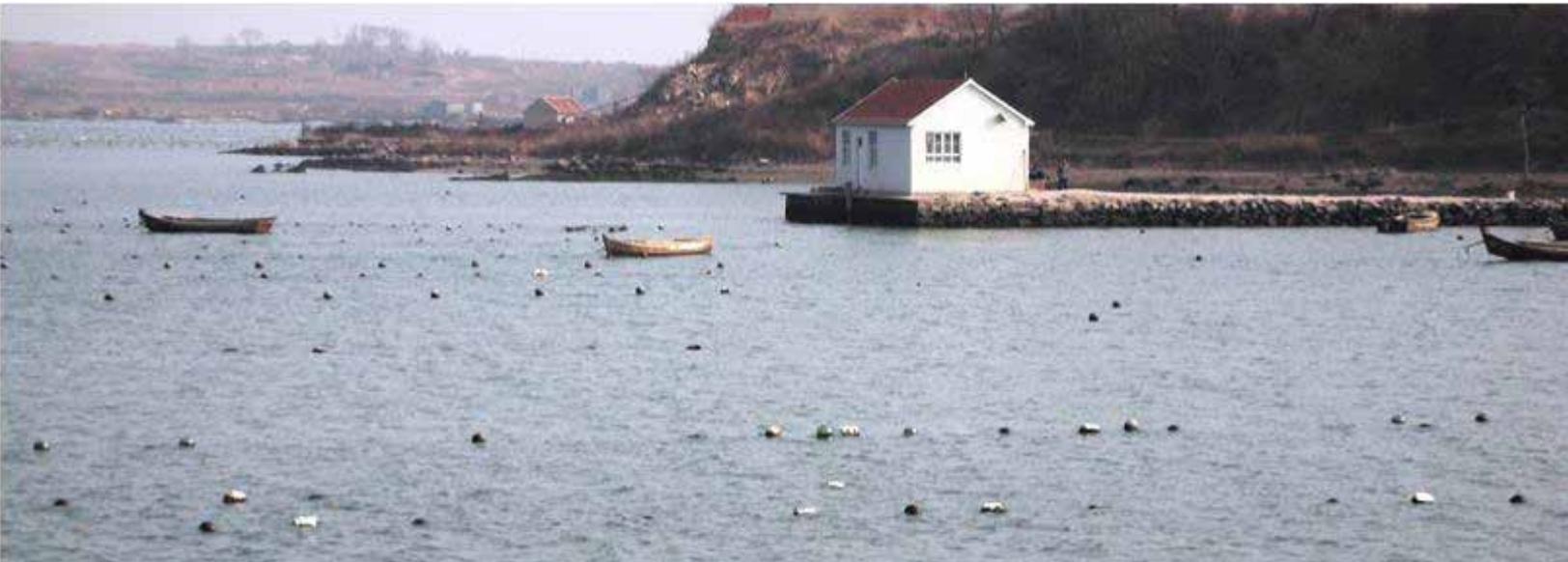


BGG's FucoMAX™ Fucoidan **Protects Gastrointestinal Tract**



BGG's FucoMAX™

– the Proprietary and Potent Source and Formula of Fucoidan, and the Solution for Maximum Protection of the Digestive (GI) Tract

About The GI Tract

The digestive tract, also known as the gastrointestinal (GI) tract, starts at the mouth, continues to the esophagus, stomach, small intestine, large intestine (commonly referred to as the colon) and beyond. The entire system — from mouth to end — is about 30 feet (9 meters) long.

About Fucoidan

Fucoidan is a sulfated polysaccharide found mainly in various species of brown algae and brown seaweed such as mozuku, kombu, bladderwrack, wakame, and hijiki. Fucoidan is used as an ingredient in natural supplement products.

Potential Complications experienced by the GI Tract

There are at least eight commonly recorded complications - ranging from the causes of heartburn to peptic ulcers, but can extend beyond...to cancer. Research about the properties found in Fucoidan as an inhibitor for cancer is still in progress by the scientific community.

About BGG's FucoMAX™

The following analysis (White Paper) by BGG's Laboratory Scientists details their Research Findings, and focuses upon BGG's proprietary formula derived from specially sourced seaweeds, and

where Fucoidan is extracted using BGG's proprietary process.

Ulcers are the main target of the studies but where **FucoMAX™** is shown to have superior protective properties against ulcers, so logically its benefits also may be expected to extend to being valuable as a powerful extract for the full breadth of GI health.

