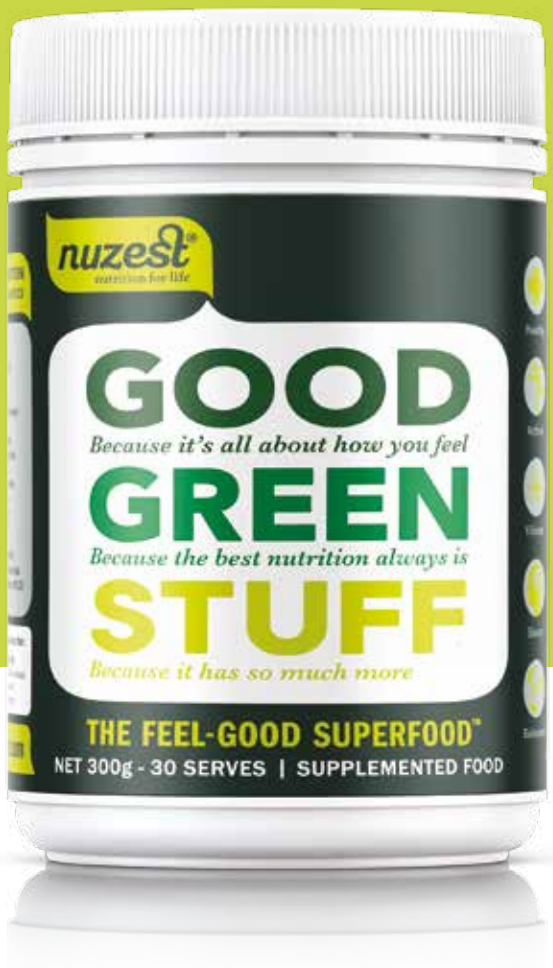
SEPT 2015

GOOD GREEN STUFF

TECHNICAL BULLETIN



COMPLETE NUTRITIONAL SUPPORT IN ONE DAILY SERVE

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INTRODUCTION & PRODUCT JUSTIFICATION

MANY SCIENTISTS HAVE LONG ARGUED THAT LONG-TERM HEALTH CAN BE SUPPORTED BY TAKING A MULTI-VITAMIN ON A DAILY BASIS.[1,2]

This is because many people struggle to consume a sufficient diversity of foods on a consistent basis to deliver the diversity of nutrients required for optimal health.

Additionally, the trend towards the simplification of diets,[3] crop breeding practices that have increasingly bred phytonutrients out of plants over the last 10,000 years,[4] food processing[5] and high temperature cooking methods[6] can all contribute to a loss of nutrients.

Studies have also shown that nutrient requirements may increase according to sustained levels of psycho-emotional stress[7], prolonged and intense exercise,[8] and exposure to environmental toxins,[9] these factors being associated with many contemporary lifestyles.

National nutrition surveys undertaken in the UK have shown that that large minorities are not reaching their dietary targets for Reference Nutrient Intakes (RNIs).[10,11,12] In the case of the elderly, inadequate intake of vitamin D, magnesium, Vitamin K and copper have been of particular concern.

In a major UK survey of dietary habits of 4 to 18 year-olds,[13] it has been shown that the most commonly consumed foods are white bread, savoury snacks, chips, biscuits, potatoes and chocolate confectionery. Additionally, it was found that boys eat, by weight, nearly four times as many biscuits than leafy green vegetables, while girls eat, by weight, more than four times as much sweets and chocolate than leafy green vegetables.

The same survey also revealed that 91% of girls aged 4-6 years failed to reach the RNI for zinc (6.5 mg - a key mineral required for the immune system); while 97% of girls aged 15 to 18 years did not reach the RNI for magnesium, 73% did not reach the RNI for zinc, and 53% did not reach the RNI (200 µg) for folic acid, despite recent studies that demonstrate that intakes well over 400 µg are likely to be required to minimise risk of neural tube defects.[14]

It should also be recognised that the RNI for a given vitamin or mineral is lower than the Nutrient Reference Value (NRV) (formerly commonly known as the Recommended Daily Allowance [RDA]). These amounts have been determined to deliver to the target population the minimum amounts required to prevent gross deficiencies and related diseases, not the optimum amounts required to take into account biochemical and genetic individuality,[15] as well as variable needs.

