The Okinawa Centenarians

A 25 Year Longevity Study

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Okinawa Island – The Real Shangri La

Dr Suzuki first started work on Okinawa Centenarians in 1976 with support of Japanese Health Ministry. Both Dr Bradley and Dr Craig join the research in mid 1990's with intention of publishing the study in English. Reviewed 2000 researches and 600 centenarians.

Vital Information

The Island inhabitants were lean, youthful looking, energetic, with low stress levels and remarkably low rates of heart disease and cancer – even stomach cancer which is prevalent in mainland Japan.

Okinawa possesses highly reliable (*koseki*) birth, marriage and death statistics since 1879.

There are 34 Okinawan centenarians per 100,000 inhabitants being healthy, active and living independently compare to 10 American centenarians per 100,000 who have less robust health.

Diet will influence 2/3 of their long lifespan. Low calorie plant based and high in unrefined carbohydrates diet is favoured by Okinawans.

Okinawan who migrate to mainland, USA and Brazil experience similar lifespan as host countries if adapt similar diet and lifestyle. However will still enjoy longer lifespan if follow traditional way.

Okinawan Elders are becoming less because younger generations are influenced by American culture, lifestyle and diet. (US maintain 30,000 combat troops in Okinawa)

Key Findings

Okinawa diet and lifestyle greatly minimize some of the biochemical and physiological mechanism that can lead to disease such as free radical induce cellular damage, glycosylation of cellular proteins and hormonal stimulation of cancer growth.

Healthy Artery: Homocystein

	Okinawa	France	Spain	Denmark	Germany	Scotland	Ireland	Finland
CVD Mortality per 100,000	180	210	240	330	400	500	550	550
Plasma Homocysteine µMOL/L	7.8	7.7	7.2	9.0	9.2	9.3	9.2	10.8

Alithan, G., A. Aro and K.F. Gey. 1997. Plasma homocystein and cardiovascular disease mortality. Lancet 349:397

Homosystein is an amino acid that is a by - product of protein intake from meat source. It is then converted in the body to essential amino acid methionine or harmless cystein. Sufficient Vitamin B6, B12 and folate in diet help process this amino acid. However unprocessed homocystein can lead to increase in CHD, stroke and deep vein thrombosis.

Consume leafy green vegetables, orange and unpolished whole grains will provide Vitamin B6, B12 and folate/ Folic Acid.

Healthy Heart: Cholesterol

	Okinawan &Boston Marathoners	Most American Women	Most American Man	Some Americans
Cholesterol/ HDL 3 - 4	**X**			
Cholesterol/ HDL 4– 5		**X**		
Cholesterol / HDL 5 -6			**X**	
Cholesterol / HDL 6 - 9				**X**

The elderly in their homes and elderly in nursing homes: Examination of circulatory systems Okinawa Public Health J 9:83 – 89: Tonaki, M., N. Fukumine, M. Suzuki, et al. 1977.

Gordon, T., and W.B. Kannel. 1971. Premature mortality from coronary heart disease. The Framingham Study. JAMA 215:1617 – 25; Castelli, W.P. 1988.

Okinawan cholesterol levels are generally under 170 on the average and Cholesterol/ HDL ratio averaging 3.3. This is well under recommended ratio of 4.5 by National Cholesterol Education Program.

Consuming soy, unpolished whole grains, vegetables, canola cooking oil, omega 3 rich fish and less cholesterol rich food will help in reducing risk of coronary heart disease.

Hormone Dependent Cancer Risk

Yearly Cancer Death per 100,000 people						
Rank	Location	Life Expectancy	Breast	Ovarian	Prostate	Colon
1	Okinawa	81.2	6	3	4	8
2	Japan	79.9	11	3	8	16
3	Hong Kong	79.1	11	3	4	11
4	Sweden	79.0	34	10	52	19
8	Italy	78.3	37	4	23	17
10	Greece	78.1	29	3	20	13
18	USA	76.8	33	7	28	19
World Health Organization 1996: Japan Ministry of Health and Welfare 1996: Rose, D.P., A. P. Boyar, and E.L. Wynder. 1986. International comparisons of mortality rates for cancer of the breast, ovary, prostate and colon and per capita food consumption. Cancer 58:2363 - 71						

Flavonoid Intake and Cancer Rates

Rank	Location	Flavonoid Intake (mg/day)	Cancer Mortality (per 100,000 / year)
1	Okinawa	100.9	97
2	Japan	64.5	106
3	USA	12.9	132
Hertzog. M, et al. 1995. Arch Intern Med 155:381 – 86; Okinawa Centenarian Study and World Health Organization 1996.			

