

Barley Grass and Green Barley Grass Juice

Continuing Education Module

David W. Johnson, Ph.D.
Associate Professor

David J. Mokler, Ph.D.
Professor

*Department of Physiology and Pharmacology
College of Osteopathic Medicine
University of New England*

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Barley Grass and Green Barley Grass Juice

Continuing Education Module

By **David W. Johnson, Ph.D., and David J. Mokler, Ph.D.**



Goal:

To examine the therapeutic claims and possible therapeutic uses of barley grass and green barley grass juice.

Objectives:

After completing this module the participant should be able to:

- summarize the claims made for barley grass and barley grass juice;
- describe the scientific basis of the actions of barley grass and its extracts in terms of antioxidants;
- describe the actions of antioxidants and how they work to decrease active oxygen chemicals in the body; and
- describe the potential therapeutic uses of barley grass and its extracts.

The young shoots of the barley plant (*Horidium vulgare*) are called barley grass. The barley shoots can be pulverized with water to make a juice—called green barley grass juice—or, in most commercial preparations, dried and made into a powder. The powder can be sprinkled on food (such as cereal or salad), mixed into juice or further processed into capsules or tablets. The young shoots differ substantially in composition from the grains that are commonly used in foods.

Barley grass powder is the most

common commercial form of green barley grass but is not widely available. A few producers promote powdered green barley grass primarily through Internet sites. Green barley grass powder is also found in mixtures of other green grasses as a nutritional supplement.

Barley grains have been used to make bread and beer for thousands of years, but it is unclear if the plant's young grass shoots have been used historically as food or medicine. We know from numerous articles in the agricultural scientific literature that

barley grass has nutritive value for ruminant animals (cattle and sheep, for example), because they can digest and use the cellulose in grasses such as barley whereas humans cannot.

Barley grass contains beta carotene, calcium, copper, folic acid, iron, manganese, magnesium, pantothenic acid, phosphorus, potassium, zinc, and vitamins B1, B2, B6 and C. However, the nutrient content of grasses varies dramatically depending on where a plant is grown, soil quality, average rainfall and harvest technique.¹ It would be wise

to look for barley grass products with a standardized nutrient content. Although rich in nutrients, they may not be readily bioavailable.² How well humans absorb nutrition from any form of barley grass has yet to be conclusively proven.

Effects on Metabolism

Several companies suggest barley grass can enhance metabolism. In the case of the barley grass' effect on physiology, "enhanced metabolism" appears to be used as an analogy for "increased cellular metabolic rate." Thus, barley grass is often touted as being able to lower plasma triglycerides or cholesterol. These claims suggest that the way barley grass does this is through enhanced cellular metabolism, which in turn

Barley grass is said to enhance metabolism, act as an anti-inflammatory and antioxidant, as well as promote longevity and immunity.

increases cellular metabolism of lipids such as triglycerides and cholesterol, thus lowering plasma levels of these lipids.

In fact, several studies have suggested that certain cereals such as barley do lower cholesterol levels in

Table 1

Nutrient Content of Green Barley Grass
Beta carotene
Calcium
Copper
Folic acid
Iron
Manganese
Magnesium
Pantothenic acid
Phosphorus
Potassium
Vitamin B1
Vitamin B2
Vitamin B6
Vitamin C
Zinc

some humans.³ However, these studies suggest that the hypocholesterolemic effect is caused by the soluble fiber content of the grains inhibiting cholesterol absorption from the gut, not an increase in cellular metabolism. For example, barley contains a particularly high amount of the soluble fiber beta-glucan. Hypercholesterolemic patients put on a diet rich in barley can experience significant reductions in serum total cholesterol, low-

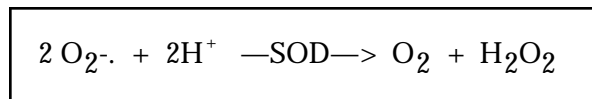
density lipoprotein (LDL)-cholesterol, phospholipids and very low-density lipoprotein (VLDL)-cholesterol.⁴ Scientific studies are required to determine whether or not barley grass is stripped of soluble fibers in the course of processing and to clarify if it has the hypolipidemic effect of ground barley.

Currently there are no studies suggesting barley grass directly or indirectly increases cellular metabolism. In fact, there is a substantial amount of scientific literature suggesting increased cellular metabolic rate and total life span are inversely correlated.⁵ That is, the higher an individual's metabolism, the shorter their life span.

