

**SOUTH AFRICAN CONSUMERS' OPINION OF  
THE POTENTIAL HEALTH BENEFITS OF SOY  
AND SOY PRODUCTS AS HORMONE  
REPLACEMENT THERAPY (HRT)**

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**CONTENTS**

ACKNOWLEDGEMENTS.....I  
 AFRIKAANSE TITEL.....III  
 OPSOMMING.....III  
 SUMMARY..... X  
 ABBREVIATIONS.....XVII

**CHAPTER 1: INTRODUCTION**

1. **Background and motivation**.....2  
 2. **Objective of the study**.....6  
 2.1 Main objective..... 6  
 2.2 Specific objective.....6  
 3. **Structure of mini-dissertation**.....7  
 4. **Authors' contribution**.....8  
 5. **References**.....10

**CHAPTER 2: LITERATURE REVIEW**

1. **Introduction**.....14  
 2. **Increasing focus on the health benefits of food**.....14  
 3. **Defining functional foods**.....16  
 4. **Soy as functional food**.....18  
 4.1 Soy food products and the isoflavone concentration thereof.....20  
 5. **Soy as hormone replacement therapy**.....24  
 5.1 The mechanism of phytoestrogen functioning.....26  
 5.2 Effects of phytoestrogens on menopausal symptoms.....27  
 5.2.1 Hot flushes.....28  
 5.2.2 Breast cancer.....30

5.2.3	Bone health.....	34
5.2.4	Heart disease.....	35
6.	<b>Possible adverse effects of isoflavones and soy.....</b>	<b>37</b>
7.	<b>Consumers' awareness and behaviour towards the potential health benefits of soy and soy products</b>	
7.1	Definition and importance of consumer behaviour.....	44
7.1.1	Contributing factors related to consumer behaviour.....	45
7.2	Consumers attitudes towards soy and soy products.....	49
7.3	Expanding the awareness of soy foods globally.....	51
7.4	Soy products and uses.....	52
8.	<b>Conclusion.....</b>	<b>55</b>
9.	<b>References.....</b>	<b>57</b>

**CHAPTER 3: SOUTH AFRICAN CONSUMERS' OPINION OF THE POTENTIAL HEALTH BENEFITS OF SOY AND SOY PRODUCTS AS HORMONE REPLACEMENT THERAPY (HRT)**

Opsomming.....	70
Abstract.....	72
Introduction.....	73
Materials and methods.....	75
Statistical analyses.....	78
Results.....	80
Discussion and conclusion.....	86
Authors' contribution.....	92
References.....	93

**CHAPTER 4: GENERAL SUMMARY, CONCLUSIONS AND  
RECOMMENDATIONS**

<b>1.</b>	<b>Introduction.....</b>	<b>97</b>
<b>2.</b>	<b>Summary of main findings.....</b>	<b>97</b>
<b>3.</b>	<b>Conclusion.....</b>	<b>99</b>
<b>4.</b>	<b>Recommendations.....</b>	<b>101</b>
	<b>ADDENDUM A.....</b>	<b>105</b>

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## **AFRIKAANSE TITEL**

Suid-Afrikaanse verbruikers se opinie aangaande die gesondheidsvoordele van soja en soja produkte as hormoonvervangingsterapie (HVT).

## **OPSOMMING**

### **Motivering:**

Daar is 'n toenemende bewustheid in die voedselindustrie oor die rol wat behoorlike voeding in die handhawing van gesondheid en die voorkoming van siektes speel. Veral vroue was nog altyd geïnteresseerd in voeding en die impak daarvan op hul algemene welstand. Dié bewustheid het groter druk geplaas op voedselvervaardigers om 'n groter verskeidenheid voedsame en heilsame produkte te lewer, wat op sy beurt weer aanleiding gegee tot die ontwikkeling van 'n nuwe veld in die voedselindustrie, naamlik funksionele voedsel. Funksionele voedsel is voedsel wat behalwe die tradisionele mikro- en makronutriënte wat dit reeds verskaf, bykomende belangrike fisiologiese funksies het wat gesondheid verhoog. Hierdie aktiewe komponente, genaamd fitochemikalieë (in plantbronne) en zoochemikalieë (in dierlike bronne), het die rol van dieet in gesondheid verander. Funksionele voedsel kan deur middel van oorsprong of ontwerp die tradisionele gaping tussen voedsel en medisyne oorbrug en daardeur aan verbruikers die geleentheid bied om betrokke te raak met hul eie gesondheidsorg. Een van dié voedselsoorte wat baie aandag en navorsing geniet, is soja. Behalwe soja se ander gesondheidsvoordele, soos cholesterolverlaging en beenversterking, dui wetenskaplike bewyse daarop dat soja as 'n alternatief vir hormoonvervangingsterapie (HVT) gebruik kan word. Toenemende belangstelling in laasgenoemde kan toegeskryf word aan vroue se veranderde sienswyse, sowel as bewyse van die nuwe-effekte van

konvensionle hormoonvervanging. Verbruikersnavorsing in die nutraseutiese gebied is egter steeds in die beginfase.

**Doelwitte:**

Die hoofdoelwit van hierdie studie was om die Suid-Afrikaanse verbruikerspopulasie se opinie aangaande die potensiële gesondheidsvoordele van soja en soja produkte as alternatief vir hormoonvervangingsterapie te bepaal. Om hierdie hoofdoelwit te bereik, is die volgende spesifieke doelwitte gestel:

1. Om met behulp van 'n vraelys die persentasie Suid-Afrikaanse verbruikers wat van soja bewus is, te bepaal.
2. Om met behulp van 'n houdingskaal Suid-Afrikaanse verbruikers se houdingsingesteldheid teenoor die potensiële gesondheidsvoordele van soja en soja produkte as 'n alternatief vir HVT, te bepaal.
3. Om Suid-Afrikaanse verbruikers se opinies aangaande die menopousaal-verwante gesondheidsvoordele van soja te bepaal.
4. Om te bepaal of daar 'n verband is tussen verbruikers wat soja eet/drink en hulle opinie aangaande die potensiële gesondheidsvoordele van soja.
5. Om te bepaal of daar 'n verband bestaan tussen verbruikers wat nie soja gebruik nie en hulle opinie aangaande die beenversterkende eienskappe van soja.
6. Om te bepaal of daar 'n verband bestaan tussen verbruikers se opinie oor die gesondheidsvoordele wat soja besit, en hulle opinie oor soja as 'n alternatief vir HVT en as verligter van menopousale simptome.

**Metodes:**

Verbruikers se opinie ten opsigte van die gesondheidsvoordele van soja is deur middel van 'n vraelys bepaal. Respondente is ewekansig uit nege metropolitaanse en plattelandse gebiede in Suid-Afrika gekies. Die studiepopulasie het die vier hoof rassegroepe in die land ingesluit, naamlik wit, swart, gekleurde en Indiër. Die totale steekproefgrootte was 3001. 'n Subdatatstel (n=825) is geskep om vroulike respondente in te sluit wat reeds van soja gehoor het en wat pre-menopousaal (35-44 jaar) en post-menopousaal is (50-59 jaar). Die totale respondente wat vir verdere statistiese ontleding gebruik is, was 825. Die respondente het hul opinie aangaande die gesondheidsvoordele van soja op 'n vyfpunt-hedoniese (Likert) skaal aangedui, wat aangepas is tot 'n driepuntskaal vir makliker interpretasie van tabelle.

**Resultate:**

1. Van die 3001 respondente was 2437 (80%) bewus van soja.
2. 'n Gemiddelde houdingsingesteldheid van 2,47 op 'n driepuntskaal dui op 'n neutraal tot 'n positiewe houdingsingesteldheid onder Suid-Afrikaanse verbruikers teenoor die potensiële gesondheidsvoordele van soja en soja produkte as 'n alternatief vir HVT. Geen prakties betekenisvolle verskille is tussen die gemiddeldes van verskillende rassegroepe en die twee verskillende ouderdomgroepe vir enige van die stellings gevind nie.
3. Van al die respondente wat 'n opinie gelig het, het 72% saamgestem dat soja oor baie gesondheidsvoordele beskik, terwyl slegs 7% 'n

negatiewe opinie daarteenoor gehad het. Alhoewel 34% Suid-Afrikaanse verbruikers positiewe opinies aangaande soja as alternatief vir HVT gehad het, het die oorgrote meerderheid (46%) 'n neutrale opinie daarteenoor gehad. Twee-en-veertig persent van die verbruikers wat hulle opinies aangaande soja as verligter vir menopousale simptome uitgespreek het was positief, terwyl 35% 'n neutrale opinie gehad het en 23% van die Suid-Afrikaanse verbruikerspopulasie 'n negatiewe opinie van soja as 'n verligter van menopousale simptome gehad het.

4. 'n Verband, alhoewel nie prakties betekenisvol nie, is gevind tussen respondente wat aangedui het dat hulle soja eet/drink al dan nie, en hulle opinies aangaande die gesondheidsvoordele van soja. Die meerderheid van respondente wat aangedui het dat hulle soja eet/drink het 'n positiewe opinie aangaande die potensiële gesondheidsvoordele van soja gehad. Die respondente wat aangdui het dat hulle nie soja eet/drink nie, het egter steeds 'n positiewe opinie aangaande die potensiële gesondheidsvoordele van soja gehad.
5. 'n Verband, alhoewel nie prakties betekenisvol nie, is gevind tussen respondente wat aangedui het dat hulle nie soja gebruik nie, en hulle opinies aangaande die beenversterkende eienskappe van soja. Van die respondente wat aangedui het dat hulle wel soja gebruik, het die oorgrote meerderheid 'n positiewe opinie aangaande die versterkende eienskappe van soja ten opsigte van beendigtheid gehad. In teenstelling hiermee was respondente wat nie soja gebruik nie, se opinies aangaande dié stelling meer verspreid tussen positief (43%), negatief (20%) en neutral (37%).
6. 'n Prakties betekenisvolle verband is gevind tussen respondente se opinies aangaande die gesondheidsvoordele van soja en hulle opinies

van soja as alternatief vir HVT en as verligter van menopousale simptome. Die meerderheid van respondente wat 'n negatiewe opinie aangaande die gesondheidsvoordele van soja gehad het, het ook 'n negatiewe opinie aangaande soja as alternatief vir HVT gehad. Van die respondente wat wél geglo het dat soja gesondheidsvoordele besit, het 45% 'n neutrale opinie en 44% 'n positiewe opinie aangaande soja as alternatief vir HVT gehad. Omtrent die helfte (47%) van die respondente wat aangedui het dat soja wél gesondheidsvoordele besit, het 'n neutrale opinie aangaande soja as verligter van menopousale simptome gehad, terwyl slegs 30% 'n positiewe opinie aangaande dié stelling gehad het. Die oorgrote meerderheid (86%) van repondente wat 'n negatiewe opinie aangaande die gesondheidsvoordele van soja gehad het, het ook 'n negatiewe opinie aangaande soja as verligter van menopousale simptome gehad.

**Gevolgtrekking:**

Uit die resultate van die studie blyk dit dat 80% Suid-Afrikaanse verbruikers bewus is van soja en dat Suid-Afrikaanse verbruikers 'n neutrale tot positiewe houdingsingesteldheid daarteenoor het. Respondente het nie 'n besondere sterk opinie uitgespreek aangaande verskeie gesondheidsvoordele van soja nie. 'n Moontlik rede kan wees dat verbruikers nie ingelig genoeg is, ten opsigte van die gesondheidsvoordele waaroor soja beskik, om 'n definitiewe opinie uit te spreek of standpunt daarteenoor in te neem nie. Verskillende rasse- en ouderdomsgroepe het nie betekenisvolle verskille aangaande uitspraak van hulle opinies getoon nie, wat daarop dui dat ras en ouderdom nie 'n prakties

betekenisvolle invloed op opinies aangaande die gesondheidsvoordele van soja in hierdie studie gehad het nie.

Van al die respondente wat 'n opinie gelig het, het 72% saamgestem dat soja oor baie gesondheidsvoordele beskik. Hierdie persentasie is byna dieselfde as die van Amerikaanse verbruikers (74%) wat soja as gesond beskou (United Soybean Board (USB) National Report, 2003-2004:4). 'n Opname deur Adams (2001:433) het bevind dat 71% Amerikaanse verbruikers glo dat HVT wat van plantbronne afkomstig is minder risiko's het, en dus as 'n veilige alternatief vir konvensionele HVT gebruik kan word. Die resultate van die huidige studie toon egter dat slegs 34% Suid-Afrikaanse verbruikers 'n positiewe opinie aangaande soja as alternatief vir HVT het. Onvoldoende bewyse oor die veiligheid en doeltreffend van die potensiële gesondheidsvoordele van soja, sowel as 'n tekort aan verbruikersopvoeding in Suid-Afrika, kan moontlik die rede vir die onsekerheid onder Suid-Afrikaanse verbruikers wees. Terwyl slegs 26% van die Amerikaanse verbruikerspopulasie daarvan bewus is dat soja menopousale simptome kan verlig, het resultate in die huidige studie is bevind dat 42% Suid-Afrikaanse verbruikers 'n positiewe opinie aangaande soja as verligter van menopousale simptome uitgespreek het.

'n Verband, alhoewel nie prakties betekenisvol nie, is gevind tussen respondente wat soja eet/drink en hulle opinie aangaande die gesondheidsvoordele van soja. Dit kan daarop dui dat die eet/drink van soja nie 'n invloed het op verbruikers se opinies aangaande die gesondheidsvoordele van soja in die praktyk het nie. Die verband wat gevind is tussen repondente wat nie soja gebruik nie en hulle opinie aangaande die beenversterkende eienskappe van soja was nie prakties betekenisvol nie. 'n

Moontlike rede hiervoor kan wees dat die gebruik van soja al dan nie, nie 'n invloed het op verbruikers se opinies aangaande die versterkende eienskappe van soja ten opsigte van beendigheid nie. 'n Prakties betekenisvolle verband is gevind tussen respondente se opinies aangaande die gesondheidsvoordele van soja en hulle opinies van soja as alternatief vir HVT en as verligter van menopousale simptome, onderskeidelik. Respondente wat positiewe opinies aangaande die gesondheidsvoordele van soja gehad het, was egter nie oortuigend positief aangaande soja as alternatief vir HVT en as verligter van menopousale simptome nie. Hulle opinies was meer neutraal. Soos verwag, het respondente wat negatiewe opinies aangaande die gesondheidsvoordele van soja gehad het, ook negatiewe opinies aangaande soja as alternatief vir HVT en as verligter van menopousale simptome gehad.

Alhoewel die bydraende faktore wat aanleiding gee tot die vorming van verbruikersopinies nie in hierdie studie bepaal is nie, kan die hipotese gestel word dat die gebrek aan oortuigende opinies aangaande soja die gevolg van 'n tekort aan gestandardiseerde bewyse rondom die veiligheid en doeltreffendheid van alternatiewe hormoonvervangings terapieë is. Verdere studies is egter noodsaaklik om die bydraende faktore tot verbruikers se opinies, of afwesigheid van opinies, aangaande soja te bepaal. Indien verbruikers nie opgevoed word ten opsigte van die voordele en nadele van soja as alternatief vir HVT nie, kan hulle nie intelligente besluite en keuses maak aangaande die gebruik al dan nie, van soja as alternatief vir HVT nie.

**Sleutel terme:** Soja, funksionele voedsel, hormoonvervangings terapie, menopousale simptome, opinie.

## **SUMMARY**

### **Motivation:**

There is an increasing awareness in the food industry about the role that proper nutrition plays in maintaining health and preventing disease. Women especially have always been interested in nutrition and its impact on their well-being. This awareness has placed more pressure on the food industry to provide a greater variety of nutritious and wholesome products which has led to the development of a new field in the food industry, called functional foods. These are food products that apart from the micro- and macronutrients that it already provides have additional important physiologically active functions that enhance health. These active components, called phytochemicals (from plant sources) and zoochemicals (from animal sources) have changed the role of diet in health. Functional foods can, by nature or design, bridge the traditional gap between food and medicine and thereby provide consumers with the opportunity to become involved in their own health care. One of these functional foods that have been receiving increased attention and research is soy. Apart from other health benefits of soy, such as cholesterol reduction and bone strengthening, scientific evidence has shown that soy can be used as an alternative for hormone replacement therapy (HRT). The increased interest in the latter can be ascribed to the changed attitude of women, as well as evidence of the side effects of conventional hormone replacement therapies. Consumer research in the nutraceutical area is, however, still in its infancy stage.

**Objective:**

The main objective of this study was thus to assess South African consumers' opinion of the potential health benefits of soy and soy products as an alternative for HRT. To attain this main objective, the following specific objectives were stated:

1. To determine, by means of a consumer questionnaire, the percentage of South African consumers who are aware of soy.
2. To determine, by means of an attitude scale, the attitudinal disposition of South African consumers towards the potential health benefits of soy and soy products as an alternative for HRT.
3. To determine South African consumers' opinions regarding the menopausal related health benefits of soy.
4. To determine whether there is a relation between respondents who eat/drink soy and their opinion of the potential health benefits of soy.
5. To determine whether there is a relation between respondents who never use soy and their opinion of the bone strengthening benefit of soy.
6. To determine whether there is a relation between respondents' opinion of the health benefits of soy and their opinions of soy as an alternative for HRT and reliever of menopausal symptoms, respectively.

