

Topics

- > What are Soy Protein Ingredients? Three Things to Remember - Nutrition, Functionality, Economics
- > Application of Soy Proteins in Further Processed Meat Products

Soybeans (*Glycine max*) are often called the miracle crop. They are an abundant source of protein that have been long recognized for high nutritional value and functional properties in food.

Meat Application Segments

- > Emulsified Meats
 - Franks, Bologna, Pate
- > Whole Muscle
 - Ham, Roast Beef, Pork Loin
- > Minced Meats
 - Beef Patties, Sausages
 - Smoked Sausage, Pepperoni
- > Poultry
 - Patties, Breasts, Whole Birds
- > Seafood
 - Surimi, Tuna, Fish Fillets
- > Vegetarian (Meat Analogs)



Why Use Soy Proteins in Processed Meat Products?

✓ Functionality uniquely similar to lean meat protein

- ☰ Functionality that provides meat-like texture
- ☰ Functionality that stabilizes fat and water
- ☰ Bland Flavor

☰ Nutritionally equivalent to meat protein

☰ Economical source of protein vs. high priced meat

Hydrated Soy Protein = Lean Meat

Soybean Composition

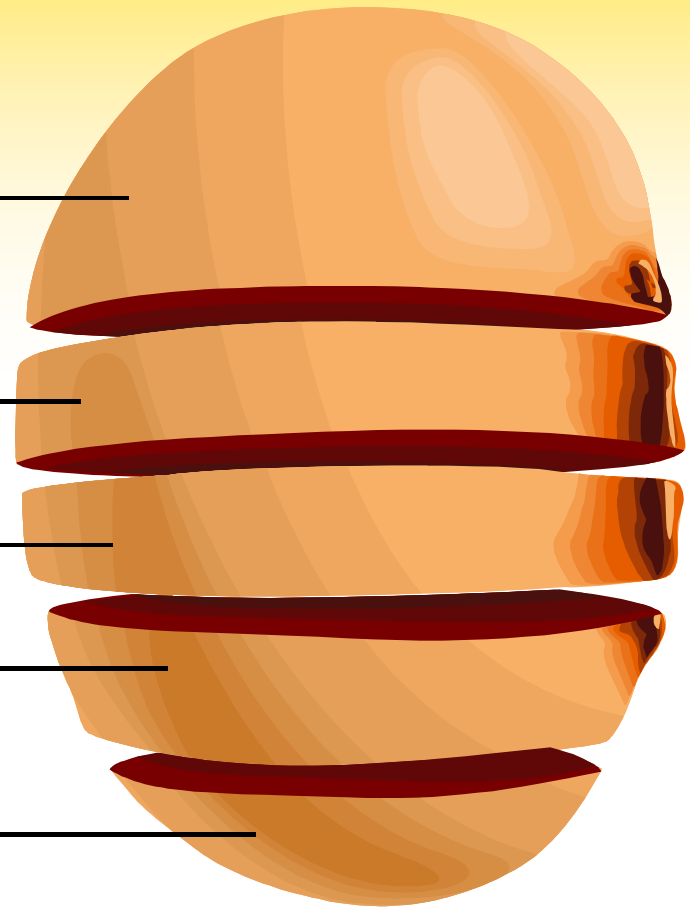
36% Protein

15% Soluble Carbohydrates
(Sucrose, stachyose, raffinose, others)

