SOY PROTEIN NUTRITION AND FUNCTIONALITY OVERVIEW

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WHY PROTEIN?

- Fundamental Macronutrient
  - Amino-acids building blocks of life
  - All living organisms require protein
  - Enzymes mediate metabolic pathways
- Fundamental functional food ingredient
  - Food formulation and processing

Protein The Macronutrient

- Fundamental role in animal nutrition
  - Essential for feed formulation
- Critical for human nutrition
  - Essential for growth and metabolism
  - Composition and quality of protein particularly important for infant and child nutrition

Protein The Macronutrient

- Animal Proteins
  - Meat
  - Milk
  - Fish
  - Eggs
- Plant Storage Proteins
  - Seeds
  - Fruits
  - Tubers and roots
- Micro-organisms
  - Mainly fungi

The Macronutrient Role

- Not all proteins are created equal:
  - Aminoacid composition
    - Not all proteins contain all essential aminoacids
    - Digestibility – PDCAAS

There is a wide variability of the nutritional value of different proteins

Alternatives to Animal Proteins

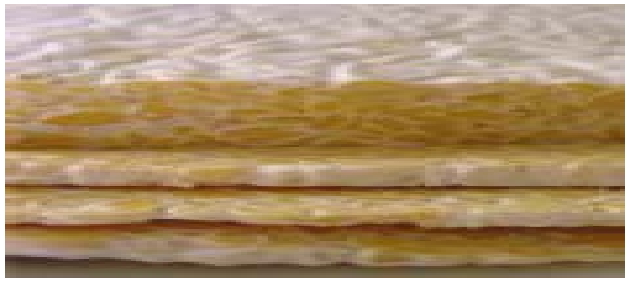
- Plant Proteins
  - Soy
  - Canola
  - Bean
  - Wheat
- Microbial Proteins
  - Mycoprotein

Alternatives to Animal Proteins

- Canola
  - Protein concentrates and Isolates in commercialization stage
  - Supertain and Puratein
- Beans and other pulses
  - Some PC and PI available
- Wheat and other cereals
  - Proteins with specific functionalities (gluten) very important ingredients

Alternatives to Animal Proteins

- Microbial Proteins
  - Mycoproteins
    - Produced by fermentations
    - Many oriental fermented foods such as Tempeh



    - Commercially produced mycoproteins available in the market: Quorn

Alternatives to Animal Proteins

- Quorn
  - Fermentation of glucose using the fungus Fusarium
  - Contains all essential aminoacids
  - Comparable to soy protein
  - Possibly an expensive process
  - Will be very much affected by biofuel demand
    - Uses same feedstock as bio-ethanol production

Alternative to Animal Proteins

- QUORN

Soy Protein Nutritional Value

- Recognized early as value for animal nutrition in North America
  - Affected Research in single cell protein production
- More recently the human nutrition aspects in NA are explored in combination with the health benefits of soy (isoflavones)

Soy Protein Nutritional Value

Essential Amino-acid content (g per 100g of edible portion)

Amino-acid	Egg	Beef	Soy Conc.	Soy Isolate
Histidine	0.30	0.66	0.40	0.60
Isoleucine	0.68	0.87	0.70	1.10
Leucine	1.10	1.53	1.20	1.70
Lysine	0.90	1.60	1.00	1.30
Methionine	0.39	0.50	0.20	0.30
Phenylalanine	0.66	0.76	0.80	1.10
Tryptophan	0.16	0.22	0.20	0.30
Threonine	0.60	0.84	0.60	0.80
Valine	0.76	0.94	0.80	1.00

Soy Protein Nutritional Value

(% Digestibility, Aminoacid score and PDCAAS)
FAO/WHO Expert consultation 1990

Protein	Digestibility	AAS	PDCAAS
Egg	98	121	118
Cow's Milk	95	127	121
Beef	98	94	92
Soy	95	96	91
Wheat	91	47	42

Soy Protein Health Benefits

- Beneficial effect on obesity
  - Lower body fat with SPI than whey protein
  - Greater weight loss in diets with soy protein
- Cardiovascular health
  - Studies indicate soy diets reduce LDL levels
  - Soyfoods when replacing animal products in diets reduce risk of cardiovascular diseases

Soy Protein the Functional Ingredient

- Proteins important in processing of foods
  - Soy Flours
    - Full fat ~40% protein
    - Defatted ~ 53% protein
  - Soy Protein Concentrates
    - ~ 65% protein
  - Soy Protein Isolates
    - ~ 90% protein

Soy Protein the functional Ingredient

- Explored for the replacement of expensive ingredients such as egg and milk for the food processing industry
- Initially there were many challenges in replacing the functionality of these traditional ingredients with soy proteins
- Advances in the breeding and processing resulted in much better and comparable functionality

Soy Protein the Functional Ingredient

- Functionalities:
  - Viscosity
  - Emulsification
  - Whipping
  - Binding
  - Many others
- These functionalities are very important in the formulation and processing of foods

Opportunities

- Adding value to food products through addition of soy protein
  - Nutritional enhancement.
  - Health benefits through Isoflavones etc.
  - Production of meat alternatives
  - Full or partial replacement of expensive functional ingredients

Opportunities

- Can be added to all categories of foods:
  - Bakery,
  - Beverages,
  - Meats,
  - Process meats,
  - Frozen desserts,
  - Dairy,
  - Snack foods,
  - Dressings and Spreads

Opportunities

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Opportunities

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