Accordingly, estimates such as Suggested Optimum Nutrient Allowances (SONAs) have been proposed,[16,17] these being considerably greater, and achieved through the diet alone by a much smaller proportion of the population. SONAs, however, do not take into account the diversity of plant-based and other nutrients required for optimal function and chronic disease prevention.[18]

INTRODUCTION & PRODUCT JUSTIFICATION

Food (dietary) supplements often provide single, isolated nutrients vitamins, minerals or limited combinations, these being provided in forms that are often not typical of those found in a food matrix. There is increasing evidence that nutrients in the precise forms, and even ratios, found in foods as well as with the numerous synergistic cofactors and other components are more beneficial than the isolated or limited combinations of industrially produced analogues.[19,20]

There are also some studies that have shown that particular synthetic nutrients, specifically synthetic beta-carotene,[21] synthetic vitamin E[22] and synthetic folic acid,[23] may present health concerns if consumed at higher dosages over long periods in some people. None of these synthetic forms are contained in Good Green Stuff (GGS).

GGS is a unique product worldwide, formulated specifically to meet the nutritional requirements typical of modern lifestyles. Accordingly, the product contains 76 functional ingredients (Table 4), the plant foods and extracts (42 ingredients; Table 4) in turn including a vast and diverse array of natural chemistries that help modulate a host of different metabolic processes. Such diversity of plant-based and other nutrients is extremely challenging, if not impossible, to achieve in a normal diet, especially on a consistent basis.

EXCEPTIONAL NUTRIENT DENSITY

The following tables (1-3) list the concentrated ingredients (76 in total; Table 4) and amounts present in a single serving (10 g) of GGS. This diversity and the lack of any fillers in the formulation delivers an exceptionally high nutrient density. Table 4 lists the key ingredients categories and the numbers of ingredients in each.

Table 1. Plant foods and extracts in GGS (per single, 10 g serving)

PLANT/ALGAL/FUNGAL FOODS	amounts	PLANT EXTRACTS (concentration)	amounts
Organic spirulina	1000mg	Citrus bioflavonoids	500mg
European pea protein isolate	905mg	Globe artichoke leaf (15:1)	500mg
Lecithin (sunflower)	750mg	Bilberry (100:1)	200mg
Apple pectin	550mg	Blackcurrant (200:1)	200mg
Red marine algae	485mg	Rosehip (4:1)	175mg
Organic Flaxseed	400mg	Grape seed (120:1)	100mg
Organic wheatgrass leaf	340mg	Panax ginseng (4:1)	100mg
Organic chlorella	340mg	Milk thistle seed (70:1)	80mg
Organic barley leaf	340mg	Gotu kola (10:1)	75mg
Acerola fruit	270mg	Green tea (10:1)	75mg
Papaya	250mg	Rosemary leaf (4:1)	75mg
Pineapple juice (9:1)	250mg	Ashwagandha root (5:1)	75mg
Broccoli sprout	250mg	Astragalus root (4:1)	75mg
Beetroot	170mg	Turmeric root (4:1)	70mg
Carrot	90mg	Cocoa polyphenols	70mg
Ginger root	75mg	Rhodiola rosea root (15:1)	50mg
Licorice root	70mg	Goji berry (4:1)	40mg
Spinach	70mg	Dandelion (4:1)	40mg
Whole kelp	60mg	Hawthorn berry (10:1)	35mg
Shiitake mushroom	30mg	Burdock root (10:1)	25mg
Slippery elm bark	25mg	Resveratrol	15mg

Table 2. Bioavailable vitamins and minerals, amounts and Nutrient Reference Values (NRVs) in GGS (per single, 10 g serving)