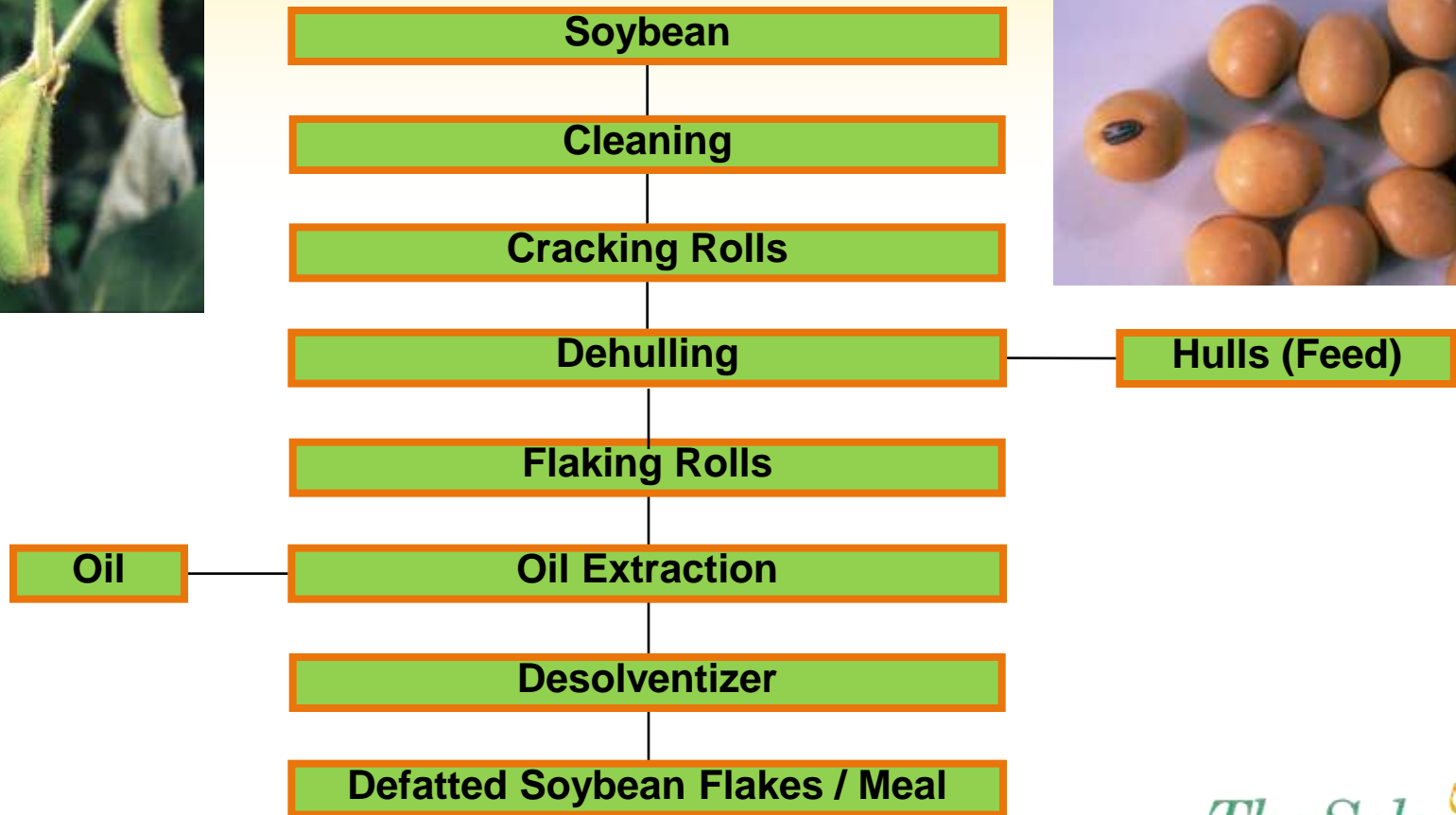
15% Insoluble Carbohydrates
(Dietary fiber)

18% Oil
(0.3% Lecithin)

