ISOLATED SOYBEAN PROTEIN (ISP) PROCESSING

Is their a difference in quality?

Introduction

Isolated soybean proteins, or soybean protein isolates as they are also called, are the most concentrated form of commercially available soybean protein products. They contain over 90% protein, on a moisture free basis.

Soy protein isolates have been known and produced for industrial purposes, mainly as adhesives for the paper coating industry, well before World War II. ISP's for food use, however, have been developed only in the early fifties. ISPs intended for human consumption undergo the most pains taking detail and expensive quality control to prevent contamination, oxidative damage and preserve marker enzymes (Urease, etc.). High performance liquid chromatography assures ethical processing.

The basic principles of ISP production are simple. Using defatted soy flour or flakes as the starting material, the protein is first solubilized in water. The solution is separated from the solid residue. Finally, the protein is precipitated from the solution, separated and dried. In the production of ISP for food use, in contrast to ISP for industrial use, care is taken to minimize chemical modification of the proteins during processing. Fragmented soy proteins are believed to exercise allergic and sensitivity responses in susceptible individuals. Obviously, the sanitary requirements are also much more demanding requiring microbiological monitoring throughout the process to prevent pyrogenic as well as immunological reactive byproducts.

Being almost pure protein, ISP can be made to be practically free of objectionable odour, flavour, colour, anti-nutritional factors and flatulence. Furthermore, the high protein concentration provides maximum formulation flexibility when ISP's are incorporated into food products. These and other advantages have been the source of highly optimistic forecasts regarding the widespread use of ISP. Although the volume of production increased and although several production facilities have been erected in the U.S.A., Europe, Japan, India and Brazil, the tonnage figures are far from those predicted when food grade ISP was first marketed.

The principal reasons for this situation are: the relatively high production cost (see below), nutritional and regulatory limitations, the inability of ISP-based texturized products to compete with texturized soy flour and texturized SPC, and finally, the competition of other abundant "isolated proteins", particularly casein and caseinates. Nevertheless, it should be noted that many novel isolated proteins, such as those obtained from cottonseed, peanuts, fish, squid etc. have been much less successful than ISP. Many of these did not reach the stage of commercial production.

Although actual trade figures are not disclosed, the growth in sales of concentrates and isolates is said to be, at present, stronger than that of flours.

ISP can be further modified and processed into more sophisticated products. These include: spun fibres from ISP as an ingredient for muscle food analogs, proteinates and enzyme modified ISP. While nutritionally acceptable, some objections exist regarding the immunological recognition of foreign protein side reaction by-products causing allergic-type reactions.
The cost of isolated soybean proteins is five to seven times higher than that of defatted soy flour used in many soy-foods such as artificial bacon, chicken, fish and meat products. On an equal protein weight basis the cost ratio of these two products is nearly 3:1. The main reasons for the added cost will become evident from the description of the manufacturing methods for ISP. Many nutrition scientists agree that the compatibility and safety of ISP far exceeds that of defatted soy flour.

**Definition, composition, types**

The specification of the Association of American Feed Control Officials, Inc. (AAFCO) defines ISP as follows:

"**Soy Protein Isolate** is the major proteinaceous fraction of soybeans prepared from dehulled soybeans by removing the majority of non-protein components and must contain not less than 90% protein on a moisture-free basis." (from '90 Soya Bluebook).

There are no official standard definitions or specifications for the various types of isolates. ISP is bought and sold on the basis of specifications formulated by the manufacturer or the user. Biological quality varies greatly.

