

# Soy Protein for Healthy Aging



## Healthy Aging

Establishing healthy behaviors early in life is a major factor for maintaining a high quality of life throughout the aging process. It is commonly thought that aging begins at age 50 or 60, however, aging begins at birth. The aging population should strive to practice a lifestyle referred to as *healthy aging* which can help extend lifespan as well as accommodate more enjoyable years of life. The normal underlying “aging process” is controlled by internal biology while the “process of aging” is controlled by the environment or external factors. The World Health Organization<sup>1</sup> points out that the “aging process” is very different from the “process of aging”. The aging process describes the biological changes that occur with age and are unaffected by disease or environment and, as such, are normal. The process of aging, however, is influenced by external factors such as the environment, lifestyle and disease which, in turn, are related to or change with increasing age but are not due simply to aging<sup>2</sup>. This perspective on the difference between what are often assumed to be maladies (external factors) of aging, allows for the possibility to develop lifestyle behaviors that contribute to preserving good health. In order to experience this *healthy aging lifestyle*, environmental influences that affect the “process of aging” must be understood and an important component is the diet a person consumes throughout their lifespan.

Evidence supports the benefit of increasing total protein intake, the percent of calories from protein and possibly the amount of protein consumed at one time<sup>5-8</sup>.



## The Aging Population

Globally, the most rapidly growing age group is 80 years and older. With improved health care along with an effort to live a healthier lifestyle, the U.S. Census Bureau has projected that by the year 2050, 88.5 million Americans will be age 65 or older<sup>3</sup>. By 2050, more than 25% of Europe, 16% of Asia, and 10% of the Eastern Mediterranean will be age 65 or older<sup>2</sup>. Also by 2050, 32 countries are expected to have more than 10 million people aged 60 or over, including five countries with more than 50 million people who will be 60 or over: China (440 million), India (316 million), the United States (111 million), Indonesia (72 million) and Brazil (64 million)<sup>4</sup>. These data indicate that the world’s population is quickly becoming older and it will require well planned public health policies to accommodate this growing number of aging adults. Adequate nutrition and healthcare, as well as access to physical activity and healthy social interactions will be required in order for the global aging population to have a productive, healthy quality of life.

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Soy protein can decrease total and LDL cholesterol and thus decrease cardiovascular risk factors both in Asians<sup>17,18</sup> and Westerners<sup>19,20</sup>. Soy remains one of only a few food components that reduces total cholesterol (>4%) when added to a diet<sup>21</sup> low in saturated fat and cholesterol.

The decline in protein intake for both males and females after the age of 59 may be an indication that protein adequacy is compromised for a majority of older adults.

One of the most critical challenges facing the aging populations of the world is adequate nutrition. Educating older adults and caregivers on the importance of choosing the best nutrition to consume is an important component of *healthy aging*. The failure of some age groups to consume adequate energy may be an indication that segments of the aging population are not meeting their nutrient needs. For example, the decline in protein intake for both males and females after the age of 59 may be an indication that protein adequacy is compromised for a majority of older adults. Specific recommendations are still lacking to describe the importance of protein for the health of older adults, especially with regards to maintenance of muscle mass.

## Macronutrient Recommendations for the Aging Population

The 2005 Dietary Guidelines for Americans recommends that men over the age of 50 consume between 2,000 and 2,800 calories per day depending on activity. Women over the age of 50 need between 1,600 and 2,200 calories per day, depending on activity<sup>9</sup>. Older adults should choose calories (energy) that provide the best nutritional value in order to meet nutritional needs. The Institute of Medicine (IOM) has outlined recommended levels of carbohydrate, protein and fat along with a breakdown for types of fat<sup>10</sup>. This table represents the dietary reference intakes for older adults based on information from the National Policy and Resource Center on Nutrition and Aging and the IOM:

### U.S. Dietary Reference Intakes for Older Adults

#### RDA (Recommended Dietary Allowance)

Energy <sup>a</sup> (kcal)	2204	1978	2054	1873
Protein <sup>b</sup> (g)	56	46	56	46
Carbohydrate <sup>c</sup> (g)	130	130	130	130
Total Fiber <sup>d</sup> (g)	30	21	30	21
	MALE	FEMALE	MALE	FEMALE
	AGE 51-70		AGE 70+	

<sup>a</sup> Values are based on Table 5-22 Estimated Energy Requirements (EER) for Men and Women 30 Years of Age. Used height of 5'7", "low active" physical activity level (PAL) and calculated the median BMI and calorie level for men and women. Caloric values based on age were calculated by subtracting 10 kcal/day for males (from 2504 kcal) and 7cal/day for females (from 2188 kcal) for each year of age above 30. For ages 51-70, calculated for 60 years old, for 70+, calculated for 75 years old. 80 year old male calculated to require 2004 kcal, female, 1838 kcal.