16% Other

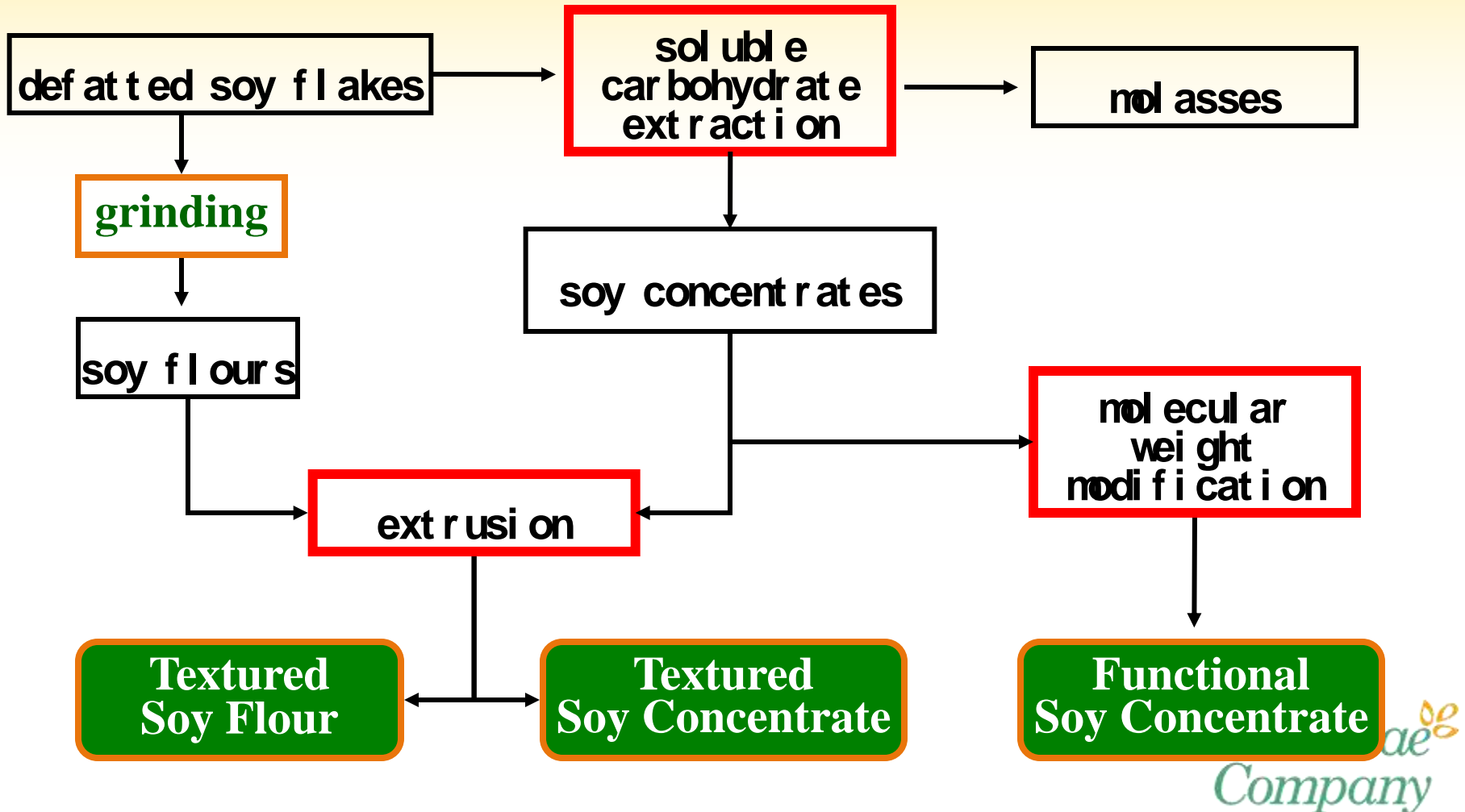


Soy Bean Oil Extraction

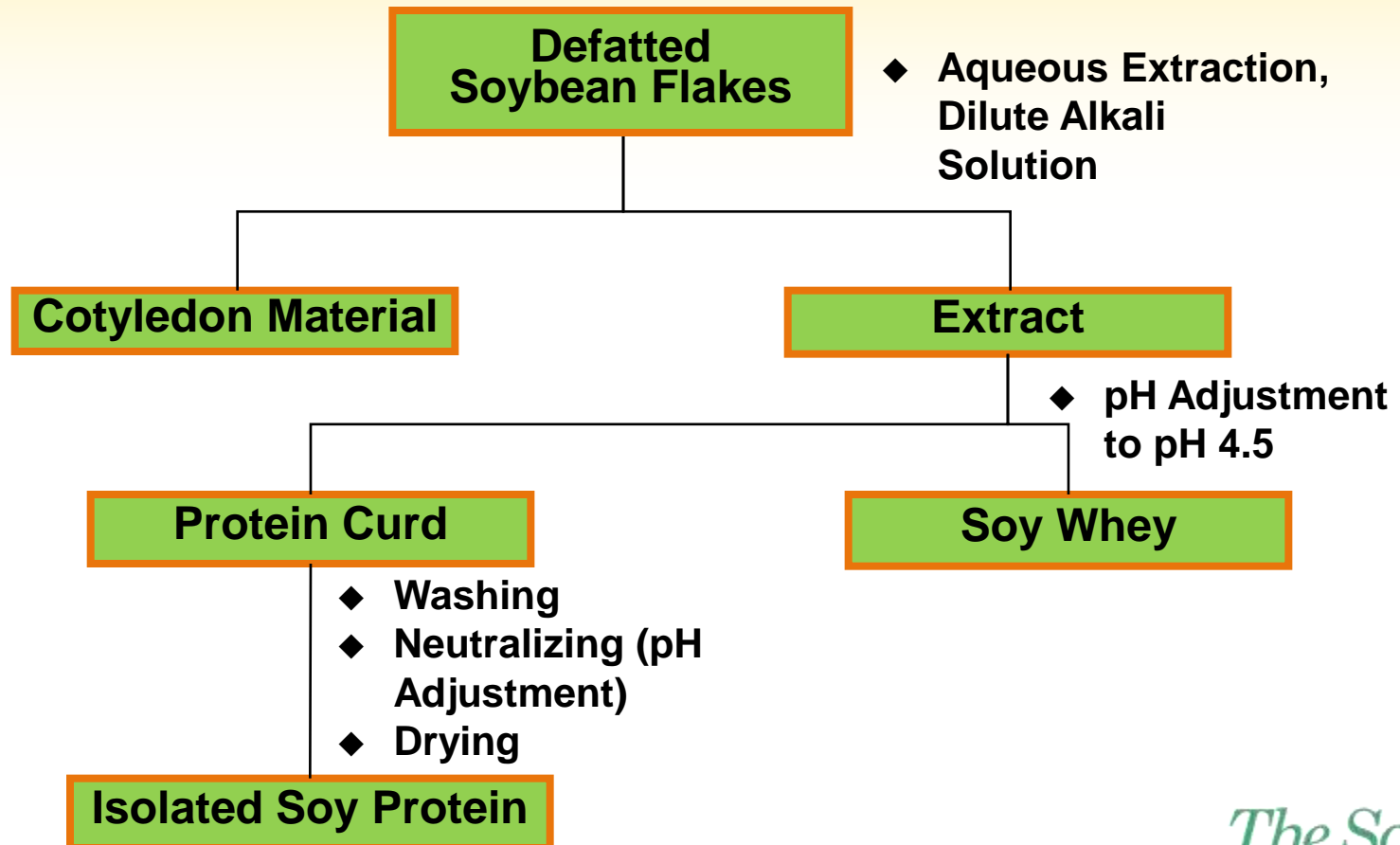


> 95% of soybean meal goes to animal feed

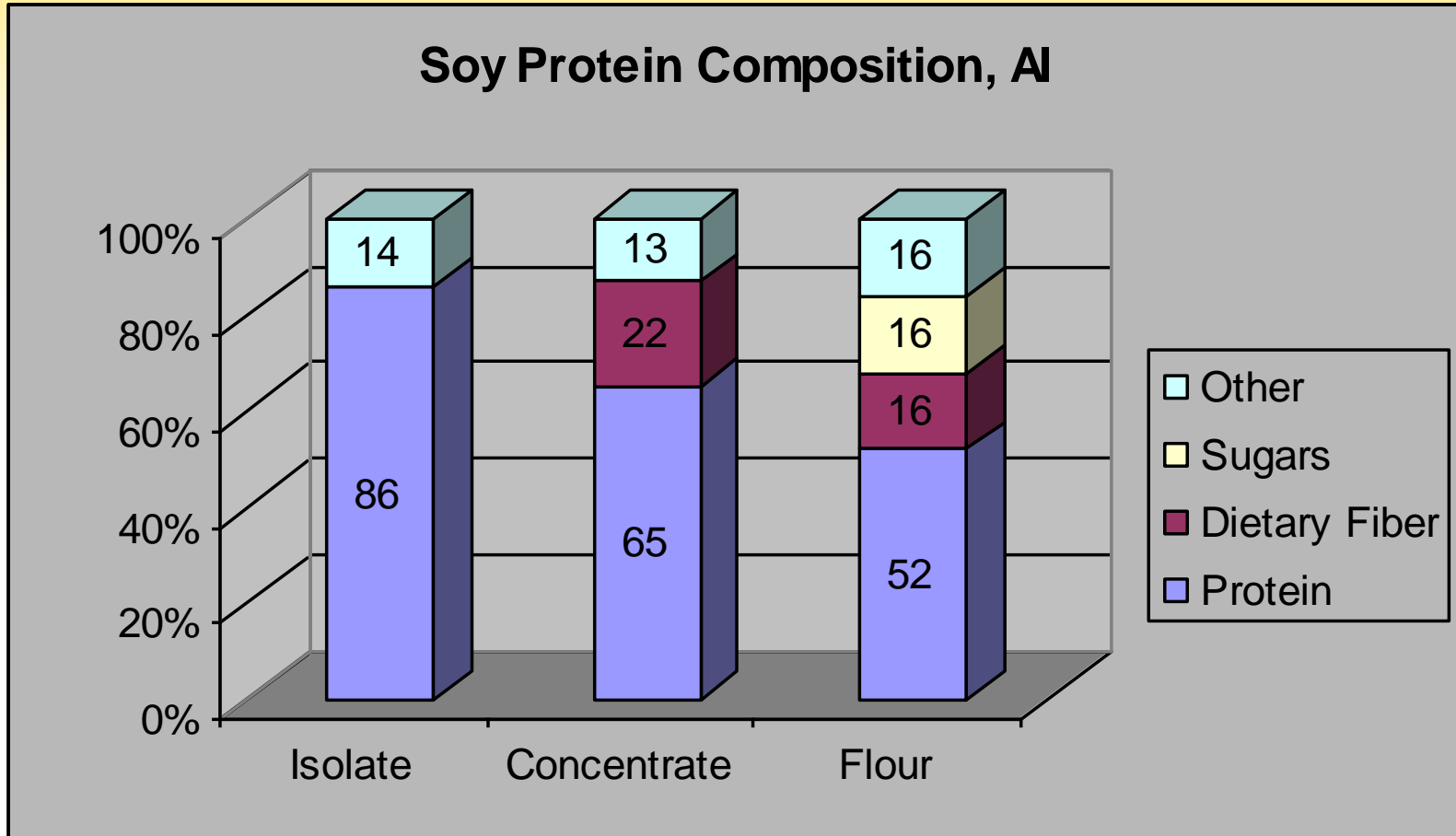
Soy Protein Concentrate & Flour Manufacturing Process



Isolated Soy Protein Manufacturing Process



Soy Protein Composition



Other = Moisture / Ash / Fat

Physical Forms of Soy Protein

- > Dry powders
- > Dry textured particulate
- > Dry textured fibrous pieces
- > Hydrated, textured pieces
- > Hydrolyzed Powders (HVF)
- > Vitamin and Mineral Fortified Powders



Soy Protein Functional Properties Important in Meat Applications

- > Water and Fat Binding / Emulsification
- > Texture Creation / Extrusion and Gelation
- > Viscosity
- > Solubility
- > Color (translucent / opaque)
- > Clean Flavor (absence of off flavor)

Factors Affecting Hydration and Functionality

- > Time
- > Temperature
- > Shear or Energy
- > pH
- > Ionic Environment

Nutritional Benefits of Soy Protein

> Soy protein:

- A complete, high quality protein, comparable to meat, milk, and egg protein
 - PDCAAS score of 1.0
- Meets or exceeds the essential amino acid requirements (as set by FAO-WHO) for adults and children.
- Comparable in digestibility to meat, milk, fish, and egg protein.
- Lactose free.