The typical composition of an isolated soy protein is shown in Table 6-1.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>WEIGHT PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>90</td>
</tr>
<tr>
<td>Fat</td>
<td>0.5</td>
</tr>
<tr>
<td>Ash</td>
<td>4.5</td>
</tr>
<tr>
<td>Total carbohydrate</td>
<td>0.3</td>
</tr>
</tbody>
</table>

*Source: Kolar et al. (1985)*

The conventional procedure for ISP production is based on protein solubilization at neutral or slightly alkaline pH, and precipitation by acidification to the isoelectric region, near pH 4.5. The resulting product is "isoelectric ISP". It has low solubility in water and limited functional activity yet retains the molecular integrity of unfragmented soy protein. Different "proteinates" can be produced by resuspending isoelectric ISP in water, neutralizing with different bases and spray-drying the resulting solution or suspension. According to the base used for neutralization sodium, potassium, ammonium or calcium "proteinates" are produced. The first three are highly soluble in water, producing solutions with very high viscosities, foaming, emulsification and gel forming properties. These are used for non-food products. Calcium proteinate has lower solubility in water but is more stable and maintains pH neutrality to the product. The calcium ISP provides the highest quality of food grade product available. Low-solubility (inert) ISP's are used where the formulation calls for a high level of protein incorporation without excessive viscosity of other functional contributions.
Since spray-drying is the common drying method in the production of ISP, the primary physical form of ISP in commerce, is that of fine powders. Structured forms, such as granules, spun fibres and other fibrous forms are made by further processing. These forms are discussed in a separate paper, dealing with texturized products.

Production processes

6-3-1 The conventional process

This is the process commonly described in the literature and suggested by suppliers of equipment and complete plants. Exact processing conditions and the type of equipment used may vary from plant to plant.

An outline of the process is given in Fig.30.

**Figure 30: Isolated Soybean Protein. Production Process Outline**

*a- Starting material:* Dehulled, defatted, edible grade white flakes or meal with the highest possible protein solubility index are used. Although the rate of protein extraction from finely
ground flour would be faster, flakes permit easier separation after extraction. In batch extraction, particle size has no effect on protein extraction yield, if extraction time is over 30 minutes.

**b- Protein extraction:** The flakes are mixed with the extraction medium in agitated, heated vessels. The extraction medium is water to which an alkali such as sodium hydroxide, lime, ammonia or tri-basic sodium phosphate has been added, so as to bring the pH to neutral to slightly alkaline reaction. Under these conditions, the majority of the proteins go into solution. The sugars and other soluble substances are also dissolved. The highest food grade soy flakes are cold water extracted without severe pH modification. This process produces a lower yield but higher biological quality as measured by the urease activity.

* **Alkalinity:** More protein can be extracted at higher pH. However, the extracted proteins may undergo undesirable chemical modifications in strongly alkaline solutions. These include protein denaturation and chemical changes in amino acids. Excessively high pH also favours protein-carbohydrate interaction (Maillard reaction) which results in the formation of dark pigments and in loss of nutritive value. Furthermore, proteins precipitated from highly alkaline media tend to retain too much water, and do not settle well. In practice, the range between pH 7.5 and pH 9.0 is most commonly preferred.

One of the chemical reactions of amino acids in alkaline media has attracted particular attention. That is the destruction of the amino acid cystine, with the formation of dehydroalanine. In addition to the nutritional implications resulting from the loss of cystine, there might be also a toxicological aspect to consider. Dehydroalanine can react with free epsilon-amino groups of lysine, to produce lysinoalanine. This compound has been found to cause kidney lesions in rats under certain experimental conditions. The toxicity of lysinoalanine for man is still an open question.

* **Extraction time:** The course of nitrogen extraction from white flakes, using 0.03 molar calcium hydroxide as extractant is shown in Fig. 31. The amount of nitrogen extracted under these conditions increased steadily during the first 30 minutes and reached a nearly constant level after 45 minutes. The extraction time in industrial operation is, probably, in the order of 1 hour.

* **Temperature:** Protein extraction yield is considerably increased by raising the temperature, up to 80°C.