<sup>b</sup>The RDA for protein equilibrium in adults is a minimum of 0.8 gm/kg body weight for reference body weight.

<sup>c</sup> The RDA for carbohydrate is the minimum adequate to maintain brain function in adults.

<sup>d</sup> Recommendation is expressed as an Adequate Intakes (AIs)

Adapted from table from the National Policy and Resource Center on Nutrition and Aging<sup>11</sup>

The values for this table were excerpted from the Institute of Medicine, *Dietary Reference Intakes: Applications in Dietary Assessment*, 2000 and *Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Protein and Amino Acids (Macronutrients)* 2002.



## Protein Recommendations

The IOM has recommended an RDA (Recommended Dietary Allowance) of 0.8 g protein/kg/day for all adults, including the elderly<sup>10</sup>. However, it appears that an intake of 1.5 g protein/kg/day, or about 15-20% of total caloric intake, is a reasonable target for elderly individuals wishing to optimize protein intake in terms of health and function<sup>12</sup>. It has been reported that the average protein intake declines progressively over the lifespan in both men and women<sup>13</sup> which may be an indication that protein adequacy is compromised for a majority of older adults. There is evidence that increasing total protein intake, increasing percent of calories from protein and possibly increasing amount of protein consumed in a single meal can have beneficial outcomes for individuals<sup>5-8</sup>. High quality proteins can give an aging individual the proper amount of essential amino acids required for normal muscle maintenance; soy protein is a high quality plant-based protein that can be incorporated into the diet and is a healthy option for the aging population.

## Soy Protein

Soy protein is a high quality protein that can be consumed throughout the life cycle. Protein quality is measured by assessing the amino acid content of the protein and the digestibility level. The current method for assessment is the Protein Digestibility-Corrected Amino Acid Score (PDCAAS). PDCAAS is the methodology recommended by the Food and Agriculture Organization and

the World Health Organization and has been in use since 1991<sup>1</sup>. PDCAAS is based on comparison of the essential amino acid content of a protein with that of a reference essential amino acid pattern and a correction for differences in protein digestibility as determined using a rat assay. PDCAAS methodology takes into consideration three parameters 1) the essential amino acid profile, 2) a correction for the digestibility of the protein and 3) the ability of the protein to supply the recommended amounts for 2 – 5 year olds<sup>1</sup>. Soy protein has a PDCAAS of 1.00, similar to egg, meat and dairy protein.

### Soy: The Complete Vegetable Protein\*

Solae™ Isolated Soy Protein	100
Milk (Casein)	100
Egg White	100
Beef	92
Pea Flour	69
Kidney Beans	68
Pinto Beans	63
Peanut Meal	52
Whole Wheat	40
Wheat Gluten	25

Vegetable Protein  
Animal Protein

\*Protein Digestibility-Corrected Amino Acid Score (PDCAAS). A score of 100 meets 100% of the reference amino acid requirements.<sup>2</sup>

## Age Related Health Concerns

While a variety of conditions can affect adults as they age, the three main causes of death are heart disease, cancer, and stroke<sup>14</sup>. In addition to the number of deaths caused by these three diseases, other health related conditions that will also reduce the quality of life during aging are obesity, diabetes, sarcopenia (degenerative loss of muscle) and osteoporosis. Estimates from the CDC indicate that at least

80% of older Americans are living with at least one chronic condition, and 50% have at least two<sup>15</sup>. As the global population ages, these chronic conditions will need to be addressed and one way of helping alleviate them will be through nutrition. Protein is an important component of a healthy diet of an aging individual. In the sections below, we will explore the beneficial effects of protein from soy.

## Role of Soy Protein in Heart Health

Coronary heart disease (CHD) and stroke are the two forms of cardiovascular disease (CVD) that affect the aging population. The WHO published the following information about the global prevalence of cardiovascular diseases (CVD)<sup>16</sup>.