HEALTH BENEFITS

- > Health Claim for soy protein reducing the risk of heart disease approved, October 20, 1999
- > FDA Wording: “25 grams of soy protein a day, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. A serving of (name of food) supplies ---- grams of soy protein.”
- > Current Research Into:
 - Woman’s Health
 - Bone Health
 - Cancer

Economic Benefits of Isolated Soy Proteins

- > Economic replacement of more expensive meat proteins:
 - Lean meat = 22% protein
 - Isolated soy protein plus 3 parts of water = 22% protein
 - \$ Lean Meat = \$ Isolated Soy Protein /4
- > Processing efficiencies:
 - Higher processing yields
 - Cook yields
 - Rework
 - Slicing



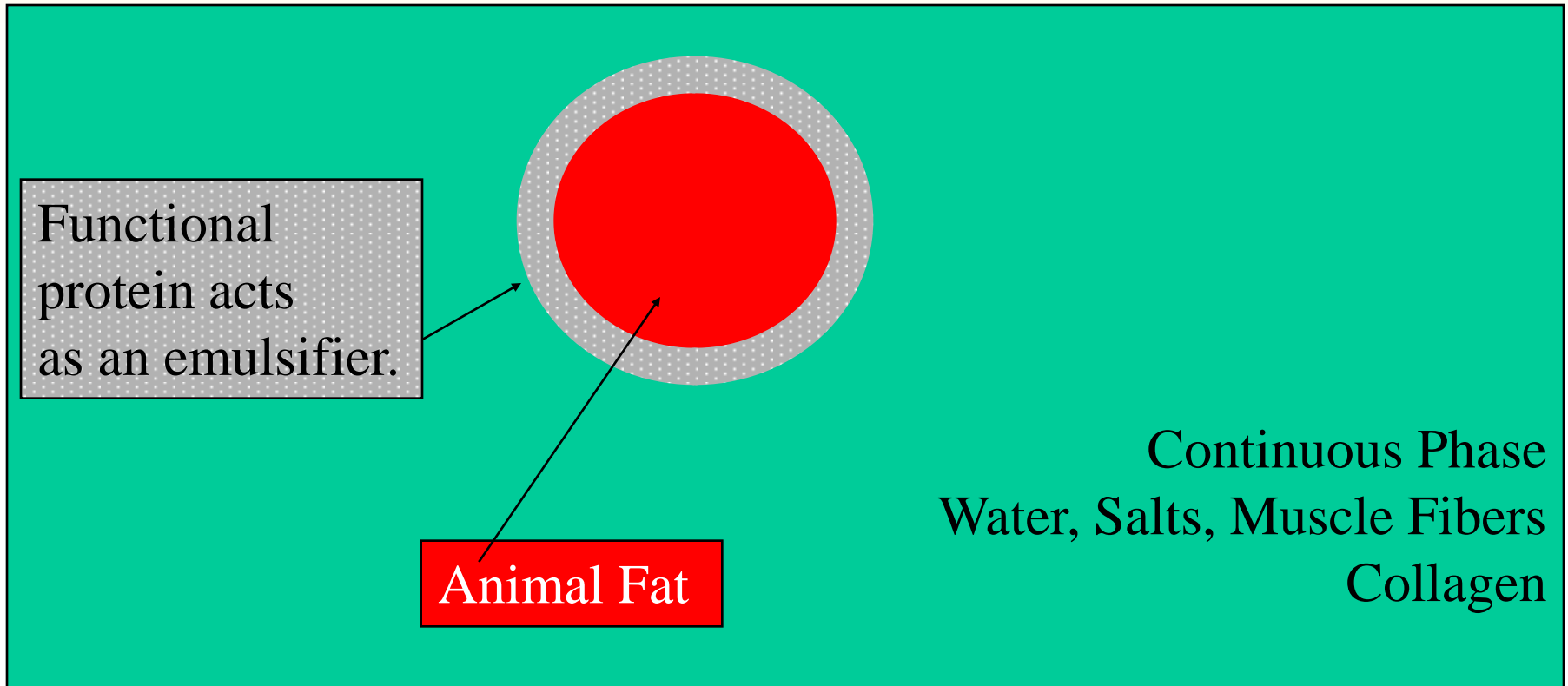
The Solae
Company

EXAMPLE:
Direct Replacement of Lean Meat

	<u>PRICE (\$/KG)</u>	<u>CONTROL</u>	<u>TEST</u>
BEEF 90/10	3.00	100 Kg	50 Kg
ISP	5.00	--	10 Kg
WATER	0.00	--	40 Kg
COST, \$/KG		\$300.0	\$200.0
% PROTEIN		19.0	18.5

Key Goal : Fat and Moisture Stabilization

Soluble proteins from soy and lean meats act as emulsifiers to stabilize fat and moisture. When fat is not stabilized, fat separation occurs. Formulation and processing impact stabilization.