**Methods:**

In this study, consumers' opinion regarding the health benefits of soy was evaluated using a questionnaire. Respondents were randomly selected from nine metropolitan, as well as rural areas in South Africa, representing the four

main race groups, namely whites, blacks, coloureds and Indians. The total sample size of the metropolitan and rural subjects was 3001. A sub-dataset was created which included female respondents that have heard of soy before and were pre-menopausal (35-44 years) and post-menopausal (50-59 years) of age. Thus, the total number of respondents used for further statistical analyses was 825. The respondents expressed their opinions of the health benefits of soy on a five-point hedonic (Likert) scale which was adapted to a three-point scale for easier interpretation of the tables.

**Results:**

1. Of the 3 001 respondents, 2 437 (80%) were aware of soy.
2. A mean attitudinal disposition score of 2.47 on a three-point scale indicated a neutral to positive attitudinal disposition of the South African consumer population towards the potential health benefits of soy and soy products as alternative for HRT. No practically significant differences were found between the mean values of each statement, which indicated that no specifically strong opinions were expressed between different races or between different age groups.
3. Of all the consumers surveyed and those who did express a specific opinion, 72% agreed that soy has many health benefits compared to only 7% who disagreed. Although 34% of South Africans expressed a positive opinion when asked if soy can be used as alternative for HRT, the majority (46%) of the population had a neutral opinion. Forty-two percent of the consumers who held an opinion regarding soy as reliever of menopausal symptoms were positive, 35% had a neutral opinion and

23% of South Africans did not agree that soy can relieve menopausal symptoms.

4. A relation, although not of practical significance, was found between respondents who eat/drink soy and their opinion of the health benefits of soy. Of the respondents who indicated that they eat/drink soy, the majority agreed that soy has many health benefits. The respondents who disagreed when asked if they eat/drink soy, still expressed an overall positive opinion when asked whether soy has many health benefits.
5. A relation, although not of practical significance, was found between respondents who never use soy and their opinion of the bone strengthening benefit of soy. Of those who indicated that they use soy, the majority agreed that soy has a bone strengthening benefit. On the contrary, only 43% of those who agreed that they never use soy were positive about the bone strengthening benefit of soy, whereas 37% held a neutral opinion and 20% expressed a negative opinion.
6. The relation between respondents' opinion of the overall health benefits of soy and their opinion of soy as alternative for HRT and reliever of menopausal symptoms was of practical significance. Of the respondents who did not agree that soy has many health benefits, the majority expressed a negative opinion of soy as an alternative for HRT. Of those who agreed that soy has many health benefits, 45% expressed a neutral opinion and 44% a positive opinion of soy as alternative for HRT. Almost half (47%) of the respondents who agreed that soy does have many health benefits, expressed a neutral opinion when asked if soy can relieve menopausal symptoms, whereas only 30% had a positive opinion in this regard. The majority (86%) of the respondents

who disagreed that soy has many health benefits, also expressed a negative opinion of soy as reliever for menopausal symptoms

**Conclusion:**

The results of this study indicate that 80% of the South African consumer population are aware of soy and that South African consumers have a neutral to positive attitudinal disposition towards the potential health benefits of soy. Respondents did not express a particularly strong opinion regarding several health benefits of soy. It may be hypothesized that they are not informed well enough on the health benefits of soy as to take a stand and to form a definite opinion. Neither different race groups, nor pre- or post-menopausal women differ significantly in the frequency of their opinions, indicating that in this study, race and age did not have a practical significant influence on opinion of the health benefits of soy.

Of all those surveyed and who did express a specific opinion, 72% agreed that soy has many health benefits, which is almost the same percentage (74%) as American consumers who perceive soy products as healthy as according to the United Soybean Board (USB) National Report (2003-2004:4). A survey by Adams (2001:433) reported that 71% of American consumers believed that plant-derived HRT have fewer risks and can thus be used as a safe alternative for conventional HRT. According to the results of the present study only 34% of South African consumers expressed a positive opinion when asked if soy can be used as an alternative for HRT. Insufficient evidence on the safety and efficacy of the potential health benefits of soy, as well as a lack of consumer education in South Africa, could be the reason for this uncertainty among

South African consumers. While only 26% of American consumers are aware that soy might relieve menopausal symptoms (USB National Report, 2003-2004:4), results of the current study found that 42% of South Africans were of opinion that soy can relieve menopausal symptoms.

A relation, although not of practical significance, was found between respondents who eat/drink soy and their opinion of the health benefits of soy. This can be an indication that whether or not the South African consumer population consume soy doesn't have an influence on their opinion of soy's health benefits in practice. The relation found between respondents who never use soy and their opinion of the bone strengthening benefit of soy were not of practical significance. This can be an indication that whether or not South Africans use soy does not influence their opinion of the bone strengthening benefit of soy in practice. Further more, a practically significant relation was found between respondents' opinion of the overall health benefits of soy and their opinion of soy as alternative for HRT and reliever of menopausal symptoms, respectively. Interestingly, respondents who expressed a positive opinion regarding the health benefits of soy did not have a convincingly positive opinion of soy as alternative for HRT and as reliever of menopausal symptoms. They expressed a more neutral opinion. As expected, consumers that were not of opinion that soy has certain health benefits, also disagreed when asked if soy can be used as and alternative for HRT or as reliever of menopausal symptoms.

Although the causes for the respondents' opinion or uncertainty were not determined in this study, it can be hypothesised that it may be due to lack of standardisation of evidence on the safety and efficacy of alternative hormone replacement therapies. Further studies are still needed to determine the

contributing factors which influence consumers' opinion or lack of opinion on soy. If consumers are not educated about the benefits and disadvantages of soy as alternative for HRT, they can not make intelligent decisions and choices as to whether or not to use soy as alternative for HRT.

**Key words:** soy, functional food, hormone replacement therapy, menopausal symptoms, opinion.

**ABBREVIATIONS**

$\mu^2$	Effect size for k groups
%	Percentage
↑	Increase
↓	Decrease
ADA	American Dietetic Association
ANOVA	Analysis of variance
BMD	Bone mineral density
CCEPT therapy	Continuous-combined estrogen progesterone
CVD	Cardiovascular disease
ERT	Estrogen replacement therapy
FDA	Food and Drug Administration
FOSHU	Foods for specified use
HDL	High density lipoprotein
HRT	Hormone replacement therapy
HVT	Hormoonvervangingsterapie
IFIC	International Food Information Council
ILSI	International Life Sciences Institute
LDL	Low density lipoprotein
n	Sample size,
NIH	National Institutes of Health
<i>O</i> -DMA	<i>O</i> -desmethylangolensin
SD	Standard deviation
SERM	Selective estrogen receptor modulator
TC	Total cholesterol
UK	United Kingdom

US	United States
USA	United States of America
USB	United Soybean Board
VLDL	Very low density lipoprotein
w	Effect size using Chi-square
WHI	Women's Health Initiative

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# **CHAPTER 1**

## **INTRODUCTION**

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1. BACKGROUND AND MOTIVATION**

This study was motivated by the lack of existing knowledge on South African consumers' opinion of the potential health benefits and adverse effects of soy and soy products. The aim of this chapter is to motivate the possible benefits, as well as the adverse effects of soy as hormone replacement therapy (HRT) and also the essence of consumer research relevant to existing knowledge.

Most of the prevailing chronic diseases in the world have an important nutritional component by directly causing a specific disease, enhancing the risk through phenomena of promotion, exerting a beneficial effect in decreasing risk, or preventing the disease (Weisburger, 2000:767). One of the largest trends that have been gathering momentum in the United States is thus an increasing awareness of the role of diet and proper nutrition to maintain health and prevent diseases (Childs & Poryzees, 1997:433).

Advances in biology and medicine have identified a number of diet-related factors contributing to human health and well being. This leads to an increased pressure to build into the food supply a broader version of "healthiness" and wholesomeness and will involve continued and much more extensive efforts to avoid diseases and conditions due to food ingestion. It will further concern itself with production of foods actively promoting health and well-being, not only through micro- and macronutrients, but also through ingredients with more specific physiological functions, including the so-called area of functional foods or nutraceuticals (Karel, 2000:57). Health and disease observations among Eastern and Western populations have received

considerable interest and have led to a situation in which both health authorities and industry have stated to invest substantial time and money in the evaluation of the health effects of phytochemicals that are consumed along with the diet (Brouns, 2002:187).

There have been several studies performed with phytoestrogen in various aspects of the postmenopausal women's health. The theory that soy may alleviate menopausal symptoms was prompted by the observation that women in East Asian countries report significantly lower levels of hot flushes and night sweats compared to Western women (Hasler, 1998:64). A clinical intervention trial by Murkies *et al.* (1995:193) and a recent study by Han *et al.* (2002:391), reported that soy isoflavones are effective in the reduction and severity of hot flushes and may be a safe alternative therapy for menopausal symptoms. Several other studies have reported that soy can also be effective for other menopausal symptoms and related diseases such as breast cancer (Setchell, 2001:S360), osteoporosis (Potter *et al.*, 1998:S1374) and coronary heart disease (Han *et al.*, 2002:389; Messina, 2003:1; Teede *et al.*, 2001:3056). Following the recent trial of the Women's Health Initiative (WHI) on the adverse effects of HRT, there seems to be controversy between the proposed benefits and potential risks of soy as alternative for HRT. Though, on the basis of available data - there is little reason to think that soy consumption will increase the risk of any diseases - whereas there is at least preliminary data suggesting soy may provide some benefits (Messina, 2003:6).

Nutraceuticals and functional foods are clearly poised as a 21<sup>st</sup>-century industry. They promise value-added opportunities in the food industry and new market opportunities for the pharmaceutical industry. They offer advances in public health as health claim marketing messages empower

consumers to select healthier food choices (Childs, 2001:527). The proposed physiological effects of phytoestrogens have created a marketing opportunity that has been utilized by the industry, particularly in soybean-producing countries such as the USA and Australia. Many 'health' supplements and drinks are now marketed as containing genistein, along with tablets containing isoflavones extracts which are marketed as 'natural' hormone-replacement therapies, and are available over the counter (Bingham *et al.*, 1997:394). Marketing of products with health claims and reaching consumers with meaningful messages and positioning for products in the functional food arena take careful attention to regulatory issues and insightful thought on how to communicate product benefits for consumer attention (Childs, 2001:518).

Food choice, like any complex human behaviour, will be influenced by many interrelating factors. Many of the influences on food choice may be mediated by people's beliefs and attitudes. In addition to sensory preferences, beliefs about the nutritional quality and health effects of a food may be more important than the actual nutritional quality and health consequences in determining a person's choice (Shepherd & Sparks, 1994:205).

Consumer behaviour can thus be defined as the behaviour that consumers display in seeking, purchasing, using, evaluating and disposing of products and services that they expect will satisfy their needs (Schiffman *et al.*, 1997:6). Attitude is a way of thinking and behaving and since attitude has the important psychological function of directing behaviour, it is necessary to determine. Beliefs can be defined as a subjective judgement about the relationship between two or more things, and are based on knowledge. In other words, what you have learned about a product determines what you believe about the product. The first time a person develop a belief, feeling, or

attitude about something is called opinion formation. People's attitudinal opinions are based on their beliefs and feelings (Blackwell *et al.*, 2001:291).

Numerous studies linking diet and health have been published over the past decade and consumers are demanding more information on how to achieve health benefits through food and vitamins (Childs & Poryzees, 1997:433). The increase use of alternative treatment for menopausal symptoms is mainly due to women's changing views of conventional HRT, and although alternative therapies are becoming mainstream (Dantas, 1999:212), consumer research in the nutraceutical area is still in its infancy stage (Childs & Poryzees, 1997:434).

The National Report of the *United Soybean Board* on consumer attitudes on nutrition (2003-2004) reported that 74% of Americans are aware of the health benefits of soy foods. The Report also stated that 26% of consumers in America are aware that soy may help relieve symptoms of menopause. A survey by Adams (2001:433) reported that compared with conventional HRT, most respondents endorsed the belief that plant-derived hormones are safer, cause fewer side effects and are equally or more effective for long-term bone and heart protection. Studies on consumers' awareness and attitude towards HRT and soy as an alternative therapy for menopausal symptoms have also been done in countries other than the United States, such as China (Lam *et al.*, 2003:2) and Australia (Bednall & Kanuk, 1996:571). In both countries the women had a low HRT usage rate and the majority of them are lacking of the knowledge about HRT.

To our knowledge, South Africa lacks a National Report similar to that of the United Soybean Board, and there is minimal existing information regarding

South African consumers' attitudes and opinions towards the health benefits of soy as a product and as an alternative to HRT. If it is true that a regular consumption of isoflavones along with the regular diet has a protective effect and may reduce the risk of certain diseases, then there would be good reason to educate people to consume foods that are rich in such compounds. Alternatively, enrichment of food products in the daily diet could be a way to realise the ultimately desired goal to improve the long-term quality of life by appropriate health maintenance. When effective, this may result in a potential reduction of the costs of health care and disease management of the Western population

## **2. OBJECTIVE OF THE STUDY**

### **2.1 Main objective**

To assess South African consumers' opinion of the potential health benefits of soy and soy products as an alternative to HRT.

### **2.2 Specific objectives**

The specific objectives of this study were to determine:

1. by means of a consumer questionnaire, the percentage of South African consumers who are aware of soy.
2. by means of an attitude scale, the attitudinal disposition of South African consumers towards the potential health benefits of soy and soy products as an alternative for HRT.

3. South African consumers' opinions regarding the menopause related health benefits of soy.
4. whether there is a relation between respondents who eat/drink soy and their opinion of the potential health benefits of soy.
5. whether there is a relation between respondents who never use soy and their opinion of the bone strengthening benefit of soy.
6. whether there is a relation between respondents' opinion of the health benefits of soy and their opinions of soy as an alternative for HRT and as reliever for menopausal symptoms.

### **3. STRUCTURE OF THE MINI-DISSERTATION**

This mini-dissertation is presented in article format. As reflected in the above, this mini-dissertation discusses consumers' awareness, attitudinal disposition, and opinion of the potential health benefits of soy and soy products as an alternative to HRT in general as well as in the South African context. Following this introductory chapter which motivates the necessity of the current research by giving background on the possible benefits, as well as potential adverse effects of soy as HRT and also the essence of consumer research, Chapter 2 gives an overview of the literature that will be needed as background for the interpretation and understanding of the data used in this mini-dissertation. This includes a broad definition of functional foods as well as soy as functional food, the mechanism through which phytoestrogens may act as hormone replacement, possible adverse effects of HRT and consumer's awareness, attitudinal disposition and opinion of soy and soy products. Chapter 3 consists of a manuscript on South African consumers' opinion of the potential health benefits of soy and soy products as an alternative to HRT.

In Chapter 4, a final conclusion is drawn and recommendations are made. The questionnaire used in this study is presented as Addendum A at the end of the mini-dissertation. Please note that the relevant references in Chapter 3 are provided at the end of the chapter according to instructions of the specific journal to which the manuscript will be submitted. The references used in the unpublished Chapters 1 and 2 are provided according to the mandatory style stipulated by the PU for CHE.

#### 4. AUTHOR'S CONTRIBUTIONS

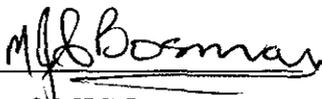
The study reported in this mini-dissertation was planned and executed by a team of researchers. The contribution of each researcher is given in the following table:

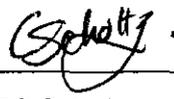
Name	Role in study
A. van Wyk de Vries	Author, statistical analysis, interpretation of data, literature research and preparation of this mini-dissertation.
Prof. M.J.C. Bosman	Study leader and co-author. Supervised statistical analysis and interpretation of the data. Supervised the writing of this mini-dissertation.
Dr. S.C. Scholtz	Co-study leader and co-author. Supervised statistical analysis and interpretation of the data. Supervised the writing of this mini-dissertation.

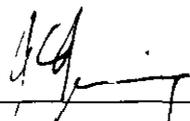
Prof. JC Jerling	Conceived idea of the study. Organised sponsorships and funds to enable the study. Draw-up of questionnaires together with <i>Markinor</i> . Execution of study.
J. Badham	Conceived idea of the study. Organised sponsorships and funds to enable the study. Draw-up of questionnaires together with <i>Markinor</i> . Execution of study.

The following is a statement from the co-authors confirming their individual role in the study and giving their permission that the article may form part of this mini-dissertation.

*I declare that I have approved the above-mentioned article, that my role in the study, as indicated above, is representative of my actual contribution and that I hereby give my consent that it may be published as part of the Masters' mini-dissertation of Miss A van Wyk de Vries.*

  
 Prof. MJC Bosman

  
 Dr. SC Scholtz

  
 Prof. JC Jerling

  
 Miss. J Badham

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**CHAPTER 2**

**LITERATURE REVIEW**

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## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **1. INTRODUCTION**

The aim of this chapter is to put all the literature in context, to give the reader the necessary factual background for the understanding and interpretation of the manuscript presented (Chapter 3), as well as to provide insight into the study as a whole.

A short introduction of the increasing focus on nutrition and of the health benefits of food will set the background for the rest of the discussion. The author will subsequently explore in more detail soy as functional food, the possible benefit of soy as hormone replacement therapy and the mechanism of phytoestrogens' functioning, as well as the effects of soy on menopausal symptoms. Furthermore, the importance of consumers' behaviour and factors related to consumer behaviour, as well as consumers' awareness of the possible health benefits of soy will be discussed globally.