Free Radical Damage Activity

Group	Plasma Lipid Peroxide (Free Radical By Product)
100 year old Okinawan Elders	1.59
70 year old normal population	2.96
Suzuki, M., M. Akisaka, and S. Inayama. 1993. Medicobiological stydies on centenarian in Okinawa, measuring plasma lipid peroxide, proline and plasma and intracellular tocopherol. In Beregi, E., I. A. Gergely, and K. Rajczi, eds, Recent advances in Aging Science. Bologna: Monduzzi.	

Protective Factors from Cancer

Protective Factor 1:
Flavonoids consist of flavones, isoflavones, bioflavones are very powerful antioxidant/ free radical scavenger. Very high Flavonoids intake help reduce free radical damage on our cells and organ thus reducing cancer risk.

Flavonoids from soy products and sweet potato satsumaimo are consumed abundantly.

Protective Factor 2:
Okinawans consume less 40% calorie compare to Americans.

The more we eat the more our body will produce free radicals due to oxidation process.
Lower calorie diets helps in lowering cell damaging free radicals.

Protective Factor 3:
Vegetables and Fruits

The US National Cancer Institute recommends 5 servings a day.
Okinawans consume 7 servings a day.

Smaller servings will enhance absorption of nutrients for older people. When we grow older gastric juices and natural movement of food enzyme in intestine will decline resulting in poor absorption of nutrients.

High consumption of of flavonoid rich antioxidants leafy vegetables type and Satsumaimo sweet potato and fruits will help to reduce cell damaging free radicals.

Protective Factor 4:
Good Fats

Cooking oil that is more resistant to oxidation can help to reduce free radicals that are produce during cooking.

Okinawan uses Canola oil (monounsaturated oil) to stir fry their dishes.
Avoid deep fried food as it is highly oxidized will produce more cell damaging free radicals

Protective Factor 5:
Low Glycemic Index and High Fiber Food

High glucose load will increase production of Insulin. Insulin is also considered Insulin Growth Factor and high level will trigger higher cell production. In long run that may lead to cancer.

Okinawan consumes unpolished whole grain rice and sweet potato (satsumaimo) for carbohydrates and good amount of vegetables. Satsumaimo has additional benefit of containing natural hyaluronic acid that rehydrates skin.

Protective Factor 6: Moderate Alcohol Consumption

Heavy consumption of alcohol (more than 2 drinks a day) causes increase production of estrogen in both man and women. Higher estrogen levels may increase risk of gynecomastia (growth of breast tissue) that can cause breast cancer for both men and women.

Alcohol also destroys folate/folic acid which is thought to protect against colon cancer. Okinawan women drink once hard liquor daily and men twice daily. Men suffer from more colon cancer.

Protective Factor 7:

Low Body Fat Level

Post menopausal obesity is closely link to increase production of estrogen and Insulin.

Estrogen is manufactured in excess body fat especially around the hips and waist. Production of too much of estrogen will expose overweight menopause women to breast cancer.

Body fat is one of principle signals for beginning of menstruation. Body fat will also signals insulin hormones and growth hormones to induce menstruation. Higher levels of insulin hormones will lead to higher circulating Insulin growth factors causing excess proliferation of cells leading to breast cancer.

Higher body fat in Japanese women in last few decades leads to earlier onset of menstruation cited as possible reason for higher breast cancer rates.

Protective Factor 8:

High Level of Physical Activity

Exercise helps muscle take up more insulin leaving less insulin left to stimulate cells growth that can cause cancer. Exercise also helps reduce body fats will eventually help reduce postmenopausal production of estrogen and circulating insulin levels that can cause breast and colon cancers.

Okinawans like to do martial arts, dancing, gardening and walk, walk and walk!.