Emulsified Meats

> Methods of addition:

- Dry addition
- Pre-hydration
- Pre-gels
- Pre-emulsions
- Granules



Dry Powder Addition

- > May be done in chopper or mixer.
- > Combine protein and water simultaneously as early in the chop or mix as possible.
- > Be sure to provide sufficient water with protein.
- > Select protein with dry addition capabilities.
- > Colder is better.

Preformed Emulsions

- > Objective is to stabilize fat and/or connective tissue. Also whitens product.
- > Typical ratios are 1 soy protein:4-6 water: 4-6 fat or skin but may be higher if emulsion is semi-hot or hot.
- > Optimize ratios for stability and production convenience.

Pre-Hydrated Gels

- > Achieves 10-20% more functional contribution than dry addition.
- > Usually prepared in a bowl cutter using 1:4 to 1:5 hydration ratio.
- > Gel continues to strengthen over 24 hours.
- > Freezing may be used to help maintain particle integrity.
- > Colors may be added.

What Kinds of Soy Proteins are used in Ground Meats

- **Textured Soy Concentrates**
- **Textured Soy Flours (TVP)**
- **Powdered Soy Concentrates**
- **Isolated Soy Proteins**
- **Soy Grits (soy flour)**

Ground Meat: Choosing the Correct Soy Ingredient

Product Issues

- L Shrink**
- L Consistency**
- L Fat content**
- L Texture**
- L Appearance**
- L Economics**

Technology Features

- L Yield improvement**
- L Product consistency**
- L Fat level control**
- L Meat-like particles**
- L Improved forming**
- L Formula optimization**
- L Use lower cost meat**

Technology Benefits

- L Cooking tolerance**
- L Increased Succulence**
- L Fat reduction claims**
- L Consumer appeal**
- L Appearance/taste**
- L New product options**

TSC binds water, improves machineability, enhances texture. FSPC and ISP improve yields.

Ground Meats

> Methods of addition:

- Dry addition
- Marination
- Granules
- Emulsions

> Process

- Grind, Mix, Grind, Form
- Freeze
- Cook / Freeze



Company

Textured Soy Concentrate in Enhanced Beef Patties

	0 % Enhanced	20% Enhanced	30% Enhanced	40% Enhanced	60% Enhanced
Bf 90	82.24	57.85	45.66	33.46	9.07
Bf 50	17.20	21.59	23.78	25.98	30.37
Salt	0.56	0.56	0.56	0.56	0.56
Response 4402	0	5.00	7.5	10.00	15.00
Water	0	15.00	22.50	30.00	45.00
Total	100.00	100.00	100.00	100.00	100.00
Raw Finished Fat %	16	16	16	16	16

Textured Soy Protein Concentrate Enriched Patties

- > As extension level increases:
 - cook yields increase
 - cook time decreases
 - raw ingredient cost decreases
 - dimensional shrink decreases
- > Sensory evaluation indicates that all meat acceptance is maintained between 20% and 30% extension.

Chicken Nugget Sample Formulations

<u>Ingredient</u>	<u>Premium</u>	<u>Economy</u>
Chicken Breast	78.0	
Chicken Dark Meat		60.0
Chicken Skin	5.0	5.0
Water	13.6	26.1
SUPRO® ISP	2.0	6.5
Salt	0.6	0.6
Sodium Phosphate	0.4	0.4
Seasoning	0.4	1.4

Beef Crumble Formulation

<u>Ingredient</u>	<u>Percent</u>
Beef	62.36
Water	25.54
SUPRO [®] ISP	9.00
Seasonings	3.00
Total	100.00

Conclusions

- Soy Proteins are valuable ingredients for meat applications.
- A wide range of soy protein products are available for different applications.
- A systematic approach to formulation is worthwhile.
- Manufacturing procedures may be adapted to achieve the most value from soy proteins
- Physical Properties Demo Next!