#### **2. INCREASING FOCUS OF THE HEALTH BENEFITS OF FOOD**

Never before has the focus on the health benefits of food been so strong. The philosophy that food can be health promoting beyond its traditional nutritional value is gaining acceptance among scientists and health professionals (Anon., 1995:496).

Women have always been interested in nutrition and its impact on their health and wellbeing. Many women are affected by the dramatic variation in hormone levels that occur during each menstrual cycle, and know from experience that some foods may help them to feel better, or worse. For some the menstrual cycle involves uncomfortable, but tolerable side effects, but for a minority of women menstrual symptoms have more severe side effects, resulting in premenstrual syndrome, which may be sufficiently severe to require medical intervention (Jefferson, 2003:16).

Hormone replacement therapy (HRT) is increasingly recommended for prevention and treatment of the long-term effects of menopause. Wide evidence suggests that long-term hormonal treatments are necessary to obtain a substantial decrease of risk for diseases such as cardiovascular disease and osteoporosis, but serious side effects discourage long-term HRT use (Chiechi *et al.*, 2002:5). As postmenopausal hormone replacement has become an ever more complex issue, women have sought nonestrogen alternatives to treat their menopausal symptoms and improve their overall health (Carusi, 2000:253). On account of geographic evidence, soy isoflavones have been investigated as an alternative therapy to relieve menopausal symptoms without the accompanying side effects of HRT or estrogen replacement therapy (ERT) (St. Germain *et al.*, 2001:18). To fully understand the functional benefits of soy as reliever of menopausal symptoms though, the term functional foods must first be defined.

### 3. DEFINING FUNCTIONAL FOODS

Knowledge of the role of physiologically active food components, both from plant (phytochemicals) and animal (zoochemicals) sources has changed the role of diet in health. The American Dietetic Association support the opinion that functional foods, including whole foods and fortified, enriched, or enhanced foods, have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at affective levels. The Association supports research to further define the health benefits and risks of individual functional foods and their physiologically active components (Anon, 1995:493).

There is no universally accepted definition of functional foods, although, several organizations have attempted to define this emerging food category. According to The International Food Information Council (IFIC) functional foods are foods that provide health benefits beyond basic nutrition. The International Life Sciences Institute (ILSI) of North America, on the other hand, defines functional foods as foods that, by virtue of physiologically active food components, provide health benefits beyond basic nutrition. The Institute of Medicine of the National Academy of Sciences limits functional foods to those in which the concentrations of one or more ingredients have been manipulated or modified to enhance their contribution to a healthful diet (Anon, 1995:493). Functional foods need not always be newly developed foods – even familiar foods for which recent research findings have highlighted new health benefits or dispelled old dogma about potential adverse health effects, may be included in this category (Scholtz, 2002:46).

The term “functional foods” originated in Japan in the mid-1980s. The Japan government launched a program to promote the development of foods with healthful properties and formulated a specific regulator process for functional foods known as “foods for specified health use” (FOSHU) (Hasler, 1998:63). By the 1990s there had been an explosion in knowledge about the physiological functions and health benefits of nutrients, offering exciting prospects for the food industry and consumers alike (Howe, 2000:S108). Today, the increased interest in functional foods in general is likely occurring for three reasons, namely increased health costs and life expectancy, recent legislation (e.g. on health claims), and scientific discoveries (Milner, 2000:S1654). Although the term “functional foods” may not be the ideal descriptor for this emerging food category this term is recognized more readily and was also preferred by consumers over other commonly used terms such as “nutraceuticals” (Anon, 1995:494). Consumers have clearly demonstrated their interest in and expectations of functional foods as a further means to take their health care into their own hands. Therefore, it is essential to establish reliable mechanisms for obtaining and communicating the information needed by consumers to make informed choices about their diet and to have realistic expectations of the health benefits to be derived from functional foods (Howe, 2000:S108). It is already known that women are seeking other alternatives to conventional hormone replacement therapies to treat their menopausal symptoms (section 2, p. 14). Though, without the proper knowledge and understanding of the functional benefit of soy as an alternative for HRT, consumers will not be able to form an opinion about it. It is thus essential to define soy as a functional food as well as the part it can play in reducing menopausal symptoms.

#### 4. SOY AS FUNCTIONAL FOOD

Soy protein is unique in that it is rich in polyunsaturated fats and fiber, which are cardio protective, and also contains high amounts of isoflavones (Vincent & Fitzpatrick, 2000:1175). The soy isoflavones are present in the plant as glycones and once ingested, they are metabolised by intestinal bacteria to yield the active isoflavonoids daidzein, genistein, and glycitein (Anon, 2000:1; Brouns, 2002:189). Most plant estrogens are bound to carbohydrate - called glycones and referred to as daidzin, genistin and glycetin, and only a small fraction appears to be unbound plant estrogens - called aglycones: daidzein, genistein and glycitein, respectively. One of the key questions with respect to the functional role of specific plant compounds in the human body is whether these compounds are actually absorbed from the gastrointestinal tract, are metabolised or not and finally reach target tissues to exert a favourable effect (Brouns, 2002:189). Heterocyclic phenols with a structure similar to estrogens are formed by a complex enzymatic metabolic conversion in the gastrointestinal tract (Sirtori, 2001: 666; Albertazzi & Purdie, 2002:175).

Over the past several years, in addition to direct research on soy, understanding of soy has been greatly aided by advances in the field of steroid biochemistry. Particularly important in this regard is the identification of a second estrogen receptor (estrogen receptor  $\beta$ ). This discovery has led to development of selective estrogen modulators – compounds that have tissue selective effects (Messina, 2002:1). The isoflavones bind to estrogen receptors on cells of different organs in the human body (Carusi, 2000:253; Brouns, 2002:189). The morphology of the ligand binding domain of the receptor, especially the position of helix 12, differs depending on the type of ligand that binds the receptor. When genistein binds to the receptor the

position of helix 12 is similar to that of raloxifene when bound to the same receptor (Albertazzi & Purdie, 2002:174). Raloxifene is among a group of compounds that are collectively known as selective estrogen receptor modulators (SERMs). SERMs are a group of chemically diverse non-steroidal compounds that bind to and interact with the estrogen receptors (Arjmandi, 2002:130). Phytoestrogens may be added to the list of SERMs, given their agonist/antagonist properties at the estrogen sensitive tissues (Carusi, 2000:253), and also due to the phenolic rings, particularly the 4'-hydroxyl, which give them the ability to bind to estrogen receptors (Setchell, 2001:356s). This binding ability of genistein has been used to explain some of its biological effects. Recent research has shown that cells have two types of estrogen receptors,  $\alpha$  and  $\beta$ . Human estrogen has a high binding affinity for the  $\alpha$  receptor while genistein shows a greater affinity for the  $\beta$  receptor. This differential affinity might be of functional significance as the two receptor sub-types differ in their tissue distribution and possibly their activity as well. It has been reported that isoflavones may have an estrogenic as well as an anti-estrogenic effect in the human body (Albertazzi & Purdie, 2002:174; Brouns, 2002:189).

Daidzein is eventually metabolized to both Equol and *O*-desmethylangolensin (*O*-DMA). Equol is not a phytoestrogen because it is not a natural constituent of plants; it is a nonsteroidal estrogen of the isoflavone class that is exclusively a metabolic product of intestinal bacterial metabolism (Setchell *et al.*, 2002:3577-3578). However, only about one-third of subjects actually produce Equol. This varies according to the composition of the intestinal microflora (Messina, 2002:1). Further more, Equol is superior to all other isoflavones in its antioxidant activity. The clinical effectiveness of soy protein in cardiovascular, bone and menopausal health may thus be a function of the

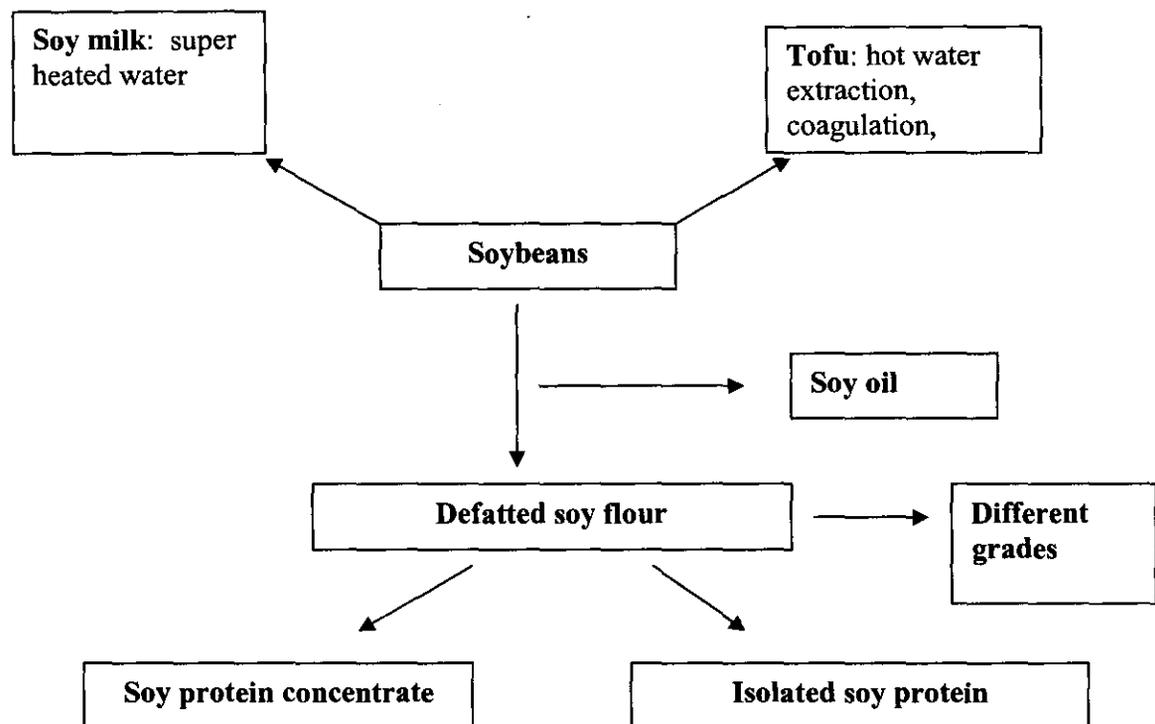
ability to biotransform soy isoflavones to the more potent estrogenic isoflavone, Equol (Setchell *et al.*, 2002:3577-3578).

Substantial evidence indicates that diets high in plant-based foods may explain the epidemiologic variance of many hormone-dependent diseases that are a major cause of mortality and morbidity in Western populations. Lignans and isoflavones represent two of the main classes of phytoestrogens of current interest in clinical nutrition. Although phytoestrogens are in abundance in their occurrence in the plant kingdom, these bioactive nonnutrients are found in particularly high concentrations in flaxseeds and soybeans and have been found to have a wide range of hormonal and nonhormonal activities that serve to provide plausible mechanisms for the potential health benefits of diets rich in phytoestrogens (Setchell & Cassidy, 1999:S758).

#### **4.1 Soy food products and the isoflavone concentration thereof**

Soybeans are converted into a variety of food products (Figure 1). In East Asia, soy beans are fermented to form miso, soy bean paste and tempeh. Americans on the other hand, mostly use soy for the production of vegetable oil, which is prepared by extracting crushed soybeans with hexane. The defatted soybeans after removal of residual solvent are pulverized to form soy flour, which contains approximately 50% by weight of protein and comes in several grades based on the extent to which it is heat-treated. Soy flour is further treated to generate products with high protein content. Aqueous washing of soy flour removes the soluble carbohydrates and increases the percentage of protein to 60-70%. In order to get taste-free and colour-free soy protein preparation for use by the food industry, some soy processors have

washed soy flour with a mixture of water and alcohol, but this procedure effectively removes almost all the phytochemicals in soy, a possible disadvantage from a health perspective for any food. Isolated soy protein is prepared by first dissolving the proteins in soy flour and precipitating them at their electric point – the dried product contains at least 90% protein (Barnes, 1998:387-388).



**Figure 1.** Different soy food products (Barnes, 1998: 388)

Murphy (1982:62) found that the concentration and composition of isoflavones in soy beans vary in different soy beans or soy products and that this variation is due to species differences, geographic and environmental conditions, as well as the extent of the industrial processing of soy beans. To evaluate the potential of isoflavones as health-enhancing dietary compounds,

the amounts of isoflavones available in typical soyfoods and in soybeans must be quantified (Song *et al.*, 1998:S1474). Table 1 illustrates the varied isoflavone concentration in a range of soy products.

**Table 1:** Isoflavone concentration in soy products (Coward *et al.*, 1998:S1489 ; Song *et al.*, 1998:S1476)

Food	Daidzein ( $\mu\text{g/g}$ )	Genistein ( $\mu\text{g/g}$ )	Glycitein ( $\mu\text{g/g}$ )
Toasted soy flour	1 343,4	1 509,5	242,5
Soy flour	829,7	834,4	142,9
Isolated soy Protein	789,3	1 258,0	114,2
Textured vegetable Protein	919,7	1 092,1	98,4
Tofu	133,1	169,0	20,9
Soy milk	1 772,0	3 804,0	327,0

Soy beans contain 2 to 4mg of isoflavones per gram of protein (Vincent & Fitzpatrick, 2000:1175). The primary isoflavones in soybeans are genistein and daidzein. They have the highest concentrations, whereas much lower amounts of glycitein are present in soybeans and soy products (Table 1). The isoflavone concentration in the soy protein varies with the isolation process - dehulling, flaking, and defatting, which is the traditional method of isolating soy protein and results in a protein low in isoflavonoids. Textured soy protein and soy flour contain, on average, approximately 5 mg of isoflavones per gram of protein (Vincent & Fitzpatrick, 2000:1175).

Both soy protein and its isolated isoflavones are being marketed to postmenopausal women, hence it is important to identify the protective components of soy necessary to guide the consumers in making appropriate choices (Arjmandi & Smith, 2002:131). With increased interest in isoflavones, purified pills with varying content of extracted isoflavones are available in health food stores. These pills contain only isoflavones and lack the protein, lipids, and other phytochemicals found in the whole soybean (Vincent & Fitzpatrick, 2000:1175). According to a recent study by Setchell *et al.* (2001:S1374) the safety of phytoestrogen supplements should be addressed. There is a misconception that these supplements are safe just because it is “natural”. In many of the supplements that were analyzed, numerous unidentifiable compounds were found. Although diets rich in phytoestrogens have been consumed by millions of humans for millennia (Barnes, 1998:386), the amounts ingested daily, estimated at 15-50mg, are below the dose promoted for supplementation. With supplementation, the dangers of overdosing becomes a reality, and there is little reason to believe that adverse effects (see section 6, p.37) could not occur in humans as a result of excessive intakes (Setchell *et al.*, 2001:S1374). Many studies have concerned the safety of isoflavones, often along with the evaluation of the efficacy of specific isoflavone dosages on selected biomarkers. After reviewing current literature, consensus was reached and the appropriate food fortification levels were established. For relief of post menopausal symptoms an intake of 60 mg aglycones was proposed but consumption of soy protein in conjunction with the isoflavones was not specifically recommended. For improvement of bone mineral density, consumption of 60-100mg aglycones per day, without concomitant soy protein, was suggested. For health benefits, recommended intakes ranged from 60-100 mg aglycones per day (100-160 mg glycones) and the minimal intake needed to reduce the serum LDL cholesterol

is between 37 mg and 62 mg aglycones per day depending on the prior cholesterol status in conjunction with approximately 25 g of soy protein (Brouns, 2002:191).

Setchell *et al.* (2001:S1374) reviewed previous studies and reported that thus far, there is little evidence that isoflavone supplements have the same clinical effects as phytoestrogen-rich foods. Isoflavone supplements have no effects on lowering serum cholesterol or lipid levels, whereas soy protein has an effect. Also, although isoflavone supplements are in large part being targeted to postmenopausal women for the relief of hot flashes, clinical studies show that they have a modest effect on hot flashes that exceeds the placebo response, and are not as effective as hormone replacement therapy. Therefore, women who choose to use isoflavones for menopausal symptom relief and long-term disease prevention may have appropriate questions regarding the quantity and type of supplement to use.

## **5. SOY AS HORMONE REPLACEMENT THERAPY**

The onset of the menopause usually occurs between 45-50 years of age and is caused by the gradual failure of the ovaries to produce the hormones oestrogen and progesterone. It is known that the reduction in oestrogen production during the menopause results in the wide range of symptoms that may occur and may contribute to the dramatic increase in the risk of development of both osteoporosis and coronary heart disease (Jefferson, 2003:18). The use of oral estrogen or estrogen-progestin HRT, for treatment of the symptoms associated with menopause, is common medical practice (Gelfand & Witta, 1997:384), but still only about 20% of peri- and postmenopausal women in the USA

actually take HRT to relief the symptoms associated with menopause and only 6% use HRT for the long-term possible cardiovascular benefits (Hope, 2003:32).

This is also a time of unprecedented growth in the popularity of alternative and complementary medicines for the management of the symptoms of menopause (Kanga et al., 2002:196). Women's views of conventional HRT and trends towards alternative medicines have contributed to an increased use of alternative treatments (Dantas, 1999:212). More women have looked to phytoestrogens, such as the isoflavones found in the soy plant, to tailor their menopausal therapy in a 'natural' way (Carusi, 2000:253). These non-nutrient bioactive compounds are ubiquitous to the plant kingdom and possess a wide range of biological properties that contribute to much different health related benefits (Setchell, 2001:S354).