BIOAVAILABLE VITAMINS Forms, amounts and NRVs		BIOAVAILABLE MINERALS Forms, amounts and NRVs	
Vitamin A (retinyl palmitate & mixed carotenoids)	600µgRE (75% NRV)	Potassium (phosphate)	300mg (15% NRV)
Vitamin D3 (from lichen)	10µg (200% NRV)	Calcium (from red marine algae)	165mg (21% NRV)
Vitamin E (d-alpha & mixed tocopherols)	15mg α-TE (125% NRV)	Magnesium (citrate & glycinate)	100mg (27% NRV)
Vitamin K2 (menaquinone-7)	70µg (93% NRV)	Zinc (gluconate)	12mg (120% NRV)
Vitamin C (ascorbic acid and acerola cherry)	360mg (450% NRV)	Copper (gluconate)	250µg (25% NRV)
Vitamin B1 (thiamine HCl)	4mg (364% NRV)	Manganese (gluconate)	1.5mg (75% NRV)
Vitamin B2 (riboflavin)	4mg (286% NRV)	Silica (orthosilicic acid & marine algae)	14.5mg
Vitamin B3 (inositol hexanicotinate)	17mg NE (106% NRV)	Selenium (L-selenomethionine)	35µg (64% NRV)
Pantothenate (pantothenic acid)	10mg (167% NRV)	Chromium (picolinate)	35µg (88% NRV)
Vitamin B6 (pyridoxine HCl)	5mg (357% NRV)	Iodine (kelp & marine algae)	154µg (100% NRV)
Folate (calcium methylfolate)	320µg (160% NRV)		
Vitamin B12 (methylcobalamin)	100µg (4000% NRV)		
Biotin (d-biotin)	330 mcg (660% NRV)		

Table 3. Other functional ingredients and nutrients in GGS (per single, 10 g serving)

INGREDIENTS	
Lactobacillus acidophilus	3 billion cfu
Bifidibacterium bifidum	3 billion cfu
R-/S-alpha lipoic acid	75mg
Bromelain (2000 GDU/g)	65mg
1,3/1,6 beta glucans	18mg
Ubiquinone (CoQ10)	8mg
Ubiquinol (reduced CoQ10)	8mg

Table 4. Ingredient categories and numbers of ingredients in each

CATEGORIES	NO. OF INGREDIENTS
Added bioavailable vitamin forms	16
Added bioavailable mineral forms	11
Plant foods (not certified organic)	15
Organically certified plant foods	5
Plant extracts	21
Microorganisms (for the gut)	2
Forms of coenzyme Q10 (ubiquinone & ubiquinol)	2
Other nutrients (R-/S-alpha lipoic acid & 1,3/1,6 beta glucans)	2
Mushroom (shiitake)	1
Plant-derived enzyme (bromelain)	1
Synthetic beta-carotene, vitamin E or folic acid	0
TOTAL	**76**

VITAMIN FORMS

THE VITAMIN FORMS IN GGS HAVE BEEN SELECTED CAREFULLY TO DELIVER THE MOST BIOAVAILABLE AND FUNCTIONAL FORMS, TYPICAL OF A FOOD MATRIX. A SELECTED NUMBER ARE DISCUSSED BELOW.

VITAMIN A

Vitamin A, which is a fat-soluble essential vitamin that has a wide range of functions in the body, including providing support for the immune system, mucous membranes, skin, vision, iron metabolism and cell specialisation.

GGS includes both preformed vitamin A as retinyl palmitate and pro-vitamin A in the forms of natural, mixed carotenoids. Preformed vitamin A is present in large amounts in animal foods such as liver, or small amounts in dairy products, while the mixed carotenoid blend includes a full spectrum of carotenes as found in red, orange and yellow pigmented fruits and vegetables. Pro-vitamin carotenoids are precursors to vitamin A, so the body has to convert them into usable vitamin A (retinol).

However, there is evidence of considerable genetic variation in conversion rates and absorption[25] with conversion losses of beta-carotene exceeding 20-fold loss from food sources in some.[26] The presence of naturally-sourced carotenoids has been shown to be particularly important for long-term health.[27]

High doses of synthetic beta-carotene, which is specifically not included in GGS, have been shown in some studies to pose increased cancer risk to some susceptible groups such as smokers, former smokers or those who have been exposed to asbestos.[28] GGS also contains sunflower lecithin and flaxseed (12% total by weight) as a source of fat (phospholipid and Omega-3 polyunsaturated fat) to aid absorption of fat-soluble vitamins.