Nature's SERMS and Their Possible Effects

Population	Flavonoids (mg/day)	Menopausal Symptoms % Per 100,000	HIP Fractures Per 100,000	Heart Disease Mortality Per 100,000
Okinawan	100.9	16.1	4,414	18
American	12.9	46.2	8,206	100

Washburn, S., G. L. Burke T. Morgan, et al. 1999.Effect of soy protein supplementation on serum lipoproteins, blood sugar and menopause symptoms in perimenopause women. Menopause 6:7 -13

Hertzog, M., D. Kromhout C. Aravantis, et. Al. 1995. Flavonoid intake and long term risk of coronary heart disease and cancer in the Seven Countries Study. Arch. Intern Med 155(4):381 – 386; Lock; M. 1994

A comparison of hip fracture among native Japanese, Japanese Americans and American Caucasians. Am J. Epidemiol 133(8):801-9 Japan Ministry of Health, 1966;1995 World health Statistics Annual. WHO, 1996. Geneva.

Okinawa women experience fewer postmenopausal symptoms such as hot flashes, hip fracture and coronary heart disease therefore have very little use for Hormone Replacement Therapy (HRT).

HRT does increase risk of breast cancer.
SERMs (Selective Estrogen Receptor Modulator) like Tamoxifen helps cuts risk of breast by 50%. Unfortunately, it also increases risk of blood clots and stroke.

Natural SERMs is abundant in soy. Soy contains natural phytoestogens that is call flavonoids.
Soy flavonoids offer protection from damaging effects of estrogen while allowing you all the beneficial effects without risk of blood clots and stroke.

Estrogen has to connect with a cell receptor to work, to promote cell growth. If the receptor is blocked, the estrogen cannot connect. Soy flavonoids SERMs are selective blockers working cleverly to connect and promote growth at certain selected part of body where it is beneficial such as the bone. SERMs will block estrogen from promoting growth in sensitive parts such as endometrium and breast.

Natural SERMs also help to ease wild pre and post menopausal estrogen swings.

Soy flavonoids is best consume as food itself. SERMs extracts in pill form may contain too much of certain flavonoids that may present health effects that are unknown.

Youthful Sex Hormones

Age Group	DHEA (ng/ml)	Testosterone (ng/dl)	Estrogen (pg/ml)
Okinawan Men 70	2.6	439	35.7
American men 70	2.0	314	20.6
Okinawan Men 100	0.8	298	12.1
Okinawan Women 70	3.0	13	15.5
American Women 70	1.1	17	5.5
Okinawan Women 100	0.6	39	4.2
Normal ranges for these age groups	M 0.5 – 5.5	M 240 -950	M 0 – 50
	M 0.3 – 4.5	F < 90	F 0 - 35

Suzuki, M, and N. Hirose. 1999. Endocrine function of centenarians. In Tauchi, H., T. Sato, and T. Watanabe, eds. Japanese Centenarians – Medical Research for Final Stages of Human Aging. Aichi: Aichi Medical University; Greendale, G.A., Edelstein, and E. Barret – Connor: 1997.

The Diet of the World's Longest Lived People and Its Potential Impact on Morbidity and Lifespan. Bradley J. Willcox, D. Craig Willcox, Hidemi Todoriki, Akira Fujiyoshi, Katsuhiko Yano, Qimei He, J. David Curb, Mahkoto Suzuki. Ann. N.Y. Acad. Sci. 1114:334 – 445 (2007)

Calorie Intake and Aging: Mechanism in Rodent and a Study in Non Human Primates. Jonathan Wanagat, David B. Allison, Richard Weindruch. Integrated MD/PHD Program, University of Winsconsin, Madison, Winsconsin 53705.

Okinawans managed to preserve DHEA, testosterone and estrogen longer than Americans.

This will suggest that Okinawan low calorie diet helps reduce oxidative stress lowering levels of free radicals. High intake of antioxidants rich soy flavonoids and satsumaimo slows also down ageing process by reducing free radicals damaging cells and together thus preserving pituitary and adrenal organs function.

The 2nd reason is high intake of soy flavonoids will provide natural estrogen that help Okinawan women maintain estrogen level higher 3 times than American counterpart with lower risk of cancer even at old age. Okinawan men also enjoy similar benefit with higher estrogen levels.

High level of natural estrogens from soy containing natural estrogens and SERMs in Okinawan men and women will improve protection from coronary heart disease and hip fractures (indirect effect of osteoporosis) without increasing risk of cancer.

Okinawans higher DHEA, Testosterone and Estrogen levels than Americans possibly reflecting a younger physiological age.

Growth Hormones

Growth hormones are release from pituitary gland in a series of pulses over the day and night, mostly when we sleep.