Anti-inflammatory Action

Barley grass is often described as having an anti-inflammatory effect. Many commercial sources recommend it as a treatment for osteoarthritis and other inflammatory diseases. Barley grass juice is said to contain anti-inflammatory substances including superoxide dismutase (SOD) and chlorophyll. Normal cellular metabolism generates free radicals in the cell, one of which is the superoxide radical, produced primarily in the mitochondria during the production of adenosine triphosphate (ATP).⁶ The superoxide radical is subsequently reduced to hydrogen peroxide (H₂O₂) and molecular

oxygen by cytosolic SOD in the following reaction:



SOD has at least three isoforms (SOD 1, 2 and 3), which contain copper/zinc, manganese or iron. The dismutation of superoxide anions by a form of SOD is a major source of cellular H₂O₂, which then can generate hydroxyl free radicals through its interaction with redox-

Many sources recommend barley grass as a treatment for osteoarthritis and other inflammatory diseases.

active transitional metals, particularly copper and iron.^{7,8} Fortunately, the enzyme catalase facilitates the decomposition of most H₂O₂ to water and molecular oxygen.⁹

Some studies do suggest that increased oxygen free radical generation plays a part in some types of inflammation, and therefore exogenous SOD might be therapeutically useful in these cases.¹⁰ However, SOD is an enzymatic protein and any therapeutic application of this compound would not involve oral administration because the stomach and small intestine degrade enzymatic proteins to their constituent amino acids. Currently, there is no evidence

demonstrating that oral doses of barley grass or any other SOD-rich food increases plasma or intracellular levels of this enzyme. If barley grass has anti-inflammatory activity, the active component responsible for this effect has not yet been identified.

Although there is no direct evidence to suggest plant chlorophyll reduces inflammation in humans, results from several studies do indicate that chlorophyll may have some biological value in terms of inhibiting mutagenicity, and therefore possibly inhibiting cancer.¹¹ However, the majority of studies with results suggesting this benefit have focused on a synthetic chlorophyll (chlorophyllin), which is a more water-soluble version of natural chlorophyll.¹²

Antioxidant Activity of Barley Grass

Free radicals and other reactive oxygen species (oxyradicals) are constantly formed in the human body. Oxyradicals, as well as oxidized and peroxidized compounds, have been associated with a variety of disease states including heart disease^{13,14} and cancer,¹⁵ as well as with accelerated aging.¹⁶⁻¹⁸ Generally, antioxidants are chemical compounds that inhibit oxidation and protect biological systems from

Table 2

Green Barley Grass Health Claims
Anti-inflammatory action
Antioxidant activity
Detoxification
Enhanced immunity
Enhanced metabolism
Increased longevity

free radical damage. Plant and animal cells have a wide variety of interactive antioxidants that protect against an oxidizing environment.

Barley grass appears to contain significant levels of antioxidants, the most important being 2"-O-glycosyl isovitexin (2"-O-GIV), which is an isoflavonoid. Although isoflavonoids are interesting as potential therapeutic "anti-estrogens,"^{19,20} they have significant antioxidant value as well.²¹ The compound 2"-O-GIV has been reported to inhibit formation of malonaldehyde (MA), a marker of lipid oxidation, which is produced by squalene and ethyl linoleate, in a

Chlorophyll may inhibit mutagenicity and therefore possibly inhibit cancer.

potency similar to that of alpha tocopherol (vitamin E).^{22,23} Researchers reported that 2"-O-GIV prevents glyoxal from forming as a

result of the oxidative breakdown of fatty acid esters.²⁴ Recently, 2"-O-GIV was shown to be inhibit superoxide and hydroxyl radical formation, most likely through free radical trapping.²⁵

Green barley grass' antioxidant potential seems promising. However, testing antioxidant activity in a

Barley grass appears to contain significant levels of antioxidants, the most important being 2"-O-glycosyl isovitexin (2"-O-GIV), which is an isoflavonoid.

clinical setting is difficult because of the vagaries of determining an endpoint. The damage produced by oxygen species is generally long-term and not easily measurable. Thus, this is also the most difficult therapeutic

effect to prove or disprove.

Barley grass also contains vitamin E succinate (VES), an analogue of alpha-tocopherol.²⁶ There is considerable evidence that VES potently inhibits the proliferation certain types of cancer cells.²⁷ However, there are no published reports specifically demonstrating that barley grass inhibits the growth of malignant cells. In an unpublished report, Dr. Allen Goldstein, a professor in the department of Biochemistry and Molecular Biology at the George Washington School of Medicine in Washington, D.C., claims results showing that VES isolated from green barley killed HLC-60 cells (a leukemic cell line). This is a promising result that will have to be duplicated. VES does appear to be a potent antioxidant, and therefore this compound likely contributes to the overall antioxidant capacity of barley grass.