* **Solid/liquid ratio:** Protein extraction yield is improved as the quantity of liquid medium used to extract a given weight of flakes is increased. After extraction and separation by filtration or centrifugation, the extracted flakes retain a considerable proportion of extract, about 2.5 times the weight of solid. In single-stage batch extraction, if the more liquid is used for extraction, the protein concentration in the extract is lower and the quantity of protein associated with the retained portion of the extract is smaller. On the other hand, larger volumes of liquid have to be handled per unit weight of protein produced. This means larger extraction vessels, centrifuges etc. and a larger volume of "whey" for disposal.

The choice of a solid/liquid ratio for extraction is, therefore, a matter of economical optimization. The ratios used in industry range apparently between 1:10 and 1:20.

* **Heat treatment history of the meal:** The NSI value of the starting material is the most important factor affecting isolation yield. (Fig. 32)
Figure 31: The Course of Soy Protein Extraction
(0.03M Ca(OH)$_2$, 55° C.) Source: Cogan et al. (1967)
*Agitation:* As in any extraction operation, agitation increases the rate of protein solubilization. However, within the practical values of extraction time for batch operations (about one hour), little is gained by increasing the turbulence beyond that provided by moderate agitation. Furthermore, strong agitation causes excessive flake disintegration, increases the proportion of fine particles in the extract, rendering solid/liquid separation more difficult. Moderate agitation can be defined as any mixing operation that would keep the flakes in suspension within the extraction medium.

**c- Solid-liquid separation after extraction:** The extract contains considerable amount of fine particles of extracted flour, the elimination of which, prior to precipitation, is necessary in order to obtain a "curd" of acceptable purity. Table 6-2 shows the effect of fine solids separation on the purity of the final product.

<table>
<thead>
<tr>
<th>Mesh # of sieve used for separation of solids</th>
<th>%Protein (N x 6.25) in dry curd</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>83.2</td>
</tr>
<tr>
<td>40</td>
<td>83.9</td>
</tr>
<tr>
<td>60</td>
<td>84.5</td>
</tr>
<tr>
<td>80</td>
<td>85.8</td>
</tr>
<tr>
<td>100</td>
<td>88.7</td>
</tr>
<tr>
<td>140</td>
<td>89.5</td>
</tr>
<tr>
<td>200</td>
<td>91.2</td>
</tr>
<tr>
<td>Centrifugation</td>
<td>93.3</td>
</tr>
</tbody>
</table>

*Source: Cogan et al. (1967)*

In industrial scale operation, it may prove convenient to carry out the extract clarification process in two steps: screening (vibrating screen, rotary screen or the like) to separate most of the solids, followed by centrifugal clarification of the extract. The wet solids can be pressed to remove as
much entrapped extract as possible. All these operations can also be carried out in one step, using decanter centrifuges. A flow diagram of decanter-based process for the production of ISP is shown in Fig. 33.

![Flow diagram of decanter-based process for the production of ISP](image)

**Figure 33: ISP Production Using Decanter Centrifuges (Courtesy of Alfa-Laval)**

d- Extract treatment: The clarified extract can be treated so as to remove certain impurities, thus improving the blandness, colour and nutritional quality and modifying the functional properties of the final product. Extract treatment may include: ion exchange to remove phytate and reduce the ash content, treatment with activated carbon to remove phenolic substances, ultrafiltration for concentration and removal of low molecular weight components etc. Although such processes have been suggested in the literature it is not known whether they are practised in the industrial production of ISP. The use of membrane processes for extract purification and concentration have been reported to be industrially applied in Europe and Japan. (Elias, 1979).

e- Precipitation: The protein is precipitated from the extract by bringing the pH down to the isoelectric region. The type of acid used or the temperature of precipitation do not affect the yield or purity of precipitated protein.

f- Separation and washing of the curd: The precipitated protein (curd) is separated from the supernatant (whey) by filtration or centrifugation. Desludger or decanter centrifuges can be used for this purpose. The curd must be washed in order to remove residues of whey solubles. This can be done by resuspending the curd in water and re-centrifuging, or continuously on a rotary or belt filter. Thorough washing is most important for the obtention of high purity ISP.

g- Drying: The usual method for drying the washed curd is spray-drying.