As noted before in this literature review, selective estrogen receptor modulators (SERMs) have been developed to preserve the benefits of traditional hormone therapy while avoiding unwanted side effects. The ideal SERM would treat such symptoms as hot flushes, vaginal dryness, and mood changes while protecting women from osteoporosis and heart disease. These benefits would be met without substantially increasing the risk of breast or endometrial cancer (Carusi, 2000:253).

Interest in soy as "natural" form of hormone was sparked by geographic observations (Carusi, 2000:253). Soybeans are a staple in the diet of East Asian countries (Adlercreutz & Mazur, 1997:108) and have been part of their diet for nearly five millennia, whereas consumption of soy in the United States and Western Europe has been limited to the 20<sup>th</sup> century (Barnes, 1998:386).

In the areas with soy-enriched diets, epidemiological studies reveal lower incidences of hormone-dependent diseases (Adlercreutz & Mazur, 1997:108). In Asian countries, soy-isoflavone intake is estimated to range from 20-100 mg/day. The Western population, however, consumes much less. A comparison of populations on high isoflavone intake with the normal Western population highlights a lower mortality rate and lower incidence of diseases (Brouns, 2002:187). The soy phytoestrogens, specifically the isoflavones, have been postulated to be partly responsible for this protection. As a result, there has been intense interest in the isoflavones as “substitutes” for estrogen for postmenopausal women and as preventive therapy for premenopausal women (Vincent & Fitzpatrick, 2000: 1175).

### **5.1 The mechanism of phytoestrogens’ functioning**

Isoflavones are phytoestrogens, which have a structural and functional similarity to human estrogen and have been consumed by humans world-wide throughout history (Brouns, 2002:187). The pharmacology and functionality of soy isoflavones have already been discussed in section 4.1. Given that phytoestrogens are weak estrogen agonists, they will exhibit their most potent estrogenic effects in a low-estrogen environment, when there is little competitor available. Thus, they may be predicted to exhibit more estrogenic properties in postmenopausal women (Carusi, 2000:254). What this implies from a clinical perspective is that at certain concentrations, which may depend on many factors including receptor numbers, occupancy and competing estrogen concentration, rather than acting as estrogen mimics and initiating estrogen-like actions, they may antagonize and inhibit estrogen action. These effects will also be tissue specific (Setchell & Cassidy, 1999:S758).

Phytoestrogens have demonstrated numerous biochemical actions. Actions at the cellular level depend on the target tissue, receptor status of the tissue, and the level of endogenous estrogen (Adlercreutz & Mazur, 1997:96). In a situation where the amount of circulating estrogen is low, like in post-menopausal women, the binding of natural plant estrogens to cells will increase the overall estrogen effect, an agonistic action. This is assumed to have an influence in all condition where low estrogen levels have negative effects on cell metabolism and organ function. An example in this respect is osteoporosis and post-menopausal symptoms like hot flushes. In the case that normal estrogen levels are present, binding to cell receptors may offset the estrogen effect. This will be an anti-estrogenic action. This may be an important feature in the prevention or management of hormone dependent cancers like breast cancer (Brouns, 2002:189).

## **5.2 Effects of phytoestrogens on menopausal symptoms**

It has been reported that soy phytoestrogens have an effect on menopausal symptoms. In Table 2, a review summary of some the most recent studies reporting effects of soy on menopausal symptoms and menopause related diseases are presented. Data was gathered through searches of electronic databases. Systematic reviews and an on-line *EBSCOHost web* and *Science Direct* search with the key-words *soy*, *menopausal symptoms* and *hormone replacement therapy* were used for the period 1995-2001.

### 5.2.1 Hot flushes

Hot flushes are related to the fall in circulating oestrogen, rather than absolute levels. HRT generally alleviates this condition, as well as the vaginitis occurring at the menopause due to atrophy. This and the rarity of the problem in soybean-consuming populations have prompted some investigations to determine whether phytoestrogens have a similar effect (Bingham *et al.*, 1997:401).

The relationship between increased phytoestrogen consumption and reduced hot flushes has been investigated by several researchers. In a clinical intervention trial by Murkies *et al.* (1995:189-195), a significant reduction of 40% was found in both the incidence and severity of hot flushes using 45 g of soy flour per day (approximately 23-90 mg of phytoestrogens). A similar amount of wheat flour, used as control, however, also reduced hot flushes by about 20%. Another study by Han *et al.* (2002:389-394) suggested that an isoflavone regime treatment of 100-mg may be a safe and effective alternative therapy for menopausal symptoms. Wilcox (1996:271) reviewed the effect of eight studies concerning the effects of soy on menopausal symptoms. It was concluded that three out of five studies reported a significant improvement in vaginal cytology and four out of five studies reported a reduction in hot flushes. The subjects in these studies, however, also showed a moderate reduction in the frequency of hot flushes while using placebo. But this reduction seems to level off after about eight weeks, while the effects of (soy) isoflavones are maintained. Optimally, treatment periods of three months or longer, or a start of treatment after a double placebo run-in period of 8 weeks should be taken into consideration. Albertazzi *et al.* (1998:6-11) showed that 60 g of isolated soy protein (SPI) powder containing 40 g of proteins and 76

mg phytoestrogens, in their active form, halve the number of hot flushes in postmenopausal women. During this study a coincidental brief decrease in the daily amount powder intake was mirrored by a marked reduction in efficacy. Sixty grams of SPI powder containing 76 mg of phytoestrogens thus appear to be the minimal effective dose required for reduction of vasomotor symptoms in postmenopausal women. Brezenski *et al.* (1997:89-94) compared a diet high in phytoestrogen with one containing low phytoestrogen on hot flushes in postmenopausal women. The phytoestrogen rich diet consisted of a daily consumption of 80 g tofu, 400 ml soy drink, one teaspoon of miso and two teaspoon of ground linseeds. This would amount to a consumption of approximately 33 mg of phytoestrogens per day. This was found to be effective in reducing hot flushes and improving vaginal dryness. This study, however, was not double-blind, admittedly difficult to achieve when using conventional food, but important when interpreting results since hot flushes are subject to a high placebo response. Two double-blind, crossover studies was reported at the Second International symposium on soy by Burke (1996) and Harding *et al.* (1996), respectively. Both studies found a reduction in hot flushes as well as other menopausal symptoms. In contrast, a recent study by St. Germain *et al.* (2001:17-26) found no appreciable effect on frequency, duration or severity of hot flushes and night sweats and concluded that phytoestrogens may not provide the once anticipated relief of menopausal symptoms. This study, however, involved only a small number of women which might have contributed to the unfavourably influenced outcome and given the positive results of several other studies, only more research can fully determine whether soy is effective against hot flushes (Messina & Loprinzi, 2001:S3095-S3108).

The majority studies reported that soy have a positive effect on the reduction of hot flushes. The studies though, did not use consequent methods and procedures to form a definite conclusion on soy's ability to reduce hot flushes. The positive evidence available should form the basis for further investigations regarding soy as reliever of hot flushes.

### **5.2.2 Breast cancer**

According to Weiss *et al.* (2002:1148), there is a positive association between continuous combined HRT and breast cancer risk among current, longer term users. The recommendations to avoid soy foods given by many health professionals to women with breast cancer, however, are not based on any clinical evidence. Soy isoflavones, like genistein, acts more like a SERM than an estrogen and this fact should be the basis for believing that soy foods are more likely to be beneficial for breast cancer treatment and prevention of breast cancer (Setchell, 2001:S358).

Results from cell line studies have shown that genistein seems to have fundamental effects in controlling cell signalling, growth and gene expression, which is probably also particularly important in cancer prevention. There is, however, little evidence to support a role for these compounds in existing epidemiological studies, which have been conducted mainly in soybean-consuming populations, with no distinction between pre- and post-menopausal state (Bingham, 1997:402). Albertazzi & Purdie (2002:180) reviewed previous studies on phytoestrogens and breast cancer risk and concluded that the effects of soy on protecting against breast cancer is still mainly supported by epidemiological data and that well-designed prospective studies in humans

are still needed. From the breast cancer point of view, there is thus opposing lines of research regarding soy consumption. On the one hand soy or its isoflavones are seen as protective against breast cancer while on the other hand soy has been shown to promote breast cancer. The overall conclusion that can be made at this time, based on the existing data, is that the consumption of soy should neither be encouraged nor discouraged with respect to breast cancer (Ardjmandi & Smith, 2002:134).

Table 2 : Summary of the studies reporting effects of soy on menopausal symptoms and menopause related diseases

STUDY	SUBJECT	DURATION	DESIGN	TEST FOOD(S)	ISO DOSE (mg/day)	HOT FLUSH	CVD	BREAST CANCER	MS	BMD	LIP
Albertazzi (1998)	n=104	12 w	Double-blind, placebo controlled	SPI vs placebo	76	↓ of 50%	-	-	-	-	-
Anderson <i>et al.</i> (1995)	review of 38 studies		Meta-analysis	SP	47	-	TC ↓ of 9% LDL ↓ of 13% 2.4% ↑ of HDL	-	-	-	↓
Anderson <i>et al.</i> (2002)	n=48, prospective, young adult women, 21-25y	1 y	Double-blind, controlled	SP supplement vs. protein diet	90	-	-	-	NE	-	-
Burke (1996)	n=43 PMW	6 w	Double-blind, crossover	SP vs. CHO drink	-	↓	-	-	↓	-	↑
Brezenski (1997)	n=114	12 w	Randomized	High phytoestrogen vs low phytoestrogen diet	33	↓ 50%	-	-	-	-	-
Chiechi <i>et al.</i> (2002)	n=187 PMW, 39-60y	16 w	Randomized, placebo-controlled	SP diet	47	-	NE	-	NS	↓	-
Han <i>et al.</i> (2002)	n=80 women, 45-55y with previous HRT treatment	16 w	Double-blind, placebo-controlled	ISO	100	↓	↓ in TC	-	-	-	-
Harding <i>et al.</i> (1996)		24 w	Double-blind crossover	SP vs. PC	80	↓	TC ↓ of 8%	-	↓	-	-

STUDY	SUBJECT	DURATION	DESIGN	TEST FOOD(S)	ISO DOSE (mg/day)	HOT FLUSH	CVD	BREAST CANCER	MS	BMD	LIP
Kritz-Silverstein & Goodman-Gruen (2002)	n=208 PMW, 45-74y	1 y and 24 w	Randomized, double-blind, placebo-controlled	FFQ of intake of ISO		-	-	-	-	↑ in BMD	-
Murkies <i>et al.</i> (1995)	n=58 PMW, 30-70y	12 w	Randomized double-blind	Full-fat soy vs. white flour, 45g	80-138	↓ of 40%	-	-	-	Ur OHProline	NS
Potter <i>et al.</i> (1998)	n=66 hypchol PMW	24 w	Parallel-group, double-blind	SPI	1.39 & 2.25		↓ in HDL cholesterol	-	-	↓ of bone loss in LSp	-
St. Germain <i>et al.</i> (2001)	n=69 PeMW	24 w	Double-blind	ISO-rich vs. ISO-poor protein	ISO-rich=80.4 ISO-poor=4.4	NE	-	-	NE	-	-
Teede <i>et al.</i> (2001)	n=179 96=men 83=PMW	12 w	Randomized, double-blind	SPI	118	-	↓ LDL/HDL	-	-	-	-
Van Patten <i>et al.</i> (2002)	n=123 PMW, with cancer	16 w	Randomized, placebo-controlled, double-blind	Soy beverage vs placebo	90	NS	-	-	NS	-	-
Vigna <i>et al.</i> (1997)	n=79 PMW, 53.3 y	12 w	Double blind, parallel, placebo-controlled	SPI	60	-	↓ in TC	-	-	-	NS
Weis <i>et al.</i> (2002)	n=3823 PMW	4 y	Multicenter, population-based, case-control	-	-	-	-	HRT associated with breast cancer risk	-	-	-

MS=menopausal symptoms, NE=no effect, NS=not significant, BMD=bone mineral density, Ur OHProline=urinary hydroxyproline, TC=total cholesterol, SPI=soy protein isolate, ISO=isoflavones, PC=protein casein, SP=soy protein, FFQ=food frequency questionnaire  
 ↓=decrease, ↑=increase, LIP=lipids, PMW=postmenopausal women, PeMW=peri-menopausal women, y=years, w=weeks, hypchol=hypercholesterolemic, SUBJ=subjects, DUR=duration of study (in weeks or years), n=sample size, LSp=lumber spine, CVD=cardiovascular disease

### 5.2.3 Bone Health

Osteoporosis is defined as a condition in which the amount of bone per unit volume is decreased, but the composition remains unchanged. The bone becomes porous due to an imbalance in forming and restoring bone cells, causing structural failure and predisposition to fracture. Osteoporosis in women is particularly associated with the menopause, since the loss of oestrogen accelerates bone loss (Bingham, 1997:400). Several lines of evidence support the concept that isoflavones have bone-preserving properties that may be of potential value to reduce the risks of osteoporosis in postmenopausal women (Brouns, 2002:190). A double-blind and placebo-controlled study by Potter *et al.* (1998:S1375) involving 66 postmenopausal women, reported that 40 mg of isolated soy protein containing 90 mg of isoflavones, resulted in a statistically significant increase of 2.2% in the lumber spine bone mineral density as compared to baseline. Kritz-Silverstein & Goodman-Gruen (2002:69) furthermore, reported that frequent consumption of isoflavones resulted in an increase in bone density in postmenopausal women between 45-74 years. In another study by Anderson (2002:390) on young adult women, it was concluded that neither the isoflavone-rich soy preparation nor the isoflavone-deficient preparation had any effects on bone mineral density. Chiechi *et al.* (2002:9) performed a randomized, placebo-controlled study on 187 postmenopausal women between the ages of 39-60 years. In contrast to the other studies, their results showed that a soy protein diet containing 47 g of isoflavones was reported to decrease bone mineral density and had no significant effect on menopausal symptoms.

As indicated in the above mentioned studies on the potential benefits of soy isoflavones to reduce menopausal symptoms, further studies are needed to

determine whether isoflavones indeed have a positive effect on bone density and whether the combination of soy isoflavones and lower doses of estrogens can prevent postmenopausal bone mineral loss (Ardjmandji & Smith, 2002:135; Albertazzi & Purdie, 2002:183).

#### **5.2.4 Heart disease**

Anderson *et al.* (1995:493) reported an average 9% reduction in total cholesterol and a 13% reduction in LDL-cholesterol in trials in which an average of 47 g soy bean protein per day was fed. Studies by Han *et al.* (2002:389), Teede *et al.* (2001:3053), Harding *et al.* (1996) and Vigna *et al.* (1997:124) all reported that soy isoflavones may offer a benefit to the cardiovascular system by significantly reducing cholesterol levels. Potter *et al.* (1998:234) also reported that soy protein may provide a reliable alternative for individuals attempting to modify their risk for cardiovascular disease without taking medicine. Mortality from cardiovascular disease (CVD) is similar in men and woman, and heart disease is the major cause of death in postmenopausal woman (Setchell & Cassidy, 1999:S762; Bingham *et al.*, 1997:400). Estrogen deficiency is associated with significant alterations in lipoprotein metabolism, resulting in the markedly increase of serum cholesterol concentrations during the postmenopausal years. Thus, reducing the increase in serum cholesterol through soy consumption is associated with reducing the risk of CVD (Setchell & Cassidy, 1999:S762).

It has been shown that dietary soy protein has several beneficial effects on cardiovascular health. The best-documented effects are on plasma lipid and lipoprotein concentrations, with reductions of approximately 10% in both LDL

cholesterol concentrations and plasma triglycerides and small increases in HDL cholesterol concentrations (Anderson *et al.*, 1995:493). This area of research obtained considerable scientific interest after epidemiological studies revealed lower rates of cardiovascular disease in East Asian countries compared with Western countries and a diet rich in phytoestrogens is thought to be responsible for this protection. This incidence was shown to change significantly in people that migrated from Japan to the western (American) culture and led to a large number of studies on various factors that are involved in the etiology of cardiovascular damage and disease (Adlecreutz and Mazur, 1997:95). In 1999, the U.S. Food and Drug Administration (FDA) approved a health claim for the cholesterol-lowering effects of soy protein, and encouraged an intake of 25g of soy protein per day for the reduction of cholesterol (Messina, 2003:1). Mechanisms that are now considered to be effective in preventing heart disease through the consumption of soy and its nutritional components are:

1. a modulation of lipoprotein metabolism by increasing HDL cholesterol, while reducing LDL and VLDL cholesterol;
2. a reduction of LDL oxidation by its antioxidant properties;
3. a reduction of proliferation and migration of smooth muscle cells in the vasculum;
4. a reduction of platelet activation and aggregation and
5. an improvement of vascular reactivity (Brouns, 2002:191).

Apart from soy protein and soy isoflavones, soy protein peptides are also being investigated as a possible mechanism for reducing CVD. Although not much published research have been done on soy peptides' function in reducing CVD, the evidence available show that it can have a beneficial effect. Further studies though, are still required to explore the mechanism of action of these

peptides to reduce CVD events (Juturu, 2003:53). Soybean protein peptide is a biologically active peptide substance composed of two or more units of amino acids and can be absorbed by the human body to meet its demands for energy to accelerate metabolism and improve immune function. Researches on soy protein peptides suggest that they represent a potential source of bioactive components that can be incorporated into foods and thereby contribute to the potential health benefits of soy foods (Juturu, 2003:54).