VITAMIN E

Vitamin E is a fat-soluble vitamin found, amongst other foods, in plant/seed oils, wheat germ, green leafy vegetables and meats. It helps to protect cells, DNA, proteins and lipids from oxidative stress.[24] It occurs naturally in foods in eight different isomers (alpha-, beta-, gamma-, delta-tocopherol, and alpha-, beta-, gamma-, delta- tocotrienol). Alpha-tocopherol is the predominant form in animal tissues and was for many years regarded as the only form required in supplements owing to its high biological activity, itself based on foetal resorption assays in rodents.[29] Gamma-tocopherol is the most abundant form in plant foods and in the diet and has a wide range of beneficial effects that have not been attributed to alpha-tocopherol.[30] Excessive intakes of the alpha-tocopherol form can actually inhibit uptake of the gamma-tocopherol form[31] and an increasing body of research suggests that all forms of vitamin E should be provided to derive maximum benefits.[32] Accordingly, GGS contains moderate amounts of alpha-tocopherol succinate, a form found in foods, as well as mixed tocopherols from rice bran, especially rich in gamma-tocopherol.

Absorption of the vitamin E, along with other fat soluble vitamins such as vitamin D3, is enhanced by including sunflower lecithin and flaxseeds in GGS.

FOLATE

Folate is a water-soluble B vitamin that is found naturally in a relatively narrow range of foods including leafy, dark green vegetables, legumes, oranges, organ meat, egg yolks and whole grains. Folic acid is the synthetic, stable and oxidised form of this vitamin and occurs only in very small amounts in nature.

Folate is essential for a wide range of functions, including cell division, maternal tissue growth during pregnancy, amino acid synthesis, blood formation, homocysteine metabolism, psychological function, immune function and reduction of tiredness and fatigue.[24] Deficiency may cause a number of serious issues including anaemia, neural tube defects, cognitive and cardiovascular problems, increased cancer risk and fatigue. Low levels of the bioactive form, L-5′-methyltetrahydrofolate (5MTHF), may also contribute to compromised methylation or detoxification capacity.[33] Methylation is a vital process in the body, needed to repair DNA, detoxify and eliminate heavy metals, breakdown used hormones and brain chemicals, and to create and use antioxidants efficiently. The methylation cycle is dependent on folate as well as vitamin B12 as cofactors. Activated folate is a critical cofactor that feeds directly into the DNA methylation cycle.

Folic acid, as used in most supplements and fortified foods, by contrast, has to go through a number of different reducing, enzyme-dependent steps in order to be converted to active folate. There is considerable genetic variation in how well these different steps work,[34,35] so for some people (up to 50% of some populations) conversion is slow or incomplete.[36] Among the most well studied genetic polymorphisms affecting metabolism of folic acid are those affecting reduced folate carrier 1 (RFC1) gene (A80G), methylenetetrahydrofolate reductase (MTHFR) (C677T, A1298C), methionine synthase reductase (MTRR) (A66G) and dihydrofolate reductase (DHFR) (C-1610G/T, C-680A, and A-317G).[37,38,39,40]

Added to which, unmetabolised synthetic folic acid from supplements and fortified foods can accumulate in the bloodstream in its oxidised form. Unmetabolised folic acid (UMFA) has been found in 40% of Americans over the age of 60; this may be the mechanism that has contributed to some of the negative long-term health effects associated with prolonged high folic acid intakes in some studies, such as cancer.[41]

Folic acid is not included in the GGS formulation. Instead folate is included in its reduced, stabilised form bound to calcium, as the calcium salt of L-5′-methyl-tetrahydrofolate, also referred to as calcium methylfolate.

VITAMIN B12

To further enhance methylation in the body and to enhance the synergy with the methylated form of folate, GGS includes only methylcobalamin[42] as its source of vitamin B12.