Problems in conventional processing

a: Process losses: The conventional process separates the soy solids into three fractions: extraction residue, curd (ISP) and whey.
Extraction residue (okara) is the insoluble solid material left behind after extraction and separated from the extract by filtration or decanting. It represents approximately 40% of the solids in the raw material and carries away 15% of the protein entering the process. It is usually pressed, dried and sold as a by-product of ISP manufacture. It can be used as a protein source for animal feeding rations or as a source of dietary fibre in human nutrition. It has been also used in food products for its exceptional water adsorbing capacity.

Whey is the liquid supernatant, after the protein is precipitated from the extract. It contains the sugars and the nitrogenous substances not precipitated by acidification.

Approximately 25% of the dry matter of the raw material and 10% of its nitrogen content is found in this fraction. Early investigations (Hackler et al. 1963) indicated that soybean "whey" may be toxic to animals. This finding has been reconfirmed often since then. Furthermore, ISP whey is a highly diluted stream, containing 1 to 3% solids depending on the solvent:flake ratio used for extraction. Concentration and drying of ISP whey would be too costly. ISP whey is, therefore, a waste stream of the isolation process.

The curd is the precipitate obtained by acidification of the extract. After washing and drying, it becomes the final product: isoelectric ISP. It contains 75% of the protein of the starting material. Nearly 3 tons of defatted soybean are needed to produce one ton of protein isolate.

This low yield explains, to a large extent, the relatively high cost of ISP.

b: Quality: ISP obtained by the conventional process contains several types of impurities (e.g. phytates and phenolic substances) which may somewhat impair its functional, sensory and nutritional quality. More complete dehulling of the beans, thorough extract clarification and repeated washing of the curd reduce the impurities but does not eliminate them completely. The cold water washed method of extraction under isotonic pH minimizes these impurities.

Alternative processes

Several alternative processes for the isolation of soy protein have been reported in the literature. These include:

a: Solubilization of the soy proteins in the salt solutions (salting-in) followed by precipitation by dilution with water.

b: Precipitation from the extract at near-boiling temperature, using calcium salts (as in the production of Tofu).

c: Ultrafiltration of the extract so as to remove the low molecular weight components of the whey, leaving a concentrated solution of protein which may be spray-dried.

d: Physical separation of the intact protein bodies from very finely ground soy flour by density fractionation (flotation).

e: Purification of the extract by ultrafiltration, filtration through activated carbon and ion exchange, in order to increase curd purity.

Utilization

Meat products
In this paragraph, only the use of non-texturized ISP and proteinates will be discussed. It should be remembered, however, that the major application of ISP in connection with meat and related product is based on the use of texturized ISP, in one form or another, to replace meat. This application will be dealt with in a separate chapter.

In emulsion type sausages, such as frankfurters and bologna, ISP and proteinates are used for their moisture and fat binding properties and as emulsion stabilizers. Typical usage levels are 1% to 4% on a prehydrated basis. The use of ISP in these products permits reducing the proportion of expensive meat in the formulation, without reducing the protein content or sacrificing eating quality.

Methods for incorporating soy protein products into whole muscle meat have been developed recently. Isolated soybean protein is dispersed in specially formulated meat curing brines and injected into whole muscle using stitch pumps. It is also possible to incorporate the protein by surface application of the protein containing brine, followed by massaging or tumbling, as practised in the cured meat industry. Typical brine formulations contain salt, sugars, phosphates, nitrite and/or ascorbic acid.

**Seafood products**

The most important of application in this category is the use of ISP in fish sausage and surimi based restructured fish products in Japan. **Surimi** is extensively washed, minced fish flesh.

**Cereal products**

ISP is sometimes used instead of, or in combination with isolates and soy flour, in the formulation of milk replacer mixtures in bakery products. ISP has been used for protein fortification of pasta and specialty bread. In these applications, the high protein content and blandness of ISP are clear advantages.