Growth hormones benefits:

1. Increase in muscle mass.
2. Decrease in body fat especially in abdomen area.
3. Increase in bone density.
4. Improve memory.
5. Improve alertness and concentration.
6. Improve overall wellness and 'feel good factor'.

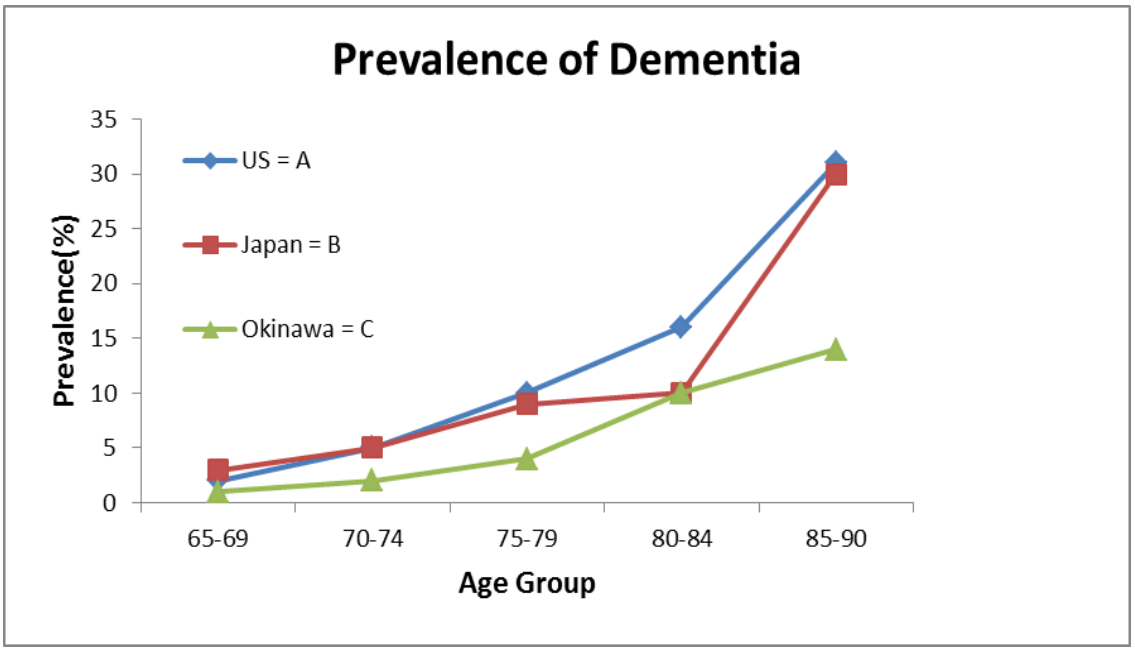
Okinawans managed to maintain high levels of growth hormones through:

1. High soy intake.
Soy contains amino acids Arginine, Glutamine, Glycine and Lycine that stimulates pituitary gland to produce growth hormones.

2. Adequate Sleep.
Sleep is when pituitary gland optimized growth hormone production. Soy contains amino acid Tryptophan that is converted to Melatonin helps improve sleep cycle.

3. Exercise.
Adequate exercise will help increase growth hormone production by almost + 20%.

Prevalence of Dementia in Okinawa, Japan and USA



Yamada, M., et al. J Am Geriatr Soc 1999;47:189 – 95. Kokmen, E., et al. Mayo Clin Proc 1996;71:275- 82, Ogura, C, et al. Internatl J Epidermiol 1995;24:373 - 80

Regular Dementia screening shows that dementia rate for Okinawan elders is fairly lower compare to other elderly population.