A study by Kerckhoffs *et al.*, (2002:2492) has shown that the soybean peptides can lower blood pressure and blood fat levels, enhance immunity, lower cholesterol, prevent cardiac and brain blood-vessel diseases and inhibit the growth of tumours.

It should be noted that in addition to the potentially beneficial effects of soy protein, soy isoflavones and soy peptides on CVD risk, the judicious replacing of animal protein with soy protein reduces saturated fat and cholesterol intakes which in turn results in a more favourable blood cholesterol level and potentially reducing the risk of CVD (Anderson *et al.*, 1995:493; Potter *et al.*, 1998:S1377).

## **6. POSSIBLE ADVERSE EFFECTS OF ISOFLAVONES AND SOY**

Many studies have concerned the safety of isoflavones, often along with the evaluation of the efficacy of specific isoflavone dosages on selected biomarkers (Brouns, 2002:191), but also from data in many animal studies in which high levels of isoflavones have been shown to cause various reproductive problems (Setchell, 2001:S357) . A variety of soy products are

available in the marketplace, but the three main categories are: traditional Asian soy foods such as tofu, soy protein isolate and isoflavone supplements (Messina & Loprinz, 2001:S3102). With the wide unrestricted availability of over-the-counter soy isoflavone pills, the possible effects on a woman who deliberately overindulges are cause for speculation (Vincent & Fitzpatrick, 2000:1181).

In 1991 the National Institutes of Health (NIH) established the Women's Health Initiative (WHI), one of the largest prevention studies in the United States. One of the efforts of the WHI was HRT, which examined the effects of HRT on prominent diseases prevention in women. The trail consisted of a randomized, blinded, placebo-controlled hormone study involving 16,608 women, with average age of 63.2 years. They received either a placebo or continuous-combined estrogen progesterone therapy (CCEPT). The majority of the participants, who received CCEPT, were randomized at least 10 years after menopause (Messina, 2003:4). The study concluded that CCEPT increases the risk of coronary heart disease, stroke, venous thromboembolism, and breast cancer, whereas risk of colon cancer and skeletal fracture was decreased (Messina, 2003:1). Table 3 is a summary of the results from the WHI trail.

**Table 3:** Relative and absolute risks in women taking CCEPT (Hope, 2003:34).

<b>Increase in:</b>	<b>Relative risk:</b>
Breast cancer	2%
Cardiovascular disease	29%
Stroke	41%
Pulmonary embolism	213%
<b>Absolute risk per 10 000 women taking CCEPT:</b>	<b>Number of extra cases each year:</b>
Breast cancer	8
Heart attacks	7
Strokes	8
Pulmonary embolism	8

Subsequently, the possible adverse effects of soy will be discussed following the results of the WHI study on CCEPT:

- **Heart disease**

Thus far no intervention trials have actually examined the impact of soy consumption on coronary events. There is no evidence to suggest that soy and isoflavones like CCEPT would increase coronary heart disease (Messina, 2003:2), whereas short-term intervention trials suggest they may decrease risk. Isoflavones, though, are not part of the health claim that was recently approved by the FDA. The health claim is based on the premise that 25g of

soy protein per day will significantly lower cholesterol (Messina, 2001:3). Still, the increased risk of cardiovascular diseases under long-term HRT may, however, also apply for soy isoflavones (Wuttke *et al.*, 2003:S12).

- **Breast Cancer**

Despite the considerable interest in the anticancer effects of soy, some concerns has been expressed that the estrogen-like properties of isoflavones might increase breast cancer risk in high-risk women or stimulate secondary tumor growth in breast cancer survivors. This lead to the question whether a woman with breast cancer should be advised to avoid soy foods and phytoestrogen supplements. While this concern is not without some merit, it should be recognized that isoflavones are different from estrogen (Messina, 2003:3). SERMs, like isoflavones, have estrogen-like effects in some tissues but either no effects or anti-estrogenic effects in other tissues, whereas estrogen has estrogenic effects in all tissues which have estrogen receptors (Carusi, 2000:253). Soy, furthermore, has no progesterone activity, and as discussed above, the combination of hormones (estrogen plus progesterone), rather than estrogen alone, appears to increase breast cancer risk (Messina, 2003:3). Weis *et al.* (2002:1152) also reported that the association between risk of breast cancer and HRT varies by regimen. Estrogen replacement therapy was not associated with an increased risk of breast cancer at any disease stage, regardless of duration or recency of use, but continuous combined HRT, on the other hand, is associated with increased risk among current users of 5 or more years. However, clinical studies are warranted to clarify this important issue with regard to soy and its isoflavones.

- **Venous Thromboembolic disease and stroke**

According to Messina (2003:3) there are no indications that soy increases clot formation or adversely affects coagulation factors and that animal research suggests soy and the main soybean isoflavone genistein may be of value in the prevention of stroke via hormonal and nonhormonal mechanisms, but it is highly speculative.

- **Colorectal cancer**

If soy does reduce the risk of colorectal cancer, it is not at all clear that isoflavones are responsible for the protective effects as isolated genistein has actually been found to increase colon tumor genesis in animals. Overall, the evidence at this point is too limited to draw conclusions about the impact of soy or isoflavones on colon cancer risk (Messina, 2003:3).

- **Fracture risk**

Soy protein, when substituted for animal protein, may improve bone health by decreasing urinary calcium excretion. All factors being equal, because net calcium absorption is probably no more than 10%, substituting animal protein for soy protein over the course of many years will likely be associated with clinically relevant skeletal benefits (Messina, 2003:6). According to Hope (2003:36), there is poor evidence that phytoestrogens have any effect on bone health, although they may be very weakly bone protective. Anderson (1999:S540) stated that Asian women with diets that are predominantly vegetarian tend to have significantly lower body mass indexes, less muscle mass and less bone mass than Western women. Compared with Western

women, Asian women have a lower lifetime estrogen exposure and lower body mass indexes, which increase their risk of osteoporosis (particularly as a result of their body mass indexes).

According to Vincent & Fitzpatrick (2000:1181) there have been no adverse effects of short- or long-term use of soy proteins in humans. The only adverse effects known are those reported in animals. Among these is “red clover disease”, which was an outbreak of infertility in sheep grazing on phytoestrogen-rich clover pastures in Australia.

There is no doubt that progress in understanding the health effects of soy is being made, but much of the data are frustratingly inconsistent (Messina *et al.*, 2002:S547). No intervention studies have actually examined the impact of soy consumption on disease outcomes *per se*, such as fractures and coronary events. As evidenced from the WHI, long-term intervention trials that have disease outcomes as endpoints are necessary before drawing definitive conclusions about the health effects of any biologically active agent or diet (Messina, 2003:6).

## **7. CONSUMER'S AWARENESS OF AND BEHAVIOUR TOWARDS THE POTENTIAL HEALTH BENEFITS OF SOY AND SOY PRODUCTS**

Food choice is a primary concern to those involved in producing and manufacturing foods since their major interest is in selling food products. However, it is increasingly being recognized that there are important nutritional questions related to food choice. Food choice determines

nutritional status and as diet has an influence on health and disease, it is of vital importance to understand the processes by which choices are made. Only with an adequate understanding of the reasons for people's choice of foods can we attempt to change choices and hence influence dietary patterns in line with recommendations from those involved in promoting health (Shepherd & Sparks, 1994:202).

During the 1990s functional foods and nutraceuticals emerged as the dominant trend for the food industry. The concept of foods that could provide health-enhancing and disease-preventing properties was embraced by a growing number of consumers, increasingly documented by nutritionists and scientists, and legally endorsed by public policy and legislative mandates for food and dietary supplement labelling (Childs, 2001:518). One of these functional food receiving much attention and being well researched, is soy. For thousands of years, the Chinese and people in neighbouring countries have consumed soybeans in various forms of traditional soy foods, such as tofu, soy sauce, soy sprouts and green vegetable soybeans. As we enter the new century, this ancient bean is becoming increasingly popular. Soy foods are now one of the fastest-growing categories in the food industry, with products ranging from traditional soy foods to soy protein ingredients, and from dairy and meat substitutes to various types of Western food enriched with soy (Liu, 2000:46). The interest in soybeans has reached an all-time high since the FDA approved a health claim for soy protein in reducing the risk of heart disease (FDA, 1999:1). Marketing of products with health claims and reaching consumers with meaningful messages and positioning for products in the functional food arena take careful attention to regulatory issues and insightful thought on how to communicate product benefits for consumer attention. Regulations control the language and scientific benefit that may be conveyed on the product label,

in the marketing literature, and in the product advertising (Childs, 2001:518). Sound scientific evidence should, however, be put into practical dietary applications for the consumer (ADA, 1995:496), as information is a powerful marketing tool when it comes to the sale of healthy foods (Sloan, 2000:60), while consumers are also often more persuaded by nuance, association, and promises of well-being than by scientific statements and statistical documentation (Childs, 2001:518).

Numerous studies linking diet and health have been published over the past decade and consumers are demanding more information on how to achieve health benefits through food and vitamins (Childs & Poryzees, 1997:433). The increase use of alternative treatment for menopausal symptoms is mainly due to women's changing views of conventional HRT, and although alternative therapies are becoming mainstream (Dantas, 1999:212), consumer research in the nutraceutical area is still in its infancy stage (Childs & Poryzees, 1997:434).

### **7.1 Definition and importance of consumer behaviour**

It has been more than 30 years since the field of consumer research was born, and since then it has emerged into a large and growing multidisciplinary field of study. A concern of businesses, consumer economists, and others is to find more effective strategies to influence and shape behaviour (Blackwell *et al.*, 2001:31). It doesn't matter how excellent a product is from the objective point of view of a scientist focusing on nutrition, safety, stability, and apparent functionality, a product is not successful if it does not please the consumer sufficiently to make him or her buy it (Karel, 2000:56).

According to Wilkie (1994:14), consumer behaviour is the mental, emotional, and physical activities that people engage in when selecting, purchasing, using, and disposing of products and services so as to satisfy needs and desires. Schiffman *et al.* (1997:6) and Blackwell *et al.* (2001:6) defines consumer behaviour quite similar as activities people undertake when obtaining, consuming, and disposing of products and services. Simply stated, consumer behaviour has traditionally been thought of as the study of “why people buy” – with the premise that it becomes easier to develop strategies to influence consumers once a marketer knows why people buy certain products or brands. Food technologists are responsible for the technical aspects of development of food products, food processes, and distribution of these products to consumers. Since the ultimate target of these efforts is the satisfaction of the consumer, it is necessary to consider not only the objective consumer needs, but also subjective aspects of consumer satisfaction (Karel, 2000:56). Just as business orientation evolved throughout the years, so has the study of consumer behaviour evolved, sometimes fuelling and sometimes keeping pace with the changes in organizations. One thing that is certain though, is that consumer behaviour is now becoming more important than ever in today’s consumer-focused world. The basis for all sales appeal comes from information about the consumer, while ignoring the consumer can lead to disaster in a modern economy (Walters & Bergiel, 1989:4).

### **7.1.1 Contributing factors related to consumer behaviour**

Food choice, like any complex human behaviour, will be influenced by many interrelating factors. Many of the influences on food choice may be mediated by people’s beliefs and attitudes. In addition to sensory preferences, beliefs

about the nutritional quality and health effects of a food may be more important than the actual nutritional quality and health consequences in determining a person's choice (Shepherd & Sparks, 1994:205). The study of the beliefs and attitudes held by a person, and the relationship of these to the choices made, offers one means for trying to increase the knowledge of the roles played by a number of different types of factors in food choice. Subsequently, the terms attitude, beliefs and opinion will be discussed shortly as factors related to consumer behaviour.

**Attitude** All attitudes develop from human needs and the values people place upon objects that satisfy those perceived needs, therefore behaviour is strongly influenced by attitudes towards a given brand or product. Attitude research is seen to form the basis for developing new products, repositioning existing products, creating advertising campaigns, and predicting brand preferences as well as general purchase behaviour. Although many different definitions of attitude have been introduced through out the years, social psychologists still can not seem to agree on one precise definition (Loudon & Della Bitta, 1993:422). Therefore, in regard of this literature study only the more commonly accepted definitions will be given. Engel *et al.*, (1995:144) defines attitude as an overall evaluation of an alternative, ranging from positive to negative or favourable or unfavourable. This definition views attitude as a feeling or an evaluative reaction to objects. Consumers react to the market environment by forming attitudes toward products, businesses, and methods of purchase. Other scientists defines attitude as the readiness to act in a predetermined manner toward some specific market-related stimulus (Walters & Bergiel, 1989:182; Wilkie, 1994:281). This definition is slightly more complicated than the first because it incorporates the notion of a readiness to respond toward an object (Loudon & Della Bitta, 1993:423).

Once an attitude is formed, it plays a directive role on future choice and is difficult to change (Engel *et al.*, 1995:144). More recently, theorists have given more attention to a new definition of attitude which has generated much research and has been useful in predicting behaviour (Loudon & Della Bitta, 1993:423). This definition explicitly treats attitudes as being multidimensional in nature. According to Wilkie (1994:282), the basic point is that having a favourable attitude toward a product is not the same as having a favourable attitude toward buying or consuming the product. Therefore, researches distinguish between two types of attitude:

1. Attitude toward the object, which represents an evaluation of the attitude object such as a product.
2. Attitude toward the behaviour, which on the other hand represents an evaluation of performing a particular behaviour involving the attitude object such as buying the product.

Given its focus on behaviour though, it is not surprising that *attitude towards behaviour* is related more strongly than *attitude toward the object* to consumers' consumption intentions.

**Beliefs** Walters & Bergiel (1989:182) defines beliefs as predispositions, which are accepted as truth and supported by strong facts or other information. It is further defined by Blackwell *et al.* (2001:291) as a subjective judgement about the relationship between two or more things, and are based on knowledge. In other words, beliefs are the probability a person attaches to a given piece of knowledge being true (Loudon & Della Bitta, 1993:423). Beliefs about a product's attributes or characteristics are also important

because they determine the favourability of a person's attitude toward the product (Blackwell, 2001:291).

**Opinion** The first time a person develop a belief, feeling, or attitude about something is called opinion formation. Engel (1995:451) defines opinion as a spoken or written 'answer' that a person gives in response to stimulus situations in which some 'question' is raised or statement is made. It is used to describe interpretations, expectations, and evaluations such as belief about the intentions of other people, anticipations concerning future events, and appraisals of the rewarding or punishing consequences of alternative courses of action. Opinions are therefore predispositions not based on certainty (Walters & Bergiel, 1989:183), but on people's beliefs and feelings (Blackwell *et al.*, 2001:476-482). In some instances there may be some facts, but they are only suggestive of the conclusion drawn by the consumer and are relatively easily changed (Walters & Bergiel, 1989:183). Once an initial opinion has been formed, any subsequent modification in it represents opinion change. Shaping consumers' opinions is a fundamental business activity. Sometimes this requires encouraging consumers to form favourable product opinions, such as taking an established product into new markets and making contact with new consumers. One of the universal truths supported by decades of research on human judgement is that a person's opinion is easily influenced during their formative stages. Consistent with the concept of classical conditioning, simple association with the "right" stimuli can cause consumers to form favourable product opinions (Blackwell *et al.*, 2001:476-482).

Consumers will only want to pay for products that satisfy their needs, but that is unlikely to occur unless the firm thoroughly understands how buyers consume a particular product. There is more demand by consumers for value

added food products instead of greater quantities of food and therefore consumer behaviour is becoming increasingly less predictable, more fragmented and less consistent. As a result of the greater demand for value added food products, food companies are increasing the research and development of new products and processes (Imram, 1999:224). It is useful to understand what consumers like and dislike. Attitudes, representing these likes and dislikes, strongly influence intentions and consumer behaviour. These attitudes are formed from a person's beliefs and feelings and opinions about the attitude object (Engel, 1995:364).

## **7.2 Consumer attitudes towards soy and soy products**

One of the most fundamental aspects of consumer knowledge involves whether or not consumers are aware of a product's existence and the contribution it can make to their well-being. Increased recognition among health professionals and consumers of the link between diet and optimal health, and recent medical discoveries about the health benefits of soy in preventing and treating many chronic diseases, have increased the interest in soy. This increased awareness, however, is not only among health professionals, but also among the news media and consumers (Liu, 2000:54). Surveys are showing that mainstream consumers are more willing to try soy in their diet. In particular, consumers who are recognizing the health benefits of soy are becoming a highly motivated target market for manufacturers and food processors (Pszczola, 2000:76).

Among the many soy components that are being examined, soy protein and isoflavones exhibit the most promising roles for their health benefits. These

findings about the health benefits of soy have become a powerful message for improving the image as soy as food, increasing consumer interest in soy foods and soy-enriched foods, and spurring production and sales of these food products (Liu, 2000:52). Every two years the *United Soybean Board* (USB) distributes a National Report regarding consumer attitudes and awareness towards nutrition. The previous National Report (2002-2003) stated that 74% of Americans perceive soybeans as healthy while only 18% of American consumers are aware that soy may help relieve the symptoms of menopause. The most recent report (2003-2004) though, stated that 26% of American consumers are aware that soy may help relieve the symptoms of menopause. Forty-two percent of Americans report that they consume soy foods once a month or more, while 28% consume soy foods weekly. A key constraint which is thought to limit soy's use as food is the characteristic beany or greeny flavour which is associated with soybean products. This flavour has been particularly problematic to Westerners, who is unaccustomed to it. New technology and product developments though, have improved the taste of soy considerably and partly eliminated the earlier assumption that the taste of soy is a barrier to incorporate soy into the diet (Pszczola, 2000:80). This is confirmed by the USB, as only 18% of respondents said that taste is the biggest barrier to incorporate soy into the diet, compared to 64% of American consumers which did not cite any specific barrier.