**Dairy-type products**

Soybean protein isolates are used in non-dairy coffee whiteners, liquid whipped toppings, emulsified sour cream or cheese dressings, non dairy frozen deserts etc. The basis for these applications is, demand for non-non-dairy (all-vegetarian, cholesterol-free, allergen-free) food products, as well as economy.

Imitation cheeses have been produced from isolated soy proteins, with or without milk whey components. The types of cheeses which can be produced include soft, semi-soft, surface-cultured (imitation Camembert) and ripened hard cheeses.

**Infant formulas**

Infant formulas where milk solids have been replaced by soy products are well established commercial products. ISP is the preferred soy ingredient, because of its blandness, absence of flatus-producing sugars and negligible fibre content. The principal market for these products are lactose-intolerant babies. However, soy protein based dietetic formulas are finding increasing use in geriatric and post-operative feeding as well as in weight reduction programs.

**Other uses**
Partially hydrolysed soy proteins possess good foam stabilization properties and can be used as whipping agents in combination with egg albumen or whole eggs in confectionery products and deserts.

Isolated soybean protein has been shown to be an effective spray-drying aid in fruit purees. In this application, it can replace maltodextrins, with the advantage of contributing protein to the final product. A nutritious "shake" base was produced by spray-drying ripe banana puree containing up to 20% ISP on dry matter basis. (Mizrahi et al., 1967).

**CONCLUSION**

The use of Soy Protein Isolates (ISP) in industrial and food applications is a highly useful and profitable enterprise. Methods of preparing soy fractions for specified applications vary greatly and result in products designed to meet market economic demands. Food grade ISP have been available to the public since the 1950s but questions are now being raised regarding biological recognition, utilization and immunological compatibility. The highest quality of ISP is carefully produced under cold water isotonic methods and contains the characteristic chromatographic fingerprinting of non-GMO whole proteins as well as the enzymatic integrity of the marker enzyme, urease. This processing decreases the yield while increasing the production costs at least two-fold. Since Dr. Shaklee's research began using soy protein food products in the 1930's, only Shaklee Corp. continues to maintain and guarantee the highest quality biologically complete, utilizable and pure non-GMO soy protein isolates in all of their products. They exceed all industry standards. In this area there is no room for compromise.

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ADDENDUM – from Shaklee Corporation

Beneficial Effects of Soy:

Soy contains valuable constituents, including protein, isoflavones, saponins, and phytosterols. Soy protein provides essential amino acids. Soy is low in fat and cholesterol-free. The isoflavones in soy, primarily genistein and daidzein, have been well researched by scientists for their antioxidant and phytoestrogenic properties. Saponins enhance immune function and bind to cholesterol to limit its absorption in the intestine. Phytosterols and other components of soy have been reported to lower cholesterol levels.

Because soy isoflavones exert mild effects like that of estrogen, they may be useful for treating symptoms associated with menopause. In one double-blind trial, supplementation with 60 grams of soy protein per day for 12 weeks led to a 45% decrease in the number of hot flashes, compared with a 30% reduction in the placebo group, a statistically significant difference. In addition, soy may help regulate hormone levels in premenopausal women.

The phytoestrogens in isoflavones may inhibit cancer-inducing estrogens. Because high estrogen levels are a risk factor for breast cancer, isoflavones may play a role in reducing this risk. Other studies have indicated that isoflavones may actually stimulate the growth of estrogen-dependent breast cancer cells. It has also been reported that high consumption of soy isoflavones may reduce the incidence of prostate cancer in men.

Also of potential benefit to women, isoflavones may support bone health and reduce the effects of osteoporosis. This benefit is being challenged. A well-designed study evaluated the use of ipriflavone, a synthetic isoflavone, in more than 470 postmenopausal women with osteoporosis. Ipriflavone did not prevent bone loss when compared to placebo.