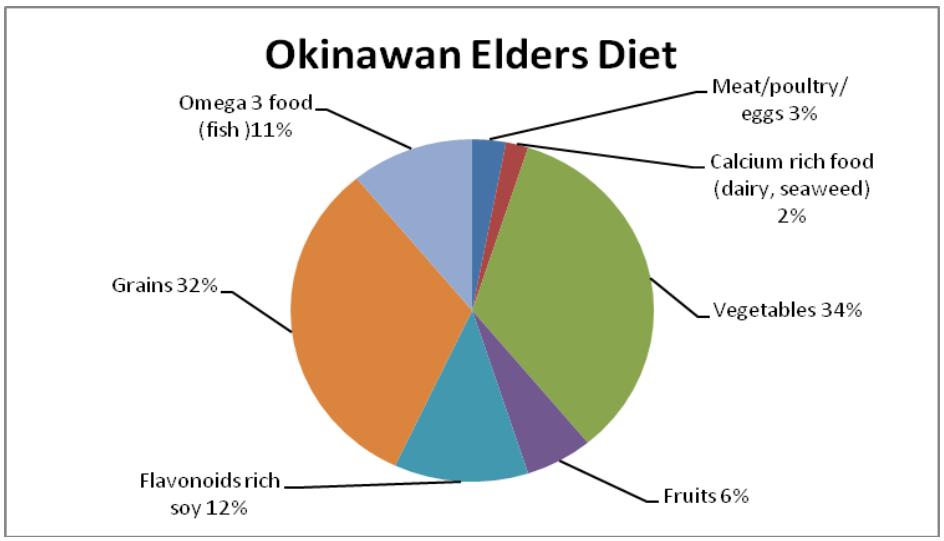
Even into late nineties Okinawan suffered lower dementia rate, about 80% for men and 60% for women were cognitively intact compare to only 40% for American and Europeans.

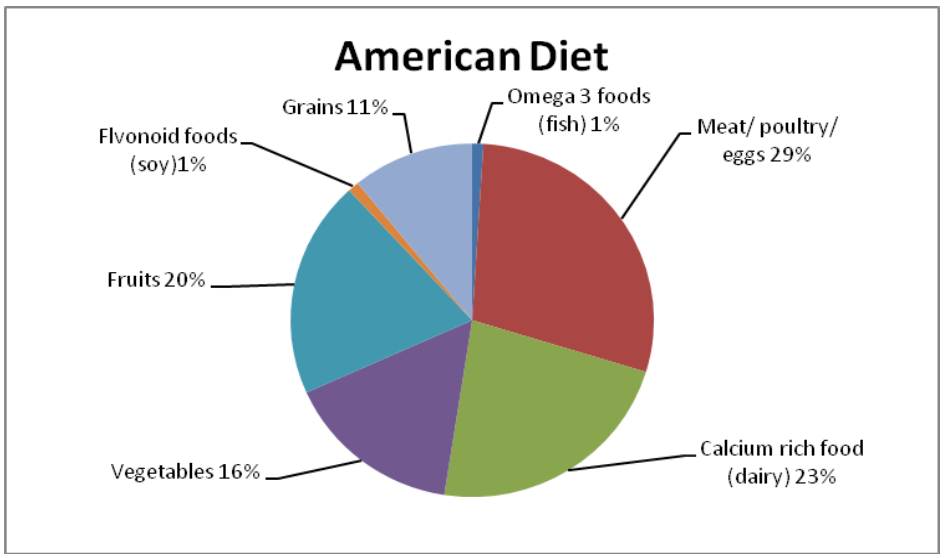
Okinawans low calorie and high soy flavonoids, sweet potato intake lead to clean arteries and better blood circulation to the brain.

Soy flavonoids protect brain cells from being damage by free radicals. Sweet potato and canola cooking oil rich in vitamin E also helps reduce free radicals damage in the brain.

Vitamin E blood level content of Okinawan is +30% higher than Americans.

Okinawan Elders Diet compare to American Diet





Okinawa dietary data from Okinawa Centenerian Study database; U.S. dietary habits from the U.S. cohort of Seven Countries Studies from Keys, A. 1980. Seven Countries: A Commonwealth Fund Book. Boston: Harvard University Press.

Complex Carbohydrates form 54% of total calorie intake for Okinawans. Unpolished grains and satsumaimo sweet potato forms bulk of it.

Okinawan consume 10 times for soy flavonoids than Americans.

Okinawan only consume 2% of calcium rich food compare to Americans 23% but have lower hip fractures .

Serving Sizes:

½ Cup	1 Cup	3 Ounces	1 Cup
A closed fist	A softball	A deck of cards	8 fluid ounces

The following equals to 1 serving:

Vegetables:

1 cup of raw leafy vegetables	½ cup of chopped raw vegetables

Whole Grains:

½ cup of cooked rice	1 slice of bread

Flavonoid Foods:

3 ounces of dense tofu	2 tablespoons of soy nuts/ Natto	1 teaspoon of Miso paste	¾ cup of Miso soup