Barley grass also contains vitamin C and carotenoids, both of which have antioxidant activity and help protect tissues from free radical damage.

Longevity and Immunity

Some producers say barley grass promotes longevity and enhances immunity. As mentioned, barley grass contains VES, which is said to increase production of both prolactin and growth hormone. This statement, made in promotional literature, is based on two studies in which VES isolated from green barley stimulated release of prolactin (PRL) and growth hormone (GH) from rat anterior pituitary cells in vitro,^{28,29} and on a personal communication to Green Foods Corporation from Goldstein who says VES "may also enhance the immune system by increasing white cell formation."

This preliminary evidence is promising but is not adequate to claim that barley grass or barley grass juice increases longevity and enhances immune function in human beings. Even if barley grass taken orally facilitates PRL and GH release in vivo in human beings (an observation that has

Table 3

Active Components of Green Barley Grass		
Component	Role	Active after oral administration
Superoxide dismutase (SOD)	Antioxidant	No
Vitamin E succinate	Antioxidant	Probably
2"-O-glycosyl isovitexin (2"-O-GIV)	Antioxidant	Probably
Unknown constituent	Anti-inflammatory	Unknown

yet to be demonstrated even in living animal models), this would not necessarily enhance immune function. Some research findings do indicate that PRL and GH may play an important role in human immunity.³⁰

Barley grass contains the alpha-tocopherol analogue vitamin E succinate, which is said to increase production of both prolactin and growth hormone.

Whether or not this might eventually be clinically useful will only be determined in blinded, controlled human clinical trials. In fact, chronically elevating GH (hypersomatotrophinism) and PRL (hyperprolactinemia) can actually be harmful.³¹⁻³³

Summary

Barley grass and green barley grass juice are promoted as antioxidants, anti-inflammatories, metabolic enhancers, immune system stimulants, promoters of longevity, and a source of complete nutrition. With the exception of the potential antioxidant effect, there is only very preliminary research to substantiate these claims. Barley grass appears to contain variable amounts of the novel antioxidant 2"-O-GIV as well as alpha-tocopherol succinate. Well controlled, double-blinded clinical trials involving the direct

consumption of barley grass or barley grass juice by humans and measurement of some objective parameters are needed to prove without doubt the health claims made for this product.

There are no adverse side effects associated with green barley grass powder or juice consumption. Doses are suggested by manufacturers, but without clinical trials these are just guidelines.

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Continuing Education Test Questions



Natural Healing Track

February 2001

Directions : Select your answer and check *one* best answer for each of the test questions. When you have answered all of the questions, please print or type all requested information and mail your completed test, along with processing fee, to the appropriate address listed below.

1. Green barley grass refers to:
 - a. roots of the barley plant
 - b. ripe heads of the mature barley plant
 - c. leaves of the young shoots
 - d. entire young shoots including roots
2. The actions of superoxide dismutase (SOD) are:
 - a. drug metabolism
 - b. reduction of hydrogen peroxide
 - c. reduction of oxygen radicals
 - d. production of oxygen radicals
3. The actions of oral green barley grass as an antioxidant are most likely caused by:
 - a. SOD
 - b. chlorophyll
 - c. 2"-O-glycosyl isovitexin (2"-O-GIV)
 - d. all three are active after oral administration
4. According to the authors, the most likely therapeutic claim for green barley at present is:
 - a. anti-inflammatory
 - b. antioxidant
 - c. immune enhancer
 - d. metabolic enhancer
5. Which critical piece of therapeutic efficacy has yet to be demonstrated for barley grass?
 - a. active compounds
 - b. controlled clinical trials
 - c. availability
 - d. in vitro activity
6. According to the authors, the most likely potential for green barley efficacy relates to which property?
 - a. anti-inflammatory
 - b. antioxidant
 - c. immune enhancer
 - d. metabolic enhancer
7. The lipid-lowering effect of barley grass is most likely caused by:
 - a. SOD
 - b. an unknown metabolic enhancer
 - c. fiber in the barley
 - d. other anti-lipidemic constituents
8. The actions of oxygen radicals are proposed to contribute to:
 - a. cancer
 - b. aging
 - c. inflammation
 - d. all of the above
9. SOD would not have antioxidant activity after oral administration of green barley grass because:
 - a. inadequate levels of SOD in green barley grass
 - b. the enzyme in green barley grass is not active
 - c. the enzyme in green barley grass is destroyed during digestion
 - d. SOD would be absorbed and work as indicated
10. According to the authors, the most important problem with green barley grass as a herbal supplement is:
 - a. lack of active ingredients
 - b. lack of availability
 - c. expense
 - d. lack of studies showing clinical efficacy

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