Isoflavones may also support cardiovascular health through a variety of mechanisms. It may help lower cholesterol. Soy milk may help lower blood pressure. After 3 months the individuals consuming soy milk had a modest, but greater, decrease in blood pressure compared to those consuming cow's milk. These benefits could potentially reduce the risk of atherosclerosis and other cardiovascular diseases.

Soybeans and soy foods like tofu are the best dietary source of isoflavones. However, many soy protein concentrates and soy products processed with alcohol may not contain isoflavones. Be sure to check how any soy supplement has been processed. Water washing, while more labor intensive, is best.

Soy Quality Control Checklist
Do not purchase soy powders and expect them to produce positive health results unless you know that the following "Essential Seven" quality controls have been met by the manufacturer:

1. **The beans must be organically grown**
2. **The beans must not be genetically engineered (Non GMO)**
3. **Each batch must be checked to confirm that it contains the 9 essential amino acids**
4. **In the manufacturing process to produce the soy isolate, the crushed soy flakes must be water washed, not alcohol washed**
5. **The anti-thyroid/anti-growth substance must be removed**
6. **The process must be without heat**
7. **The soy isolate must have calcium added** (when the oil is removed it becomes an acidic food - when calcium is added it makes it neutral again)

These explanations will help you to clear up confusion.

1. **Were the soybeans ORGANICALLY GROWN?**

   Studies have shown decreased levels of food nutrients and increased levels of nitrates in chemically fertilized crops, when compared with their organic counterparts. There is a connection between the ingestion of nitrates & CANCER! Therefore, it is important to know that pesticides, fungicides, and herbicides have not been used during the growing process. In particular, with soy beans, since they are such a hardy plant, a powerful and DEADLY weed spray called Round-up is usually used. For your safety, you must know that your soy products are organically grown.

2. **Were the soy beans GENETICALLY ENGINEERED?**

   Genetically engineered soybeans are much cheaper to purchase, and most companies producing soy products look for ways to save money. Dr. Louis J. Pribyl, a Brazilian government scientist working on policy for genetically engineered food, asserts that studies have shown toxins could be unintentionally created when new genes are introduced into a plant's cells.

   **Biologically Complete Protein From Non-GMO Soy**

   Shaklee uses an independent certification process called the Identity Preserved Program (IPP), which ensures that our soybeans are free from exposure to genetically modified soybeans. From seed to shelf, you can trust Shaklee's commitment to natural, quality ingredients.

3. **Does your soybean powder contain ALL of the nine essential amino acids?**
One of the most valuable features of the soybean is that it is a complete protein and provides ALL nine of the essential amino acids. The body requires these daily to produce hormones, digestive juices, antibodies, and enzymes. HOWEVER, not all soybeans are created equal .... quality and amino acid content will vary based on soil conditions, and variable growing and harvest conditions. If one essential amino acid is missing, the immune system can be depressed 30%, and many important body functions are delayed or stopped. Therefore, it is essential that each batch of soybeans be checked for amino acid content if we want to depend on the soy isolate to provide a GUARANTEED supply of the nine essential amino acids.

4. Were the crushed soy flakes washed in alcohol or water?

Alcohol washing destroys isoflavone content ..... up to 88%! It is the isoflavones that reduce the risk of breast, prostate, lung and bowel cancer! As well, it is the isoflavones that are so beneficial in hormone balancing and increasing bone mass.

5. Was the "anti-thyroid", "anti-growth" substance in the raw soy removed?

Orientals, who have consumed large amounts of soy for years, have known that RAW soy contains an "anti-growth", "anti-tyrosine" substance. Tyrosine deficiency will cause low blood pressure, low body temperature, and restless leg syndrome. Therefore, Orientals always lightly cook their soy foods to deactivate the "anti-tyrosine/anti-growth" substance. Find a brand that uses an extracting process that removes this substance, yet keeps the soy in a raw form in order to maintain the HIGHEST LEVEL OF AMINO ACIDS and ISOFLAVONES which are very sensitive to heat.