Okinawan Diet Components

Diet	Food	Servings	Advantages	Benefits
Soy Flavonoids	Miso paste Miso Soup Soy Nut/Natto Dense Tofu	Up to 4 servings a day	Flavonoids is a potent antioxidant reducing cell damaging free radicals preserving organs function Provide natural estrogens improve bone density, sexual health, protection from CHD Natural SERMs selective hormonal blockers help increase cells to bone but not to breast & endometrium Provide amino acids arginine, glutamine, glycine and lycine helps pituitary gland produce growth hormone Flavonoids reduce free radicals cell damage to skin helps formation of collagen	Reduce Dementia Reduce Cancer Reduce Coronary Heart Disease Improve Bone Health Preserve Sex Hormones Enhance Growth Hormones Minimize Menopausal Symptoms Improve Wellness Maintain Youthful Looking Skin
Omega 3	Salmon Mackerel Tuna	3 servings a week	Omega 3 fatty acids helps reduce cholesterol and inflammation	Reduce Coronary Heart Disease
Grains	Japanese Sticky Rice Unpolished Brown Rice Somaly Rice Whole grains	Up to 6 servings a day	Unpolished Whole Grains is lower in Glycemic Index and contains more Minerals and Vitamins Reduce risk of High Insulin, Insulin Growth Factors and Diabetes Smaller serving reduce glucose load and lower insulin response	Reduce Risk of Cancer Good Control of Blood Sugar

Okinawan Diet Components

Diet	Food	Servings	Advantages	Benefits
Vegetables	Satsumaimo Sweet Potato Leafy Vegetables	Up to 7 servings a day	Satsumaimo and some leafy vegetables has high content of Vitamin E antioxidant reducing free radical cell damage to brain and other organs. Satsumaimo also contain Natural Hyaluronic Acid helps rehydrate skin	Reduce Risk of Dementia Preserve Cognitive Function Maintain Youthful Looking Skin
Fruits	Papaya, Tangerine, Pineapple, Watermelon, Banana	Up to 2 servings a day	Any fruits contain Vitamins, Antioxidants helps prevention from disease and reduce free radical cell damage. Okinawans only consume fruits once a day. Fruits do not contain as many vitamins, flavonoids and micro nutrients as vegetables.	Enhance benefits of Antioxidant Flavonoid and Vitamin E Activity
Canola Oil	Canola Cooking Oil	To cook vegetable and other dishes	Cooking oil that is more resistant to oxidation can help to reduce free radicals that are produce during cooking Okinawan uses Canola oil (monosaturated oil) to stir fry their dishes that cause less oxidation damage to their dishes Canola oil is preferred than Olive Oil because it is more resistant to oxidation and has very much higher Omega 3 Polyunsaturated fat.	Consuming less Oxidize Food will reduce Free Radicals Cell Damage to organs Reduce Coronary Heart Disease

The Okinawan Diet

Diet	Food	Servings	Advantages	Benefits
Salt	Sea Salt Low Sodium Miso Paste Low Sodium Soy Sauce	Whenever necessary	Sea Salt contains less Sodium and more minerals that commercial salt	Reduce Risk of Hypertension
Sugar	Raw Cane Sugar	Sparingly and not more than 2 teaspoon a day	Raw Sugar is unrefined contain less sugar can help reduce glucose load and lower insulin response	Reduce Risk of Cancer Good Control of Blood Sugar
All from Above	All from Above	Eat only up to 80% full *Hara Hachi Bu*	Eating up to 80% Full can also mean eating just enough not to be hungry Helps reduce glucose load and lower insulin response Helps reduce oxidation process during digestion that will reduce cell damaging free radicals production	Reduce Cancer Risk Reduce Coronary Disease Good Control of Blood sugar

Clinical Applications A

Patients Profile	Recommendation	Observation	Follow Up
Pre Menopausal & Pre Andropause Post Menopause & Post Andropause Biological Ageing Man and Woman in 40's	Follow all recommendation on Okinawan Diet with similar number of servings. Include exercise such as walking, gardening, dancing or martial art	Conduct Profile Wellness Score by 3rd to 4th month to confirm improvement in Wellness and Strength	Patients who observed significant improvements will continue with Okinawan Diet Patients who observed average improvement can consider supplementation with Okinawan Food Formula drink. Refer Application B, C. Patients who observed poor or no response can consider supplementation with Okinawan Food Formula drink concomitantly with hormones. Refer Application D. Clinical monitoring to be conducted every six months to keep hormones level at optimal mean level