There is also a significant increase on the awareness of the health benefits of soy, which is, among other factors such as demographic evidence and publicity, due to the approval of the health claim on soy protein in 1999. A survey study by Adams (2001:433) reported that when compared to conventional HRT's, most respondents believed that plant-derived HRT have fewer risks (71%), have fewer or no side effects (69%) and are equally or

more effective for managing menopausal symptoms (62%). Although evidence show that many consumers are aware of the potential health benefits of alternative HRT's like soy, a study by De Kleijn *et al.* (2001:1830) reported that dietary intake of isoflavones, coumestans and lignans in healthy postmenopausal woman in the United States is low. This may be due to lack of standardization of evidence on the safety and efficacy of "natural" therapies (Dantas, 1999:212).

### **7.3 Expanding the awareness of soy foods globally**

The opportunity for expanding soybean food utilization is not limited to the domestic market. There is also a huge potential in the international market. In many parts of the world, particularly the developing countries, there is widespread starvation/hunger, malnutrition and other chronic health problems. This situation is further worsened by the nutrition transition and population explosion in these regions. Feeding soybeans to the world's poor might help solving these problems, also because soybeans have the remarkable ability to produce the highest amount of edible protein per acre of land compared to other known crops. Realizing this potential, food industries should also focus their marketing strategies on human consumption of soy in developing countries (Liu, 2000:56).

In trying to encourage people in a developing country to adopt a healthy protein alternative such as soy, it is useful to profile the type of people from that country who have already adopted the product. This will provide insights in to how individuals with a similar profile can be targeted and encouraged to consume the product. Nutritional education efforts therefore, should rather be

focused on a targeted group than on a general population in order to be more effective (Wansink & Cheong, 2002:276, 278).

#### **7.4 Soy products and uses**

When taking into consideration the growing popularity of soy, it is not surprising that a number of companies are using strategic alliances such as acquisitions, joint ventures, and cooperative efforts between their subsidiaries to introduce soy products into the marketplace (Pszczola, 2000:78). Soy foods have never been common foods in Western diets, whereas it is well known that soy are among the most popular foods in the Far East. Despite its rich history as food, unique features as a crop, and increasing annual production, soybeans suffered until recently a severe image problem in the West especially because of its unfamiliar flavour and taste, commonly described as beany (Liu, 2000:52).

As we enter the 21<sup>st</sup> century, however, we see a turning point for the soy foods industry. A number of soy ingredients are being developed that are improving functionality and nutraceutical value. Eliminating or reducing undesirable tastes associated with soy, increasing stability, improving dispersibility and solubility, providing healthier fatty acid profiles, and utilizing new methods for recovering isoflavones, are only some of the advantages that these ingredient are now offering. As a result, their use in a broader range of applications is becoming reality (Pszczola, 2000:78). In the United States, soy foods can be classified into six major groups: soy oil, traditional soy foods, soy protein products, new-generation soy foods, soy-enriched foods, and functional soy ingredients or dietary supplements (Liu, 2000:47).

The soy food descriptions listed in Table 4 represents the most recently developed soy foods in the United States, as well as some novel prototypes that may soon be appearing in the mainstream.

**Table 4:** Some of the newly developed and produced soy foods in the United States (Soyfoods guide, 2001:10-11; Pszczola, 2000:82).

<b>Soy food</b>	<b>Description</b>
Pasta	The soy ingredient is added to the normal pasta-making process without making changes to the process or the pasta's taste. Contains 6,25 g of soy protein per finished serving.
Waffles	Eggless and dairy-free waffles which deliver standardised amounts of isoflavones, as well as calcium and folic acid. Delivers 30 mg of soy isoflavones per serving and is especially aimed at women who are entering menopause and men with higher risk of coronary heart disease.
Pudding	Instant pudding which provides 6,25 g of soy protein and 3 g of fat, was developed to qualify for the FDA's health claim on soy.
Infant formulas	Soy-based infant formulas are similar to other infant formulas except that a soy protein isolate powder is used as a base.
<b>Soy food</b>	<b>Description</b>
Frozen dessert	A soy-containing frozen novelty, which combines whey protein concentrate, yoghurt, tropical fruits and soy isoflavones for a creamy frozen core and is coated with a white chocolate melt.
Soy yoghurt	Made from soymilk and can be found in a variety of flavours.
Soy cheese	It is also made from soymilk and can be an easy substitute for most

	cheeses, sour cream or cream cheese. Products made with soy cheese include soy pizza.
Soy beverages	Soy beverages can be made with soymilk or isolated soy protein. Flavourings or fruit juices may be added. They can be purchased ready to-drink or in a dry-powder form where liquid is added.
Bread	A high-soy protein bread which may help relieve menopausal symptoms and support the wellness of women. It is made with ingredients such as soy isoflavones, flaxseed, rice bran and B vitamins and delivers 40 mg of phytoestrogens in one slice.
Muffin	A muffin prototype designed to promote joint health which contains a variety of nutraceuticals including soy isoflavones, which are shown to be effective in preventing osteoporosis.

As mentioned before in this literature study, the FDA approved health claim on soy stated that a soy product should contain at least 6.25g of soy protein per serving to include information on soy's role in reducing the risk of CVD on their labels and that a daily intake of 25g of soy protein is required to be effective in lowering cholesterol and reducing the risk of CVD (FDA, 1999:1). Calculating exact phytoestrogen intake is difficult, as many products do not provide this information on packaging, although this may be provided by manufacturers on request. One thing that is clear is that eating phytoestrogens in their natural form, such as part of soy foods appears to be the most effective way to boost phytoestrogen intake (Jefferson, 2003:21). Table 5 is an example of ways to incorporate 25g of soy protein per day from different food sources in the diet.

**Table 5:** How to consume 25g soy protein per day (Langenhoven *et al.*, 1991)

<b>Food item</b>	<b>Food amount</b>	<b>Soy protein amount (g)</b>
Soybean beverage	250ml	8.5g
Soybean curd (Tofu)	25g	3.8g
Soy yoghurt	180ml	6g
Cooked vegetarian soy hamburger	100g	7.2g
<b>Total</b>		25.5g

## 8. CONCLUSION

A shift in power from the primary producer to the food consumer as the key element driving the food chain has unfolded in the past millennium. The consumer has become a powerful driving force motivating both food manufacturers and retailers alike to cater to their needs (Fuller, 2001:35). Nutraceuticals and functional foods are clearly poised as a 21<sup>st</sup>-century industry. They promise value-added opportunities in the food industry and new market opportunities for the pharmaceutical industry. They offer advances in public health as health claim marketing messages empower consumers to select healthier food choices (Childs, 2001:527).

Consumption of a diet rich in phytoestrogens appears to hold the potential to be of benefit in maintaining optimal health. At the present time precise amounts of phytoestrogens required are unknown, but evidence to date suggests a firm basis for further investigation (Jefferson, 2003:20). Soy isoflavones are biologically active compounds (Vincent & Fitzpatrick,

2000:1182). Biologically effects are dependent on many factors such as the amounts consumed, how long they are consumed for, and individual variations in metabolism (Jefferson, 2003:20). The available data thus far are insufficient, and it is premature to draw definitive conclusions regarding the use of isoflavones as an alternative to estrogen for hormone replacement in postmenopausal women (Vincent & Fitzpatrick, 2000:1182). On the basis of the available data, there is little reason to think that soy consumption will increase risk of any diseases whose risk was increased in the WHI, whereas there is at least preliminary data suggesting soy may provide some of the benefits (Messina, 2003:6).

The rediscovery of the value of soybeans for its functional health benefits presents great opportunities for expanding soybean uses as food. If the benefits of soy are educated in correct means towards consumers and consumers' awareness and attitude towards soy continue to rise, the result would be a thriving soy foods industry in the years ahead and healthier food for people around the world (Liu, 2000:58). In conclusion, with an increasing coverage on nutritional studies by the media and escalating interest in preventative health measures, it is necessary to continuously determine consumer's attitudes and awareness regarding nutraceuticals (Childs & Poryzees, 1997:435), for the consumer's role remains paramount and should drive the structure of both public health campaigns, as well as marketing plans (Childs & Poryzees, 1997:444).

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## **CHAPTER 3**

# **SOUTH AFRICAN CONSUMERS' OPINION OF THE POTENTIAL HEALTH BENEFITS OF SOY AND SOY PRODUCTS AS HORMONE REPLACEMENT THERAPY (HRT)**

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## **South African consumers' opinion of the potential health benefits of soy and soy products as hormone replacement therapy (HRT)**

### **Opsomming**

Funksionele voedsel word gedefinieer as voedsel wat addisionele gesondheidsvoordele verskaf afgesien van die voedingswaarde wat dit besit. Soja is 'n funksionele voedsel waarop daar deesdae al hoe meer navorsing gedoen word ten einde die gesondheidsvoordele daarvan te motiveer. Die toenemende gebruik van alternatiewe behandelings vir menopousale simptome kan toegeskryf word aan vroue se veranderende sienswyses ten opsigte van konvensionele hormoonvervangingsterapie (HVT). Die doel van hierdie studie was om die Suid-Afrikaanse verbruikerspopulasie se opinie aangaande die potensiële gesondheidsvoordele van soja as alternatiewe HVT te bepaal. Respondente (n=3001) is ewekansig gekies uit 9 metropolitaanse, en plattelandse gebiede in Suid-Afrika. Data-insameling is deur middel van vraelyste, bestaande uit 17 voedselverwante afdelings elk met onderafdelings gedoen. Vier afdelings aangaande soja, soja produkte en die gesondheidsvoordele van soja is vir statistiese analise in hierdie studie gebruik. Die totale steekproefgrootte was 825. Die resultate toon dat 80% van die verbruikerspopulasie bewus is van soja en 'n neutrale tot positiewe houding teenoor die gesondheidsvoordele van soja het. Twee-en-sewentig persent van die totale verbruikerspopulasie het 'n positiewe opinie aangaande die gesondheidsvoordele van soja gehad. Slegs 34% het 'n positiewe opinie aangaande soja as alternatief vir HVT gehad en 42% se opinie was positief aangaande soja as verligter van menopousale simptome. 'n Prakties

betekenisvolle verband was gevind tussen verbruikers se opinies oor die gesondheidsvoordele van soja en aangaande soja as alternatief vir HVT en soja as verligter van menopausale simptome, onderskeidelik.

**Sleutelwoorde:** funksionele voedsel, soja, menopausale simptome, hormoonvervangingsterapie, opinie

**Abstract**

Functional foods are foods that, by nature or design, can deliver benefits beyond that of nutrition. One of these functional foods receiving much attention and being well researched is soy. The increase use of alternative treatment for menopausal symptoms is mainly due to women's changing views of conventional hormone replacement therapy (HRT). The objective of this study was to assess South African consumers' opinion of the potential health benefits of soy as an alternative for HRT. Respondents (n=3001) were randomly selected from 9 metropolitan as well as rural areas in South Africa. The questionnaire used, consisted of 17 food-related sections of which only the four sections on soy were used for statistical-analyses in this study. The total sample size was 825. Of all the respondents 80% were aware of soy and expressed a neutral to positive attitudinal disposition towards the potential health benefits of soy in general. The percentage of consumers who agreed that soy has many health benefits were 72%. Thirty-four percent agreed that soy can be used as an alternative for HRT and 42% agreed that soy can relieve menopausal symptoms. A practically significant relation was found between respondents' opinion of the health benefits of soy and their opinion of soy as alternative for HRT and as reliever of menopausal symptoms respectively.

**KEY WORDS:** functional food, soy, menopausal symptoms, hormone replacement therapy, opinion.

## INTRODUCTION

After an average of 35 years of menstrual cycles, healthy women of around 50 years of age begin to undergo a new physiological experience, called menopause (Lomranz *et al.*, 2000:199). The very early phase of this ovarian dysfunction is characterized by the gradual failure of the ovaries to produce the hormones oestrogen and progesterone (Jefferson, 2003:18), leading to irregular bleeds which will later cease altogether (Lomranz *et al.*, 2000:199). Symptoms such as hot flushes, sweating, mood swing and/or irritability often accompany this process and may contribute to the dramatic increase in their risk of development of certain diseases (Jefferson, 2003:18). Hormone replacement therapy (HRT) is increasingly recommended for prevention and treatment of diseases such as osteoporosis and cardiovascular disease (CVD), which are related to estrogen deficiency. Sound evidence suggests that long-term hormonal treatments are necessary to obtain a substantial decrease of risk for diseases such as CVD and osteoporosis, but serious side effects, such as an increase in the incidence of breast cancer, discourage long-term HRT use (Chiechi *et al.*, 2002:5). Therefore, soy isoflavones have been investigated as an alternative therapy to relieve menopausal symptoms without the accompanying side effects of HRT or estrogen replacement therapy (ERT) (St. Germain *et al.*, 2001:18).

Numerous studies linking diet and health have been published over the past decade and consumers are demanding more information on how to achieve health benefits through food and vitamins (Childs & Poryzees, 1997:433). Consumer interest and education in food components that prevent disease and prolong good health, accompanied with publicized technological advances and scientific studies isolating food components such as antioxidants and

isoflavones whose presence in food delivers these prophylactic benefits, have created a market for such products (Childs, 2001:519). A survey by Adams (2001:433) on women's views on alternative therapies for HRT, reported that when compared with conventional HRT's, most respondents believed that plant-derived HRT have fewer risks, fewer or no side effects and are equally or more effective for managing menopausal symptoms. Women's views of conventional HRT and trends toward alternative medicines have contributed to an increased use of alternative treatments globally (Dantas, 1999:212). As shown from the results of Adams' study, more women have looked to phytoestrogens, such as the isoflavones found in the soy plant, to tailor their menopausal therapy in a 'natural' way (Carusi, 2000:253). The relationship between increased phytoestrogen consumption and reduced hot flashes has been investigated by several researchers. In a clinical intervention trial by Murkies *et al.* (1995:189-195), a significant reduction of 40% was found in both the incidence and severity of hot flashes using 45g of soy flour per day (approximately 23-90 mg of phytoestrogens). Another study by Han *et al.* (2002:389-394) suggested that an isoflavone regime treatment of 100-mg may be a safe and effective alternative therapy for menopausal symptoms. Wilcox (1996:271) reviewed the effect of eight studies concerning the effects of soy on menopausal symptoms. It was concluded that three out of five studies report a significant improvement in vaginal cytology and four out of five studies report a reduction in hot flashes.

Every two years the *United Soybean Board* distributes a National report regarding consumer attitudes and awareness towards nutrition. The most recent National report (2003-2004) stated that 74% of Americans perceive soybeans as healthy and 26% of American consumers are aware that soy may help relieve the symptoms of menopause. There is also a significant increase

on the awareness of the health benefits of soy, which is, among other factors such as demographic evidence and publicity, due to the approval of the health claim on soy protein in 1999.

Most of the prevailing data on consumers and soy have been done in United States, but this is no indication that the opportunity for expanding soybean food utilization is only limited to their domestic market. There is also a huge potential in the international market, but in order to understand the marketing potential fully, it will be necessary for both the private and public sectors to know the consumer inside and out. Food is a strong factor of personal tastes and habits which will make marketing even more complex (Childs, 1997:444). In-depth quantitative and qualitative research studies are thus necessary to understand consumer needs, opinions and attitudes fully. To the knowledge of the author, there is minimal existing information regarding South African consumers' opinions of the health benefits of soy as a product and as an alternative to HRT. Therefore, the objective of this study was to determine the percentage of South African consumers who are aware of soy and their attitudinal disposition towards the potential health benefits of soy and soy products as alternative for HRT.

## **MATERIALS AND METHODS**

### **Respondents and questionnaire**

Respondents were randomly selected from nine metropolitan, as well as rural areas in South Africa and representative of the four main race groups: whites, blacks, coloureds and Indians. The total sample size of the metropolitan and

rural subjects was 3 001. MARKINOR, a market research company, collected all the data using random sampling. Random sampling results in every sampling unit in a definite population having a calculable non-zero probability of being selected in the sample. The chance of a unit being included in a sample can be calculated. Random sampling has been widely adopted by leading research bodies because of its sound theoretical basis, which allows the legitimate use of the mathematics of probability. It is the only completely objective method of sampling populations (Chrisnall, 2001:99). The questionnaire, developed by nutrition researchers in co-operation with business partners, consisted of 17 food-related sections with sub-sections. Four of the sections (27 statements) (see Addendum A) contained information regarding soy, soy products and the health benefits of soy and only these sections, which included respondents that have heard of soy before, were used to create a sub-dataset (n=2 437). From the soy-dataset another sub-dataset was created including only pre-menopausal (35-44 years) and post-menopausal (50-59 years) age groups which concluded the total respondents used for further statistical analyses namely, n=825. Before statistical analyses were done the data was weighed to represent the total South African consumer population.