6. Is your soybean food RAW or heated?

Amino acids are very sensitive to heat. In some studies, cooking protein has been shown to destroy up to 50% of some ESSENTIAL AMINO ACIDS. If an individual consistently consumes a diet that is lacking in all of the essential amino acids, inadequate brain development and hormones, or other body tissue development can be the result.

7. Has CALCIUM been added to your soy powder?

Some negative reports about soy say that soy powders are VERY ACIDIC and cause bone loss because it causes calcium to be drawn from the bones!!!! The raw soy bean is a NEUTRAL food ..... neither acidic or alkaline. However, the removal of the soybean oil (which is essential so the soy powder will not go rancid very quickly), makes the powder very acidic. Therefore, adequate calcium (which is very alkaline) must be added to cause the powder to be neutral again, or it can cause the above stated problem. Many protein powder manufacturers do not add any or enough calcium.
Side Effects or Interactions

It has been suggested that too much soy can cause thyroid problems, and that soy is contraindicated for individuals on thyroid medications. Soy intake has not been observed to adversely effect normal thyroid function in human studies.

While it is unlikely that the level of soy consumed by most adults would affect dosage levels of thyroid medications, potential interaction exists. One strategy is to take soy protein and medication at separate times. It is a good idea to also let one's physician know that supplemental soy is being taken so that thyroid levels can be routinely monitored.

Effects of soybeans and foods vs. soy protein isolates

A number of foods, including raw soy beans, members of the cabbage family, and others, contain pro-goitrogens. These substances stimulate the thyroid gland to enlarge, causing what is known as goiter. While unprocessed soy contains these goitrogenic factors, heat applied during the processing of soy protein isolate results in their removal.

Soy infant formula and thyroid dysfunction

While goitrogens can enhance the effects of iodine inadequacy, iodine deficiency is the primary cause of goiter. In the 1960's, there were some reports of goiter inducing-effects observed in soy-formula fed infants. This was related to the inadequate content of iodine in these formulas, not the soy itself. Today, iodine is routinely added to soy formulas.

Apart from the iodine content, the use of soy formula feeding in infancy has been associated in retrospective analyses with autoimmune thyroid disease, and there are ongoing theoretical questions and concerns about soy formula.

There are several reports of medication dosage problems in soy formula fed infants with congenital or hereditary hypothyroidism who were treated with thyroid replacement medication (e.g. synthroid). Soy apparently bound the thyroxine drug in the gastrointestinal tract and decreased its absorption, requiring an increase in the drug dose.

It does not appear that these effects apply to adults for a number of reasons:

1. Infants respond differently to medications than do adults.
2. The sole diet of these infants was soy, while adults eat a varied diet.
3. There is not a high incidence of thyroid abnormalities in Asian countries where soy intake is common.

Effects of isoflavones and protein components of soy
In vitro (test tube) studies suggest that soy isoflavones may inhibit the action of enzymes involved in thyroid metabolism, namely thyroid peroxidase. It has been speculated that these actions might lead to thyroid problems. To date, however, no consistent changes in thyroid function as measured in several studies have been observed, and no metabolic dysfunction has been reported from human studies.

Soy protein contains a high ratio of arginine to lysine, two naturally occurring amino acid components of all protein. This ratio is thought to stimulate synthesis of the thyroid hormone, thyroxine. In animals (gerbils, hamsters and rats), increase in serum thyroxine levels has been noted when high levels of soy have been fed. In human studies, however, no clear relationship between thyroid hormone concentrations and soy protein ingestion has been noted.

Most importantly, in human studies, serum thyroxine levels have never been observed to rise outside the normal range. Soy researchers have stated that soy does not appear to impact thyroxine levels in humans.