Elevated LDL cholesterol is a marker for increased risk of CVDs. Evidence indicates that soy protein can decrease total and LDL cholesterol and thus decrease cardiovascular risk factors both in Asians<sup>17, 18</sup> and Westerners<sup>19, 20</sup>. Soy remains one of only a few food components that reduces total cholesterol (>4%) when added to a diet<sup>21</sup>

low in cholesterol and saturated fat, an “intrinsic” effect. Soy protein can also “displace” suboptimal foods (those higher in saturated fat and cholesterol) rather than be added on top of the daily diet (replacing rather than adding)<sup>21</sup>. This displacement value of soy protein or “extrinsic” effect can help lower serum cholesterol. Recent analysis of the effect of soy protein on LDL-cholesterol lowering indicates that soy protein may do so

through intrinsic and displacement (extrinsic) mechanisms and this LDL lowering would range between 7.9%-10%<sup>21</sup>.

Beneficial effects result from reducing intake of saturated fat, dietary cholesterol, increasing intake of soluble fiber and soy protein<sup>22</sup>. Several countries, including the US, have approved soy protein heart health claims. Soy protein can help improve heart disease risk factors by reducing LDL cholesterol levels, the LDL cholesterol:HDL cholesterol ratio, and the apolipoprotein B:apolipoprotein A-1 ratio, as evidenced by studies in healthy young men<sup>23</sup>, adults with type 2 diabetes<sup>24</sup> and hyperlipidemic subjects<sup>25</sup>.

### ***Role of Soy Protein in Weight Management***

Overweight (Body Mass Index or BMI between 25-30) and obesity (BMI greater than 30) affect approximately 68% of the population in the US<sup>26</sup>. It is estimated that a third of the adult population in Europe are obese while 20% of US adults aged 65 or older are obese<sup>27</sup>. Increased body weight and body fat (especially visceral or abdominal fat) are associated with co-morbidities and reduced quality of life<sup>28</sup>. In the aging adult, obesity can add to the already increased risk of morbidity with aging. In order to experience a healthier lifestyle over the lifespan, people will need to be cognizant of their body weight and eating patterns. One way to help the aging population control their body weight may be through eating a healthy diet that includes adequate protein levels.

Protein intake, including soy protein, has been reported to have a greater satiating effect than carbohydrates and fat<sup>29-31</sup>, and high-protein diets show beneficial effects when used in weight loss programs<sup>32</sup>. If an elderly person is trying to lose weight, the most important factor to consider is the amount of muscle mass they may lose. Aging adults are already at risk of losing muscle (sarcopenia) during normal aging; therefore, it is important for them to consume adequate amounts of protein during a weight loss program to help preserve muscle. Overweight or obese people may receive body weight benefits by consuming a high quality protein like soy protein which may help them control their caloric intake and<sup>33-35</sup> help preserve muscle mass, especially when combined with exercise<sup>36</sup>.

### ***Role of Soy Protein in Muscle Health***

Degenerative loss of skeletal muscle, or sarcopenia, occurs at a rate of 3-8% per decade after the age of 30 and increases with advancing age<sup>37</sup>. Sarcopenia is associated with decreased metabolic rate, decreased strength, increased risk of falls and fractures, increased morbidity, and impaired ability to carry out routine tasks of daily living leading to loss of independence. Estimates project that as the number of people over the age of 65 increases, the health care impact due to falls will increase from \$2 billion in 2000 to close to \$6 billion in 2030<sup>38</sup>. Chronic muscle loss is estimated to affect 30% of people over the age of 60 and may affect more than 50% of those over the age of 80<sup>6</sup>. Sarcopenia is distinct from loss

of muscle strength, which is also a factor of aging. Sarcopenia is a complex multi-factorial process facilitated by a combination of a sedentary lifestyle, a less than optimal diet and loss of response to anabolic changes in extracellular amino acid concentrations<sup>6,38</sup>. Studies to determine the underlying mechanisms involved with sarcopenia have looked at the role of protein metabolism and cell signaling, protein energy malnutrition and reduced anabolic efficiency to protein intake<sup>6, 37</sup>.

Identifying the amount of protein needed to avoid the muscle loss of sarcopenia is a critical concern for the aging population<sup>39</sup>. Studies have also investigated the role of physical activity in preventing sarcopenia and all show that strength or resistance training, with an appropriate diet that includes protein, can help stop or reverse sarcopenia<sup>7, 36, 40</sup>. It has been reported that exercise along with protein intake helps older adults maintain muscle mass better than placebo<sup>7</sup>.