Clinical Application B

Patients Profile	Recommendation	Observation	Follow Up
Pre Menopausal & Pre Andropause, Post Menopause & Post Andropause, Biological Ageing, Man and Woman in 40's With below conditions: Busy and have difficulty in complying with diet	Start consuming Okinawa Food Formula drink	Conduct Profile Wellness Score by 4th month to confirm improvement in Wellness and Strength	Patients who observed significant improvements will continue with Okinawa Food Formula drink and is encourage to observed Application C diet Patients who observed average response can continue supplementation with Okinawa Food Formula drink & diet menu refer to Application C Patients who observed poor or no response can continue supplementation with Okinawa Food Formula drink & diet menu concomitantly with hormones refer to Application D Clinical monitoring to be conducted every six months to keep and adjust hormones level at optimal mean level

Clinical Application C

Patients Profile	Recommendation	Observation	Follow Up
Pre Menopausal & Pre Andropause, Post Menopause & Post Andropause, Biological Ageing, Man and Woman in 40's With below conditions: Unavailability of Okinawan diet flavonoids such as Miso, Natto, Dense Tofu and sweet potato Satsumaimo Have difficulty in complying with 6 -7 servings of certain food	Start consuming Okinawa Food Formula drink together with: 2 daily servings of local soy products such as soy milk, dense tofu, normal tofu, tempeh 3 -4 daily servings of leafy vegetables 2 daily servings of fruits Consider steam satsumaimo for snacks 3 servings per week of Tuna, Mackerel and Salmon Use Canola oil to stir fry & no deep fry Keep red meat, eggs <5% of diet Use sea salt & raw cane sugar Eat unpolished brown rice, whole grains Include exercise such as walking, gardening, dancing or martial art Try eating up to 80% full / *Hara Hachi Bu* Limit to one alcoholic drink per day Do not smoke & adequate sleep	Conduct Profile Wellness Score by 3rd to 4th month to confirm improvement in Wellness and Strength	Patients who observed significant improvements will continue with Okinawa Food Formula drink together with the diet Patients who observed poor or no response can continue supplementation with Okinawa Food Formula drink & diet menu concomitantly with hormones. Refer Application D Clinical monitoring to be conducted every six months to keep and adjust hormones level at optimal mean level

Clinical Application D

Patients Profile	Recommendation	Observation	Follow Up
Pre Menopausal & Pre Andropause, Post Menopause & Post Andropause, Biological Ageing, Man and Woman in 40's With below conditions: Severely deficient in sex and growth hormones	Start consuming Okinawa Food Formula drink concomitantly with hormones 2 daily servings of local soy products such as soy milk, dense tofu, normal tofu, tempeh 3 -4 daily servings of leafy vegetables 2 daily servings of fruits Consider steam satsumaimo for snacks 3 servings per week of Tuna, Mackerel and Salmon Use Canola oil to stir fry & less deep fry Keep red meat, eggs <5% of diet Use sea salt & raw cane sugar Eat unpolished brown rice, whole grains Include exercise such as walking, gardening, dancing or martial art Try eating up to 80% full / *Hara Hachi Bu* Limit to one alcoholic drink per day Do not smoke & Adequate sleep	Conduct Profile Wellness Score by 3rd to 4th month to confirm improvement in Wellness and Strength	Clinical monitoring to be conducted every six months to keep or adjust hormones level at optimal mean level Consider reducing hormones dosage whenever significant improvements is achieved

Glycosylation is the enzymatic process that links saccharides to produce glycans, either free or attached to proteins and lipids. This enzymatic process produces one of four fundamental components of all cells (along with nucleic acids, proteins, and lipids) and also provides a co-translational and post-translational modification mechanism that modulates the structure and function of membrane and secreted proteins. The majority of proteins synthesized in the rough ER undergo glycosylation. It is an enzyme-directed site-specific process, as opposed to the non-enzymatic chemical reaction of glycation. Glycosylation is also present in the cytoplasm and nucleus as the O-GlcNAc modification. Six classes of glycans are produced: *N*-linked glycans attached to the amide nitrogen of asparagine side chains, *O*-linked glycans attached to the hydroxy oxygen of serine and threonine side chains; glycosaminoglycans attached to the hydroxy oxygen of serine; glycolipids in which the glycans are attached to ceramide, hyaluronan which is unattached to either protein or lipid, and GPI anchors which link proteins to lipids through glycan linkages.