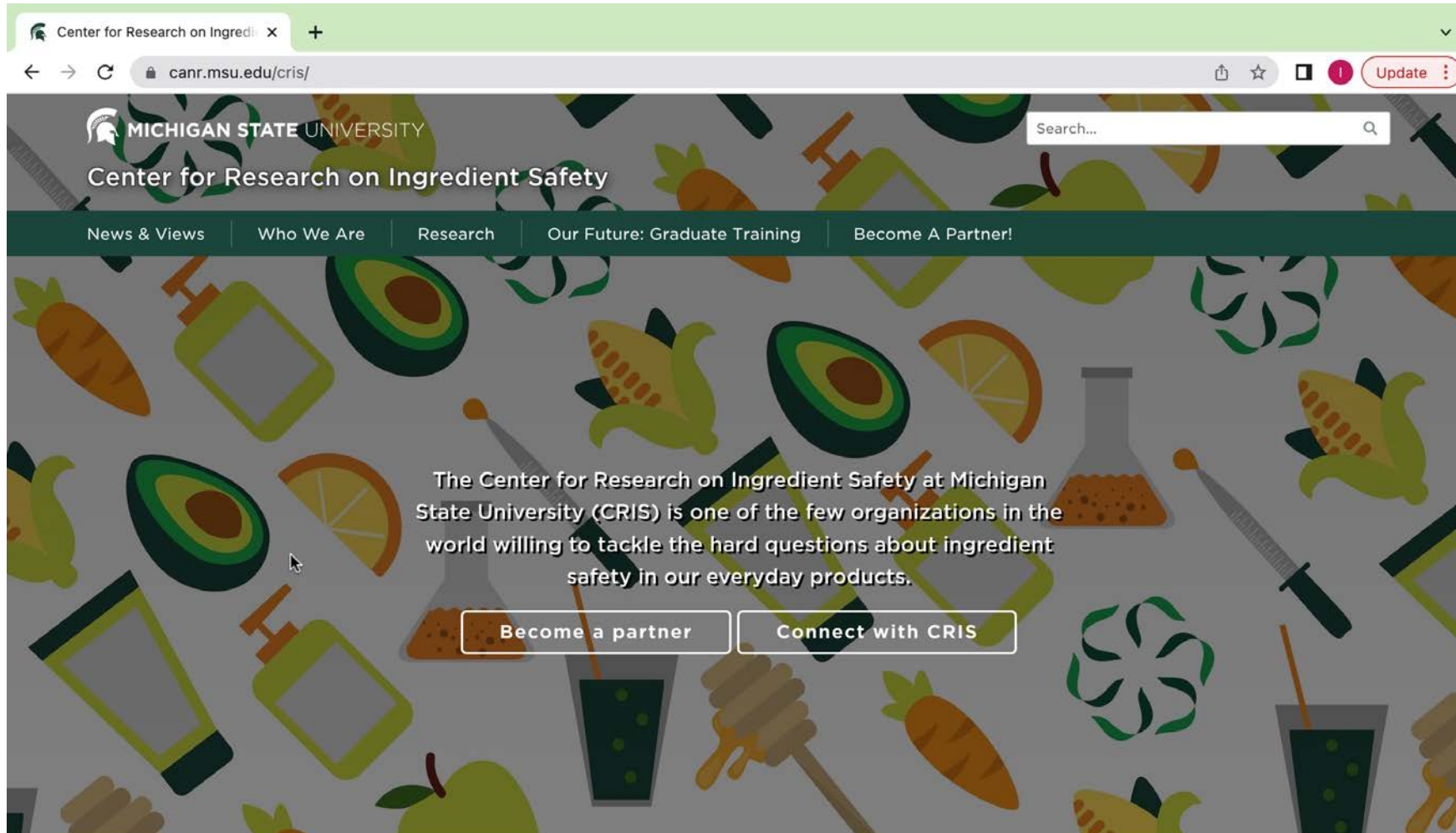
Fiber & Fiber addition

Macro sources: Cellulose, hemicellulose, mucilages,
Function

- Fat reduction
- Water holding Capacity
- Rheological properties (viscosity)
- Aiding in extrusion
- Dimensional stabilizer
- Texturising agent
- Gelling agent
- Prebiotics (Inulin, Oligofructose)

Food Safety

CRIS.msu.edu



[COOKING OILS - PLANT-](#)

There are no entries at this time.

Market Visit



Friendship / Networking / Connections