Dietary recommendations for protein intake are based on short term nitrogen balance, not on the maintenance of lean mass. Several nitrogen balance studies in adults ages 56 – 80 have found that protein needs are likely higher than the current recommendation of 0.8 g/kg/day<sup>38</sup>. The Health, Aging, and Body Composition Study explored the dietary intakes of more than two thousand men and women aged 70-79 and found that higher protein intakes were associated with smaller losses of lean mass in those who lost weight over the course of the three year follow-up<sup>41</sup>.

### **Role of Soy in Blood Sugar Regulation**

The prevalence of diabetes for all age-groups worldwide is estimated to rise from 2.8% in 2000 to 4.4% in 2030; the total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030<sup>42</sup>. Diabetes is a global health concern and is becoming more common among the aging population with 130 million people aged 65 and over estimated to have diabetes by 2030<sup>42</sup>. Regulating blood glucose through dietary intervention is an important consideration for the aging population. It has been shown that replacing simple carbohydrates with soy protein or soy fiber can lower the glycemic index of foods (Solae internal data). The glycemic index of a food is a measure of blood glucose following consumption of a specific amount of carbohydrate compared to a control food. Addition of soy can lower the glycemic index of a food and may help improve post prandial blood glucose response.

### **Role of Soy in Digestive Health**

Digestive issues can range from person to person and include gas, heartburn, bloating, diarrhea, constipation, abdominal pain and gastrointestinal reflux. Some digestive issues, especially constipation, are the side effect of various medications and a common complaint of the elderly.

### **Soy fiber can contribute to digestive health as an additional source of fiber**

More than 90% of adults do not meet recommendations for

dietary fiber<sup>43</sup>. Soy fiber can be an additional source of fiber to contribute to overall fiber intake. Many strategies to increase daily fiber intake will also increase caloric intake, potentially contributing to the obesity epidemic. A modeling exercise that utilized dietary recalls for US adults from NHANES 2003-2006 data sought to test methods of increasing fiber intake<sup>43</sup>. Increasing dietary fiber-containing foods 10, 25, 50, or 100% increased dietary fiber intake to 16.9, 18.9, 22.1, and 28.5 g/d, respectively but also led to an increase in calories of 104, 260, 521, 1042 kcal/d, respectively<sup>43</sup>. The addition of 2.5 or 5.0 g/serving of fiber to low fiber foods (bringing them up to 'good' or 'excellent' sources) yields an overall diet that meets fiber recommendations without the associated increase in calories. Increasing consumption of currently available whole grain foods could be expected to increase fiber intake to 25.3 g/day (meeting the suggested recommendation of fiber intake for women over age 50) but with an additional 1266 kcal/d<sup>43</sup>.

When consumed at appropriate levels, fiber supports digestive health through relief of constipation and can help manage regularity. Foods with added fiber help to close the gap between intake and recommendations without adding significant increase in caloric consumption; soy fiber can be an additional source of fiber to contribute to

### **Healthy Aging: A Lifestyle Choice**

Establishing healthy lifestyle behaviors early in life is a tactic to contribute to *healthy aging*. Some of these important contributors to *healthy aging* include diet, physical activity, adequate rest, management of stress and regular health screenings. While the average intake of certain macronutrients may equal or exceed the recommended levels, failure of some age groups to consume adequate calories may be an indication that the aging population is not meeting their nutrient needs. Protein intakes decline for both males and females as they age and this may indicate that protein adequacy is compromised for a majority of older adults. Evidence supports the benefit of increasing total protein intake, the percent of calories from protein and possibly the amount of protein consumed at one time<sup>5-8</sup>. Educating aging adults about the importance of choosing adequate and appropriate levels of macronutrients, like protein, in their diet is a critical component of healthy aging.

overall fiber intake and may help improve gastrointestinal health. The health status of the elderly population varies, but incidence of chronic diseases is certainly on the rise<sup>46</sup>. Taking steps through lifestyle improvements that reduce the risk of disease and promote the maintenance of function to improve quality of life can support healthy aging and reduce the demands on



health care systems<sup>46</sup>. Improved health care and increased desire to age healthy impacts all adults. In order to achieve improved quality of life, aging adults should be concerned about risk factors associated with heart health, obesity, diabetes, sarcopenia,

and digestive health. Adequate protein and dietary fiber intake can promote healthy aging by playing a role in factors associated with each of these conditions. As the aging population increases, maintaining health and preventing disease will be crucial globally, from a public

health and economic perspective. Research demonstrates that adequate amounts of protein and fiber, including soy protein and fiber, can help older adults live a longer, healthier life.

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