### **Measuring instrument**

Of the 27 statements regarding soy, the following seven were first selected for statistical analyses:

1. Soy has many health benefits
2. Soy lowers cholesterol
3. Soy keeps your bones strong

4. Soy can be used in place of hormone replacement therapy (HRT)
5. Soy can cure certain diseases
6. Soy can relieve menopausal symptoms
7. Soy helps keep your heart healthy

The respondents expressed their opinions regarding the above statements on a five-point Likert scale which was adapted to a three-point scale for easier interpretation of the tables. The three-point scale was created by adding the two positive response categories (agree and strongly agree) of the scale together to create only one positive response category, and in the same manner the two negative response categories (disagree and strongly disagree) of the scale was also added together. The neutral response category of the scale was kept as it was. The three-point scale was only used in the ANOVA and frequency table and to determine the attitudinal disposition.

The seven statements were used to determine the consumers' attitudinal disposition towards the health benefits of soy on a three-point scale. Attitude is a way of thinking and behaving and since attitude has the important psychological function of directing behaviour, it is necessary to determine this disposition (Shepherd & Sparks 1994:206). Validity and reliability were determined in order to assess whether the instrument measures what it needs to measure and whether it yields consistent results, respectively. A reliable attitude test displays internal consistency, which refers to the tendency of the different items on the scale to elicit the same attitude from any given respondent on a single administration of the test. Reliability was determined by calculating the coefficient of the Cronbach's Alpha and a value of 0.88 was found, which is considered acceptable. Validity can be viewed as the extent to which alternative interpretations of the instrument's results can be ruled out.

Construct validity refers to the extent to which you can be sure the instrument represents the construct of which the name appears in its title (Henerson *et al.*, 1978). According to Smith *et al.* (1988:20), a scale displays good construct validity when one or only a few factors are extracted, which together explain a substantial proportion of the variance, and when high communalities are obtained for each statement. Validity was determined by factor analyses. A varimax-unrotated factor analyses-method was used, and according to the Keizer-criteria, one factor was extracted, which accounted for 56% of the total variance. On this basis the attitude test was accepted to determine the attitudinal disposition of the total consumer population.

### **STATISTICAL ANALYSES**

Statistical analyses were done with the Statistica<sup>®</sup>-program. Cross tabulation was done to determine frequencies of consumers' opinion regarding the different statements. The variables used in this study were age (pre- and postmenopausal) and race groups. ANOVA was used to determine if there were any statistical significant differences ( $p < 0.05$ ) between the groups.

Of the 27 statements, an additional two statements were selected to determine if there was a relation between the frequencies of respondents' opinions of each one of the last two selected statements and each of the seven previously selected statements. The two additional statements were:

1. I eat/drink soy products
2. I never use soy

Detailed two-way tables were used to determine if any relation was found between the different statements.

### Practical significance

As the data for this consumer study consisted of 3 001 respondents and was weighed to represent the total South African consumer population, statistical significant differences were always found in all groups and therefore statistical inference and p-values are not relevant. Instead of only reporting descriptive statistics in these cases, effect sizes can be used to determine practical significance. Practical significance can be understood as a large enough difference to have an effect in practice. The effect size ( $\eta^2$ ) is used to determine if there is a practical significant difference between the means of  $k$  groups (more than two means), in a one-way ANOVA applied on a sample of

$n$  data points 
$$\eta^2 = \frac{\frac{n-k-2}{n-k} F - 1}{\frac{n-k+1}{k-1} + \frac{n-k-2}{n-k} F}$$
 where  $F$  is the variance-ratio of the

ANOVA (Steyn, 2002:6). The following guidelines for the interpretation of the effect size was used, namely small effect:  $\eta^2 = 0.01$ ; medium effect:  $\eta^2 = 0.06$  and large effect:  $\eta^2 = 0.14$ . Large effects can be considered as practically significant.

In two-way frequency tables it is also important to know whether a relationship between two variables is practically significant, e.g. between consumer opinions of the health benefits of soy and their opinion of soy as HRT. For random samples, the statistical significance of such relationships

are determined with Chi-square tests, but actually one wants to know whether the relationship is large enough to be important. In this case the effect size is given by  $w = \sqrt{\frac{X^2}{n}}$ , where  $X^2$  is the usual Chi-square statistic for the contingency table and  $n$  is the sample size, see Steyn (2002:6). Cohen (1988) gives the following guidelines for the interpretation of it in the current case:

(a) small effect:  $w = 0.1$  , (b) medium effect:  $w = 0.3$  , (c) large effect:  $w = 0.5$  .

A relationship with  $w \geq 0.5$  is considered as practically significant.

## RESULTS

### **Awareness, attitudinal disposition and opinion**

Of the 3 001 respondents, 2 437 (80%) were aware of soy with a mean attitudinal disposition score of 2.47 on a three-point scale, indicating a neutral to positive attitudinal disposition of the South African consumer population towards the health benefits of soy.

Table 1 represents the frequency of opinion of age and race groups on the different statements on soy. No practical significant differences were found between the mean values of each statement and age and race groups respectively. The small standard deviations found throughout, indicated that there were few differences in opinion in a specific age group and in a specific race group for each statement. Overall all the individual groups had a mean smaller than two indicating that most consumers agree about the health benefits of soy.

Table 2 represents the frequency of consumer opinions regarding the menopause related health benefits of soy. Of all the consumers surveyed and those who expressed an opinion, 72% agreed that soy has many health benefits compared to only 7% who disagreed. Although 34% of South Africans expressed a positive opinion when asked if soy can be used as HRT, the majority (46%) of the population had a neutral opinion. Forty-two percent of the consumers who held an opinion regarding soy as reliever of menopausal symptoms were positive, 35% had a neutral opinion and 23% of South Africans did not agree that soy can relieve menopausal symptoms.

**Table 1.** Means<sup>#</sup> ( $\pm$ SD) of consumers from different race and age groups regarding their opinion on the health benefits of soy

STATEMENT	RACE GROUPS									AGE GROUPS				
	WHITE		BLACK		COLOURED		INDIAN		Effect size ( $\eta^2$ )	PRE-MENOPAUSE		POST-MENOPAUSE		Effect size ( $\eta^2$ )
	N	mean $\pm$ SD	N	mean $\pm$ SD	N	mean $\pm$ SD	N	mean $\pm$ SD		N	mean $\pm$ SD	N	mean $\pm$ SD	
1. Has health benefits	880	1.50 $\pm$ 0.75	3151	1.58 $\pm$ 0.76	444	1.47 $\pm$ 0.76	168	1.59 $\pm$ 0.80	0.01*	1556	1.49 $\pm$ 0.75	3087	1.59 $\pm$ 0.77	0.01*
2. Lowers cholesterol	594	1.18 $\pm$ 0.58	2072	1.30 $\pm$ 0.68	348	1.18 $\pm$ 0.57	143	1.14 $\pm$ 0.52	0.02*	998	1.28 $\pm$ 0.69	2159	1.22 $\pm$ 0.63	0.01*
3. Bone strength	518	1.58 $\pm$ 0.06	2930	1.55 $\pm$ 0.76	330	1.46 $\pm$ 0.70	146	1.55 $\pm$ 0.65	0.02*	2586	1.58 $\pm$ 0.73	1338	1.48 $\pm$ 0.72	0.01*
4. Alternative for HRT	381	1.70 $\pm$ 0.58	1682	1.58 $\pm$ 0.59	220	1.65 $\pm$ 0.59	72	1.36 $\pm$ 0.48	0.02*	1676	1.56 $\pm$ 0.58	679	1.70 $\pm$ 0.62	0.01*
5. Cure certain diseases	488	1.45 $\pm$ 0.52	2231	1.60 $\pm$ 0.70	245	1.49 $\pm$ 0.67	135	1.42 $\pm$ 0.52	0.02*	2133	1.55 $\pm$ 0.66	966	1.58 $\pm$ 0.70	0.02*
6. Relieve menopausal symptoms	347	1.55 $\pm$ 0.50	1433	1.60 $\pm$ 0.70	181	1.50 $\pm$ 0.60	88	1.56 $\pm$ 0.50	0.02*	1418	1.66 $\pm$ 0.58	631	1.56 $\pm$ 0.59	0.01*
7. Heart health	613	1.59 $\pm$ 0.68	2591	1.44 $\pm$ 0.64	331	1.34 $\pm$ 0.61	164	1.45 $\pm$ 0.70	0.01*	2368	1.47 $\pm$ 0.65	1331	1.44 $\pm$ 0.66	0.01*

N=sample size, %=percentage of sample size, mean $\pm$ SD=mean  $\pm$  standard deviation

Effect size (between groups): small effect (0.01) = \*; medium effect (0.06) = \*\*; large effect (0.14) = \*\*\*

<sup>#</sup>Three-point Likert-scale: 1=agree, 2=neutral, 3=disagree

**Table 2.** Consumer opinions regarding the menopause related health benefits of soy

STATEMENT	PERCENTAGE (%) OF OPINION		
	AGREE	NEUTRAL	DISAGREE
Health benefits of soy	72	21	7
Soy as HRT	34	46	20
Relieve menopausal symptoms	42	35	23

### Correlations between the use and consumption of soy and various health benefits of soy

Of all the correlations drawn, three had a medium effect on practical significance, while the others all had small effects. Therefore, only the three cases, in which a medium effect was found, will be reported in Tables 3-5.

**Table 3.** Two-way frequency tables for respondents that eat/drink soy and their opinion of the health benefits of soy

Eat/drink soy	Soy has many health benefits									
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	%	N	%	N	%	N	%	N	%	N
<b>Disagree</b>	3.16	76	4.61	111	18.82	453	60.95	1467	12.46	300
<b>Agree</b>	0	0	0	0	10.8	99	49.4	453	39.8	365

According to the results in Table 3 a medium effect ( $w=0.33$ ) was found which indicates that although there is a relation between the variables, it is not practically significant. Of the respondents who indicated that they eat or drink soy, 89% agreed that soy has many health benefits. The respondents who disagreed when asked if they eat or drink soy still expressed an overall positive opinion (73%) when asked whether soy has many health benefits.

**Table 4.** Two-way frequency table for respondents that eat/drink soy and their opinion of whether soy can cure diseases

Eat/drink soy	Soy can cure certain diseases									
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	%	N	%	N	%	N	%	N	%	N
<b>Disagree</b>	6.31	95	22.39	337	32.56	490	32.16	484	6.58	99
<b>Agree</b>	7.37	44	8.38	50	14.91	89	48.74	291	20.60	123

An effect size of  $w=0.31$  (medium effect) was found between the two statements in Table 4, indicating that although there is a relation between the two statements, it is not practically significant. Looking at the frequency of opinion, of the respondents who agreed that they eat or drink soy, a majority of 69% expressed a positive opinion when asked if soy can cure certain diseases. Of the respondents who indicated that they do not eat or drink soy, 40% had a positive opinion whereas 33% held a neutral opinion and 28% expressed a negative opinion towards soy as a curer for certain diseases.

**Table 5.** Two-way frequency tables for respondents that never use soy and their opinion of the bone strengthening benefit of soy

I never use soy	Soy keeps your bones strong									
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	%	N	%	N	%	N	%	N	%	N
<b>Disagree</b>	1.32	28	4.44	94	13.19	279	60.66	1283	20.38	431
<b>Agree</b>	9.45	62	10.21	67	37.2	244	38.41	252	4.73	31

The results from Table 5 indicate a medium effect size of  $w=0.36$ , which indicate that there is a relation between opinions regarding the two statements although it is not practically significant. Of those who disagreed (indicated that they use soy), the

majority (81%) agreed that soy has a bone strengthening benefit. On the contrary, only 43% of those that agreed they never use soy, were positive about the bone strengthening benefit of soy, whereas 37% held a neutral opinion and 20% expressed a negative opinion in this regard.

### Correlations between the health benefits of soy and opinion of soy as HRT

The relationship between respondents' opinion on the statements:

- soy has many health benefits *versus* soy can be used in place of HRT, and
- soy has many health benefits *versus* soy can relieve menopausal symptoms, was also determined. In both correlations a large effect on practical significance was found. The results are reported in Tables 6 and 7.

**Table 6.** Two-way frequency tables for respondents who believe soy has many health benefits and their opinion of soy as HRT.

Soy has many health benefits	Soy can be used in place of HRT									
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	%	N	%	N	%	N	%	N	%	N
<b>Disagree</b>	48.62	53	41.28	45	4.59	5	5.50	6	0	0
<b>Agree</b>	2.08	24	9.26	107	45.07	521	37.63	435	5.97	69

According to Table 6, the effect size is  $w=0.63$  (large effect) which indicates a practical significant relation between opinions of the health benefits of soy and of soy as HRT. A large difference in opinion was evident between respondents who had a negative opinion of the health benefits of soy and the respondents who had a positive opinion of the health benefits of soy. Of the respondents who did not agree that soy has many health benefits, almost 90% also expressed a negative opinion of soy as an alternative for HRT. Of those who agreed that soy has many health benefits, 45% expressed a neutral opinion and 44% a positive opinion of soy as an alternative for HRT.

**Table 7.** Two-way frequency tables for respondents who believe soy has many health benefits and their opinion of soy as menopausal symptom reliever.

Soy has many health benefits	Soy can relieve menopausal symptoms									
	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	%	N	%	N	%	N	%	N	%	N
<b>Disagree</b>	55.75	63	30.97	35	7.96	9	5.31	6	0	0
<b>Agree</b>	6.29	61	16.91	164	46.80	454	20.52	199	9.48	92

The effect size of  $w=0.51$  (large effect), indicating a practical significant relation between the two statements (Table 7). Almost half (46.8%) of the respondents who agreed that soy does have many health benefits, expressed a neutral opinion when asked if soy can relieve menopausal symptoms, whereas only 30% had a positive opinion in this regard. The majority (86%) of the respondents who disagreed that soy has many health benefits, also expressed a negative opinion of soy as reliever for menopausal symptoms.

## DISCUSSION AND CONCLUSION

It is common knowledge that the US, Japan and the UK are the world's biggest and most dynamic functional foods and nutraceuticals markets, but this does not mean that they define the whole market. There is an explosion in demand for functional food all over the world, and other markets are becoming increasingly sophisticated (Ciocca, 2003:6). Export figures released by the United States Department of Agriculture show that United States (U.S.) soybean exports are increasing every year. Apart from the European Unions, the Middle East also continues to emerge as a market for U.S. soybean and soybean product exports with the region's increasing population and projected economic growth (Soy Line, 2000:1). This certainly means that there has been a growth in the soy food sector and that consumers are buying these products. Massive research on soy's health benefits combined with hundreds of new soy products on supermarket shelves portends an exciting future for the humble soybean

(Soy foods guide, 2001:8). Surveys are also showing that mainstream consumers in the U.S. are more willing to try soy in their diet, which make these consumers in particular, a highly motivated target market for manufacturers and food processors (Pszczola, 2000:76).

South African grocery stores also have been prominently displaying soy products among traditional foods. Soy-based burgers and sausages are often found in the freezer case next to other meats. And it's not unusual to see refrigerated soymilk alongside cow's milk products. Many 'health' supplements and drinks are now marketed as containing genistein, along with tablets containing isoflavones extracts which are marketed as 'natural' hormone-replacement therapies, and are available over the counter (Bingham *et al.*, 1997:394). Still, a product can not be successful if consumers are not willing to buy it on a regular basis. Consumers in turn, will only want to pay for products that satisfy their needs or offer some kinds of health benefit. A concern of businesses, consumer economists, product developers and food technologists is to find effective strategies to influence and shape consumer behaviour (Blackwell *et al.*, 2001:31). Just as business orientation evolved throughout the years, so has the study of consumer behaviour evolved, sometimes fuelling and sometimes keeping pace with the changes in organizations. One thing that is certain though, is that consumer behaviour is now becoming more important than ever in today's consumer-focused world. The basis for all sales appeal comes from information about the consumer, while ignoring the consumer can lead to disaster in a modern economy (Walters & Bergiel, 1989:4).

What is South African consumers' opinion of soy and its potential health benefits? The results of this study indicate that the 80% of the South African consumer population are aware of soy and have a neutral to positive attitudinal disposition towards soy. Respondents did not express a particularly strong opinion regarding several health benefits of soy. It may be hypothesized that they are not informed well enough on the health benefits of soy as to take a stand and to form a definite opinion. Neither different race groups, nor pre- or post-menopausal women differ significantly in the frequency of their opinions. Indicating that in this study, race and age did not have a practical significant influence on opinion towards the health benefits of soy.

Of all those surveyed and who did express a specific opinion, 72% agreed that soy has many health benefits, which is almost the same percentage (74%) as American consumers who perceive soy products as healthy as according to the United Soybean Board (USB) National Report (2003-2004:4). A survey by Adams (2001:433) reported that 71% of American consumers believed that plant-derived HRT have fewer risks and can thus be used as a safe alternative for conventional HRT. According to a telephone survey by Newton *et al* (2002:18) though, only 7.4% of American women between 45-65 years reported they were currently using soy products as an alternative for HRT. From the results in this study only 34% of South African consumers expressed a positive opinion when asked if soy can be used as an alternative for HRT. Dietary soy products and soy isoflavones have been suggested as possible alternatives to HRT, although the current evidence base for these products is modest (Newton *et al.*, 2002:24). Insufficient evidence on the safety and efficacy of the potential health benefits of soy, as well as a lack of consumer education in South Africa, could be the reason for this uncertainty among South African consumers. Twenty-six percent of American consumers are aware that soy might relieve menopausal symptoms (USB National Report, 2003-2004:4) while according to a survey by Newton *et al.* (2002:18), only 4.4% are currently using soy products to manage their menopausal symptoms. In this study it was found that 42% of South Africans were of opinion that soy can relieve menopausal symptoms.