OTHER VITAMINS

Two vitamin C forms are included, L-ascorbic acid acerola cherry (360 mg total per 10 g serving), which are in turn activated further, along with any vitamin C in foods consumed concomitantly, by the inclusion of citrus bioflavonoids (500 mg per 10 g serving). The vitamin K form is the heavily researched vitamin K2 form, menaquinone-7, which is very well absorbed and strongly associated with supporting bone health.[43]

MINERAL FORMS

Key to the selection of mineral forms in the GGS formulation is their water solubility and bioavailability. The former is important to ensure that significant minerals are not left behind in the mixing vessel used to prepare the product. The latter is important to ensure the mineral is absorbed optimally, rather than being excreted. This accounts for the presence of gluconate and glycinate forms.

For a multi-nutrient formulation, the inclusion level of magnesium is exceptionally high (100 mg per 10 g serving) to help compensate for common inadequacies in Western diets and its low status in stressed individuals.[44] Additionally, it complements the additional marine alga-sourced calcium, silica and iodine from *Lithothamnium calcareum*, vitamin D3 (lichen sourced), vitamin K2 and orthosilicic acid, [45] to help support bone health.

Potassium is added in larger quantities than in most multi-nutrient formulas, to help offset sodium, excessive levels of which are linked to hypertension and other cardiovascular health issues.[46]

PLANT / ALGAL / FUNGAL FOODS

Among the diversity of plant and algal foods in the GGS formulation are edible microalgae, seaweeds and cyanobacteria (sometimes misnamed blue-green algae) including kelp, broken-cell chlorella and spirulina *(Arthrospira)*. These have long been used as a food source given their provision of protein, phytochemicals and lipids, while they also have a long history of use in supporting biotransformation (detoxification) processes in the body as well as helping to balance any excess acidity. Barley leaf further contributes to alkalising the formula.

The red marine alga, *Lithothamnion calcareum*, is provided as the sole source of calcium and a contributing source of silica and iodine.

Dried broccoli sprouts (250 mg per 10 g serving) provide a rich source of sulforaphane, which is strongly linked to the pronounced biotransformational support provided by cruciferous vegetables. The amount included is not uncommon in a stand-alone product.

Ginger root, slippery elm bark and liquorice are among the plant foods added to help support the gastrointestinal tract, while apple pectin provides an important source of polysaccharides (soluble fibre) to facilitate the gut microbiota.

PLANT EXTRACTS

The plant extracts in GGS deliver more phytonutrients on their own than most botanical food/dietary supplements. The total amount of plant extracts in each 10 g serving amounts to 2.5 g by weight (i.e. 25% of the formulation) which provides a very considerable phytonutrient intake compared with a normal diet, or even one supplemented with concentrated botanicals.

Panax (red, Korean) ginseng, ashwagandha *(Withania somnifera)*, *Rhodiola rosea* root have long usage as adaptogens,[48] helping to moderate the effects of stress.

Dandelion and burdock root extracts are added to support intestinal function.

Potent multi-target, phenolic-rich botanicals that have been shown to have diverse antioxidant and anti-inflammatory effects are present in the GGS formulation, including curcuminoids in turmeric, resveratrol, cocoa polyphenols, bilberry and green tea. Liver and kidney support is facilitated by milk thistle, while globe artichoke leaf and hawthorn provide rich sources of phenolics to help support healthy circulation.

OTHER FUNCTIONAL INGREDIENTS

Each 10 g serving of GGS provides 6 billion colony forming units of microbiotic bacteria, *Lactobacillus acidophilus* and *Bifidibacterium bifidum*,[51] again more than in many stand-alone microbiotic products.