The following information is from a talk given by Dr. Nasr. Dr. Nasr has a B.S. in Agronomy; M.S. in Biochemistry of anti-oxidants and a PH.D. in Pharmacognosy (science of bio-active products). He received his M.D. from Rush Medical College in Chicago, followed by Internal Medicine and Cardiology fellowships from Chicago Medical School. He is a member of the American College of Nutraceuticals and the American College of Preventive Medicine and is Director of the Medical Care & Diagnostic Center, Lake Villa, Il Dr. Nasr strongly supports the use of soy for his patients.

Dr. Nasr uses Shaklee Soy exclusively because it has the very best and most complete soy protein and isoflavone content.

1. **Optiflora** and Soy Protein increase the absorption of protein, decrease gas and discomfort and decrease cholesterol by 23%
2. Sixty (60) studies have been conducted showing soy protein increases bone density more than just **Calcium** Magnesium does.
3. Two studies show that soy and **vitamin E**, together, decrease LDL (bad cholesterol) by 40% and that is 17% greater decrease than Zocor and Lipitor. (Read about **Diet That Lowered Cholesterol As Well as Statins**)
4. Four studies show that soy protein inhibits oxidation of LDL (bad cholesterol) by 40%. When cholesterol oxidizes, it becomes “sticky” and in this condition is when it can attach to blood vessel walls.
5. Soy prevents gall stones. It doesn’t dissolve them but it prevents them.
6. Soy prevents kidneys from damage. Lots of animal protein may be hard on the kidneys, but soy protein **protects** the kidneys.
7. Shaklee’s protein includes valuable protein and isoflavones that are not present in other soy proteins produced with heat or chemicals. Shaklee’s **low heat - water**
wash process keeps the isoflavones in the protein. Isoflavones are natural cancer fighting ingredients that occur naturally in soy.

8. Soy’s protein and Isoflavones inhibit the mutated cell’s ability to make an enzyme that would cause the cell it to reproduce.

9. Soy inhibits the cancer cell from making the body provide it with additional blood supply (additional blood supply is called angiogenesis).

10. Soy increases the killing effect of the white blood cells (phagocytosis).

11. Soy’s amino acid Lysine when combined with Vitamin C decreases Colon Cancer by 90%.

12. The flavanoids (like those in Shaklee’s FlavoMax) when combined with Soy Protein are synergistic (they work even better together) and decrease breast cancer 10 fold.

13. Beta carotene (like those in Shaklee’s CarotoMax) when combined with Soy Protein and Calcium with Vitamin D are 10 times as effective at preventing cancer cells from getting an addition blood supply.

14. Women in the Orient get about 80mg of Isoflavones a day….women in US and Europe get about 1.0 mg. That’s an 80% negative difference for US and Europe.

15. Soy protein helps the differentiated cell (bad cell) convert back to a normal cell.

Dr. Nasr also listed the several forms of protein and the length of their chain of Amino Acids. The shorter the chain, the more quickly the Amino Acids can be absorbed and utilized.

- Soy has the shortest chain and takes less than an hour.
- Fish is next.
- Chicken takes about 4 hours.
- Beef takes about 5 hours.

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**Who Will Benefit From Consuming Soy?**

Anyone concerned about:

- angina*
- breast cancer prevention
- diabetics* ([Nutrition in the News: Protein Shakes Help Outsmart Diabetes](https://www.sunnysidehealthcenter.com))
- family history of breast cancer*
- enlarged prostate*
- cardiovascular disease*
- high cholesterol*
- high triglycerides*
- menopause*
- osteoporosis*
- premenstrual syndrome (PMS)*
- Pregnant women
- Prostate cancer prevention
- Nursing mothers

NOTE: Dr. Brouse has been using Shaklee Soy protein in his practice for over 30 years in the treatment of people with all of the above plus other conditions. It is his firm belief, from clinical testing, that Shaklee soy protein is unique in its design, manufacturing and expected application in human nutrition. Do not settle for comparisons with lower quality soy products. As Dr. Shaklee stated, “Nature is our standard. We compare our products to the way they are found in nature and not to the way others prepare their products using short cuts and less careful methods.”