A relation, although not of practical significance, was found between respondents who eat or drink soy and their opinion of the health benefits of soy. This can be an indication that whether or not the South African consumer population consume soy doesn't have an influence on their opinion of soy's health benefits in practice. The relation found between respondents who never use soy and their opinion of the bone strengthening benefit of soy were not of practical significance. This can be an indication that whether or not South Africans use soy or not does not influence their opinion of the bone strengthening benefit of soy in practice. When asked if soy can cure certain diseases, or had a bone strengthening benefit, it was found that the opinions of those respondents who agreed that they do consume or use soy, differed, while the majority (40%) still had positive opinions. Thirty-eight percent of Americans on the other hand, reported that they are aware that consumption of 25 g of soy protein a day reduces the risk of coronary heart disease (USB National Report,

2003-2004:4). According to the National Report of the USB, one in six Americans consume soy foods or soy beverages once a week or more. The report further stated that amongst those who do not consume soy, 47% reported that nothing particular prevents them from including soy in their diet and that the taste was not a barrier. American consumers read about soy health news through magazines and newspapers (USB National Report, 2003-2004:3). Educating consumers towards the disease prevention and bone strengthening benefits of soy might increase their positive opinion of soy and, in turn even increase the number of people who consume soy in South Africa.

Furthermore, there is a definite practical significant relation between respondents' opinion of the overall health benefits of soy and their opinion of soy as alternative for HRT and as reliever of menopausal symptoms. Interestingly, respondents who expressed a positive opinion of the health benefits of soy did not have a convincingly positive opinion of soy as alternative for HRT and as reliever of menopausal symptoms, but merely expressed a more neutral opinion. Although the causes for this neutral opinion or uncertainty were not determined in this study, it can be hypothesised that it may be due to lack of standardisation of evidence on the safety and efficacy of alternative therapies, such as soy products or isoflavone supplements. If consumers are not educated about the benefits and disadvantages, they can not make intelligent decisions as to whether or not to use soy as alternative therapy for HRT.

Although it is clear that South African consumer are aware of soy, the diffusion in their opinions regarding the potential health benefits of soy, is an indication that the soybean has a long way to go before it becomes a staple in the average pantry. The problem facing marketers of functional foods is that the link between food and health has become increasingly complex, and the "wonder" ingredients they contain are no longer only simple nutrients, but are often unrecognisable with complex names like *phytochemicals* and *isoflavones* (Badham, 2002:39). This complexity can create confusion among consumers which may lead to a negative opinion of functional foods. Advances in communication sciences, sensory technology, and consumer behaviour have permitted the development of powerful tools to increase consumers' awareness of functional food. The consequence of all this technology has given

freedom to consumers globally and therefore, the food consumer has become more empowered (Fuller, 2001:35). Possible strategies to increase the awareness of soy foods in South Africa and possibly change the South African consumers' opinion of the health benefits of soy include the following:

- New findings regarding health benefits of soy, which in turn will improve the image of soy as food and built trust within the consumer.
- Continued efforts, through innovations in processing and breeding technology, to overcome key constraints that limit uses of soy as food and to make soy foods taste better.
- Incorporating soy ingredients into mainstream foods that people are familiar with.
- Increase marketing efforts for positive promotion of soy products (Liu, 2000:55-56).

The author also recommends the following guidelines to enable growth in the South African soy food market:

- Examination of how lifestyle and current health practices, such as self-medicators, affect opinion and acceptance of phytochemicals, as well as how consumers with a "healthy" lifestyle differ from those at risk of disease.
- Extra effort should be made to educate those groups that have limited access to formal health care and health information regarding soy, namely low-income groups including minority groups (especially those with language barriers). Special attention should be paid to these groups through language specific person-to-person communications using health workers and community volunteers.
- Apart from educating consumers, it is also recommended to educate dieticians regarding the sources of isoflavones and the ability to translate this knowledge into practical methods for consumer use. This will enable dieticians to design strategies to incorporate soy into the diet and teach the consumer about the practical applications thereof.
- In conclusion, it is also necessary to continue to track consumers' awareness and opinions of functional foods and the health benefits of soy as functional food since consumer opinions will change rapidly as publicity and marketing

of the category gains momentum. The author recommends that the South African Soy Food Industry or the *Southern African Soy Food Association* should compile and distribute an annual report similar to the *National Report* of the USB.

**Authors' contribution**

**Anel van Wyk de Vries:**

Author, statistical analysis, interpretation of data, literature research and preparation of mini-dissertation which is part of M. study.

**Magdalena J.C. Bosman:**

Study leader and co-author. Supervised statistical analysis and interpretation of the data. Supervised the writing of this mini-dissertation.

**Susanna C. Scholtz:**

Co-study leader and co-author. Supervised statistical analysis and interpretation of the data. Supervised the writing of this mini-dissertation.

**Johann C. Jerling**

Conceived idea of the study. Organised sponsorships and funds to enable the study. Draw-up of questionnaires together with *Markinor*. Execution of study.

**Jane Badham**

Conceived idea of the study. Organised sponsorships and funds to enable the study. Draw-up of questionnaires together with *Markinor*. Execution of study.

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## **CHAPTER 4**

### **GENERAL SUMMARY, RECOMMENDATIONS, DISCUSSION AND CONCLUSIONS**

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**CHAPTER 4**  
**GENERAL SUMMARY, CONCLUSIONS AND**  
**RECOMMENDATIONS**

**1. INTRODUCTION**

In this final chapter, a summary of the main findings from the consumer study reported in this mini-dissertation will be given. Since the results are discussed, interpreted and compared to the relevant literature in the preceding chapters, only general conclusions will be made. This will be followed by general recommendations regarding this study, as well as recommendations to the food industry and health professionals as deduced from these findings.

**2. SUMMARY OF MAIN FINDINGS**

1. The results of this study indicate that 2 437 (80%) of the 3 001 South African consumers were aware of soy.
2. A mean attitudinal disposition score of 2.47 on a three-point scale indicated a neutral to positive attitudinal disposition of the South African consumer population towards the potential health benefits of soy and soy products as alternative for HRT. The small standard deviations found throughout, indicated that there were few differences in opinion in a specific age group and in a specific race groups for each statement. The consumers' opinion regarding different health benefits of soy were overall positive.

3. Of all the consumers surveyed and those who did express a specific opinion, the majority agreed that soy has many health benefits. An overall neutral opinion was held when asked if soy can be used as HRT, while the majority of the consumer population in South African expressed a positive opinion regarding soy as reliever of menopausal symptoms.
4. A relation, although not of practical significance, was found between respondents who eat/drink soy and their opinion of the health benefits of soy. This can be an indication that whether or not the South African consumer population consume soy doesn't have an influence on their opinion of soy's health benefits in practice.
5. A relation, although not of practical significance, was found between respondents who never use soy and their opinion of the bone strengthening benefit of soy, indicating that whether South Africans use soy or not, they still perceive soy as healthy.
6. The relation between respondents' opinion of the overall health benefits of soy and their opinion of soy as HRT and reliever of menopausal symptoms was of practical significance. Of the respondents who did not agree that soy has many health benefits, the majority expressed a negative opinion of soy as an alternative for HRT. Of those who agreed that soy has many health benefits, 45% expressed a neutral opinion and 44% a positive opinion of soy as alternative for HRT. Further more, almost half of the respondents who agreed that soy does have many health benefits expressed a neutral opinion when asked if soy can relieve menopausal symptoms. The majority of the respondents who disagreed that soy has many health benefits, also expressed a negative opinion of soy as reliever for menopausal symptoms

### 3. CONCLUSION

For many years, soybeans had been primarily identified with their high protein and oil content. Yet, for the past decade there has been much interest among medical researchers in studying the health benefits of direct human consumption of soybeans as food. With these recent developments in the potential health benefits of soy and the increasing coverage of nutritional studies by the media, it is necessary to update opinions of consumers regarding soy as functional food in order to improve marketing or educate consumers about the health benefits thereof.

The most important reason for studying consumer behaviour is the significant role it plays in our lives. Much of our time is spent directly in the marketplace, shopping or engaging in other activities. A large amount of additional time is spent thinking about products and services, talking to friends about them and seeing or hearing advertisements about them. Health is the primary factor driving the market, while soy is being linked with a number of health benefits, including reduction in blood cholesterol, prevention of prostate and breast cancer and as an alternative for HRT. Although there is still controversy about the mechanism of action of soy isoflavones, there has been a dramatic increase in the market for soy and soy products globally. This is mainly due to the approval of a health claim for soy protein and its role in cholesterol reduction in October 1999. To measure the direct impact that consumers have on the soy food market, consumers' behaviour and opinions towards soy have to be determined. The *United Soybean Board* has taken the lead in consumer studies regarding soy by distributing an annual report on consumer attitudes about nutrition. In this report consumers' awareness, usage and opinion of the health benefits of soy is reported. It can not be assumed

that this report is single-handedly responsible for the tremendous increase in the soy food market in the United States. Consumer research in this area, however, can be one of the contributing factors which lead to the expansion of the soy food market in the United States. To the knowledge of the author research on the consumption of functional food in South Africa, is still in its infancy stage. Knowing consumers' opinions regarding soy can help marketers to improve existing products and expand product ranges. Educating consumers towards the health benefits of soy may also improve or change opinions.

Results from this study indicated that the majority of consumers in South Africa are aware of soy, and have a neutral to positive attitudinal disposition towards soy which could form the basis for further marketing strategies. Of particular interest in our findings was that there were no significant differences between the opinions of either the different race groups, or the two different age groups. It was surprising, as it was expected that the demographic differences would have an influence on consumers' opinions regarding the potential health benefits of soy. The overall opinion of South Africans regarding the health benefits of soy were positive.

The relation, although not of practical significance, found between respondents who eat/drink soy and their opinion of the health benefits of soy could imply that consumption of soy in South Africa is not necessarily influenced by consumers' opinion regarding the health benefits of soy. The consumers still expressed a positive opinion regarding this statement. The relation found between respondents who never use soy and their opinion of the bone strengthening benefit of soy, was also not practically significant. As expected, there was diffusion among consumers who never use soy and their

opinions of the bone strengthening benefit of soy. Those who do use soy on the other hand, had an overall positive opinion regarding the bone strengthening benefit of soy. A practical significant relation was found between respondents' opinion of the health benefits of soy and their opinion of soy as alternative for HRT and as reliever of menopausal symptoms, respectively. The opinion of those who believed that soy does have many health benefits though, was neutral regarding the other two statements. This could be either due to lack of consumer education and knowledge or lack of standardisation of evidence on the safety and efficacy of the potential health benefits of soy.

In a developing country such as South Africa, consumer research in any field of study should be stressed. The author thus consider the major contribution of this mini-dissertation to be an emphasis on the primary role consumers play in the food industry, for no matter how many functional benefits a product may have, there is no use in developing and selling such products if consumers are not informed well enough about its contributing benefits and do not have the intention to buy and consume it repeatedly. The data collected in this study provide insight into consumers' opinion of soy, which can be used as a basis and guideline for more detailed surveys in the future.

## **RECOMMENDATIONS**

Possible strategies to increase the awareness of soy foods in South Africa and possibly change the South African consumers' opinion of the health benefits of soy include the following:

- New findings regarding health benefits of soy, which in turn will improve the image of soy as food and built trust within the consumer.
- Continued efforts, through innovations in processing and breeding technology, to overcome key constraints that limit uses of soy as food and to make soy foods taste better.
- Incorporating soy ingredients into mainstream foods that people are familiar with.
- Increase marketing efforts for positive promotion of soy products (Liu, 2000:55-56).

The author also recommends the following guidelines to enable growth in the South African soy food market:

- Examination of how lifestyle and current health practices, such as self-medicators, affect opinion and acceptance of phytochemicals, as well as how consumers with a “healthy” lifestyle differ from those at risk of disease.
- Extra effort should be made to educate those groups that have limited access to formal health care and health information regarding soy, namely low-income groups including minority groups (especially those with language barriers). Special attention should be paid to these groups through language specific person-to-person communications using health workers and community volunteers.
- Apart from educating consumers, it is also recommended to educate dieticians regarding the sources of isoflavones and the ability to translate this knowledge into practical methods for consumer use. This will enable dieticians to design strategies to incorporate soy into the diet and teach the consumer about the practical applications thereof.

- In conclusion, it is also necessary to continue to track consumers' awareness and opinions of functional foods and the health benefits of soy as functional food since consumer opinions will change rapidly as publicity and marketing of the category gains momentum. The author recommends that the South African Soy Food Industry or the *Southern African Soy Food Association* should compile and distribute an annual report similar to the *National Report* of the USA.

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**ADDENDUM A**

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13. **SHOW CARD:** Now let's look at the following statements concerning **SOY (Soya)** and the **foods and drinks that are made from SOY (Soya)**. Could you please tell me whether you strongly agree, agree, neither agree nor disagree, disagree or strongly disagree with each statement?

<b>READ OUT. OMO</b> →	<b>STRONGLY AGREE</b>	<b>AGREE</b>	<b>NEITHER AGREE NOR DISAGREE</b>	<b>DISAGREE</b>	<b>STRONGLY DISAGREE</b>	<b>DON'T KNOW</b>
1. I believe that SOY (Soya) is good for you	-5	-4	-3	-2	-1	-6
2. I don't know where to buy SOY (Soya) products	-5	-4	-3	-2	-1	-6
3. I don't like the taste of SOY (Soya)	-5	-4	-3	-2	-1	-6
4. I would only use SOY (Soya) products if they would give me a specific health benefit for example - prevention of heart disease	-5	-4	-3	-2	-1	-6
5. I eat/drink SOY (Soya) products	-5	-4	-3	-2	-1	-6
6. I don't know how to prepare SOY (Soya) products	-5	-4	-3	-2	-1	-6
7. SOY (Soya) is a good source of protein	-5	-4	-3	-2	-1	-6
8. I would use/use more SOY (Soya) if it was readily available	-5	-4	-3	-2	-1	-6
9. I never use SOY (Soya)	-5	-4	-3	-2	-1	-6
10. I don't know where to use SOY (Soya) products	-5	-4	-3	-2	-1	-6
11. I would use/use more SOY (Soya) if there was a bigger product range	-5	-4	-3	-2	-1	-6
12. I believe that SOY (Soya) is only for people with a low income	-5	-4	-3	-2	-1	-6
13. SOY (Soya) is only for vegetarians	-5	-4	-3	-2	-1	-6
14. I associate SOY (Soya) with meat substitutes	-5	-4	-3	-2	-1	-6
15. I am aware of a number of meat substitutes made from SOY (Soya)	-5	-4	-3	-2	-1	-6
16. The protein in SOY (Soya) is not as good as the protein in meat	-5	-4	-3	-2	-1	-6
17. I associate SOY (Soya) with institutions like the army	-5	-4	-3	-2	-1	-6
18. SOY (Soya) is only for baby formula	-5	-4	-3	-2	-1	-6
19. I am aware that I can replace meat in my diet with SOY (Soya)	-5	-4	-3	-2	-1	-6

14. <b>SHOW CARD:</b> How would you rate <b>SOY (Soya) and health?</b> Please use the scale of 5 to 1, where 5 = strongly agree and 1 = strongly disagree, 6 = I do not know, how strongly do you agree with each statement?						
READ OUT. OMO	STRON GLYAG RE	AGREE	NEITHE R AGREE NOR DISAG RE	DISAG REE	STRON GLY DISAG REE	DON'T KNOW
1. SOY (Soya) has many health benefits	-5	-4	-3	-2	-1	-6
2. SOY (Soya) gives you wind	-5	-4	-3	-2	-1	-6
3. SOY (Soya) lowers cholesterol	-5	-4	-3	-2	-1	-6
4. SOY (Soya) boosts your immune system	-5	-4	-3	-2	-1	-6
5. SOY (Soya) keeps your bones strong	-5	-4	-3	-2	-1	-6
6. SOY (Soya) gives you energy / power	-5	-4	-3	-2	-1	-6
7. SOY (Soya) can be used in place of hormone replacement therapy (HRT)	-5	-4	-3	-2	-1	-6
8. SOY (Soya) helps you lose weight	-5	-4	-3	-2	-1	-6
9. SOY (Soya) can cure certain diseases	-5	-4	-3	-2	-1	-6
10. SOY (Soya) has a low glycaemic index	-5	-4	-3	-2	-1	-6
11. SOY (Soya) is good for people with a milk allergy	-5	-4	-3	-2	-1	-6
12. SOY (Soya) can boosts sexual performance	-5	-4	-3	-2	-1	-6
13. SOY (Soya) can relieve menopausal symptoms	-5	-4	-3	-2	-1	-6
14. SOY (Soya) makes you fat	-5	-4	-3	-2	-1	-6
15. SOY (Soya) helps keep your heart healthy	-5	-4	-3	-2	-1	-6
16. SOY (Soya) can help prevent cancer	-5	-4	-3	-2	-1	-6
17. SOY (Soya) is good for diabetics	-5	-4	-3	-2	-1	-6
18. SOY (Soya) is good for growing children	-5	-4	-3	-2	-1	-6