Coenzyme Q10 (16 mg) is provided in a 50:50 ratio of the ubiquinone and ubiquinol (reduced) forms, as a ubiquitous and endogenous lipid-soluble antioxidant.[52] Both forms are used as cofactors in the electron transport chain in mitochondria to generate adenosine triphosphate (ATP), the body's primary fuel.[53]

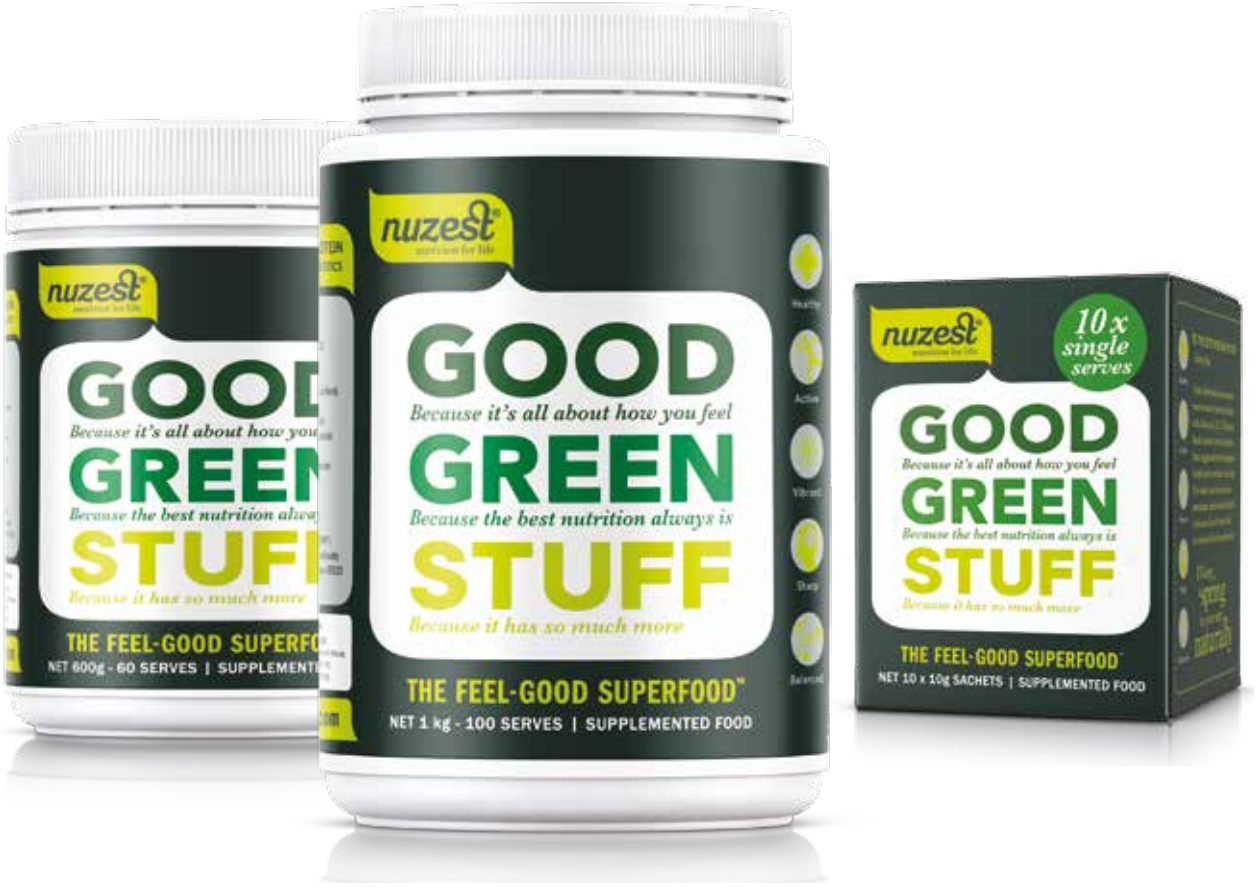
GOOD GREEN STUFF

USAGE

Each 10 g serving of GGS should be mixed with the required amount (often in the range 150-300 mL) of mineral water or filtered water, or other appropriate drink, and consumed, preferably with meals. It may also be added to NuZest's Clean Lean Protein (CLP), to combine a powerful range of nutrients with the CLP's high protein content.

CLEAN FORMULATION

The product is free from gluten, dairy, eggs, nuts, soy and corn (maize). No additives, preservatives, artificial flavours or GMOs are added or used in the product's manufacture.



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