Preface: About BGG

BGG (originally known as Beijing Ginkgo Group) is celebrating its 20th Anniversary in 2014. BGG is the world's largest supplier of Ginkgo Biloba; and in 2013, 100 acres of land in southern China was bought to establish BGG as the world's largest producer of micro-algae, to farm extracts that include Astaxanthin (BGG's Astazine™).

BGG also is well known as the largest supplier of Bilberry extract for eye health and at least twelve other major extracts, all differentiated by their GRAS certification and superior potency.

BGG has offices in Japan and in Irvine, California. For immediate inquiries, please contact Chris Holland at 828 302 0109 or by email at info@bggworld.com or visit our site at www.bggworld.com.

About BGG's scientific team

The following Analysis was written by BGG's Ph.D. team in China and has been translated for viewing in the United States, Canada and Europe.

WHITE PAPER – Prepared by BGG’s Ph.D. Team Nov 2013

About Fucoidan and BGG’s FucoMAX™ and their / its protective benefits against Gastrointestinal Ulcers

Gastrointestinal ulcer(s), also known as Peptic Ulcer Disease (PUD), is (are) the most common ulcer(s) to develop and be found in an area of the GI tract that is usually acidic, and thus the ulcer(s) is (are) extremely painful. An ulcer is defined as a mucosal erosion equal to or greater than 0.5 cm (1-fifth of an inch).

According to the World Health Organization (WHO), 120 million patients in China suffer from GI diseases, and 70 percent of them are seniors. Approximately 10 million mortalities per year in the world are due to GI ulcers.

The pathogenesis of PUD is complex and affected by many factors. Damage in the gastric mucosa defense system is believed to be a major ulcer causative factor.

Increasing mucosa defense ability and promoting mucosal repair are both important solutions for preventing and treating peptic ulcer (s). *Helicobacter pylori* infection is another main pathogenic factor for chronic active gastritis, peptic ulcer (s), and gastric mucosa associated with lymphoid tissue, and gastric cancer.

If not effectively treated, GI ulcers will result in GI mucosal erosion, ulceration, perforation, and even cancer.

Therefore, the protection of GI mucosa is important for health and well-being.

Fucoidan is a sulfated polysaccharide found in the cell walls of various species of brown algae and brown seaweed, such as mozuku, kombu, limu moui, bladderwrack, wakame and hijiki.

Scientific research suggests Fucoidan has several therapeutic properties. The most significant benefits of Fucoidan pertain

to its ability to strengthen the immune system via anti-viral, anti-cancer, liver protection and anti-inflammatory actions.

Recent studies report Fucoidan as having properties that help to prevent ulcers caused by non-steroidal anti-inflammatory drugs (NSAIDs) and *H. pylori*. By swimming with its flagella, *H. pylori* is able to adhere to the gastric mucosa by connecting to sulfates, therefore it cannot be excreted with food. In the presence of Fucoidan, *H. pylori* bind to the sulfate in Fucoidan and, as a result of this bond, are discharged out of stomach.

Pretreatment with Fucoidan can prevent *H. pylori* infection and improve *H. pylori* infection-induced edema.

For centuries, brown seaweed has been used as food throughout Asia. Traditional Chinese medicine (TCM) uses hot water extracts of several types of brown seaweed in the treatment of diseases.

As the leading natural ingredient manufacturer in China, BGG specializes in the discovery and development of new products derived from TCM. BGG’s FucoMAX™ Fucoidan is an especially potent derivative and formula that in conjunction with BGG’s proprietary distillation, is found to have scientifically measurable improvements and qualities and efficacy over plain Fucoidan.

BGG’s extensive research studies under carefully controlled laboratory conditions show FucoMAX™ to provide superior protection against gastric mucosal damage.

And BGG will be pleased to further quantify and qualify this research and the results, in even more detail beyond the report here, to meet your application(s).

BGG’s FucoMAX™

FucoMAX™ is a naturally occurring Fucoidan. It is produced by extracting from three types of organic brown seaweed: *Cladosiphon okamuranus*,

Laminaria japonica and *Undaria pinnatifida*. These species of seaweed contain high levels of Fucoidan.

FucoMAX™ is produced by state-of-the-art and proprietary technologies, which ensure the highest levels of purity (70 to 85 percent), the lowest levels of heavy metals and with a low molecular weight for easy absorption.

And with a high solubility in water makes FucoMAX™ applicable in various formulations of dietary supplements, foods and beverages.

FucoMAX™ contains fucoses, which have properties enabling them to combine with the GI's mucosa receptors, thereby offering protection from the invasion of other foreign substances.

More importantly, sulfate groups in FucoMAX™ are structurally similar to sulfates found in the GI's mucosa. Therefore FucoMAX™ forms a coating on every corner of the stomach's gastric mucosa.

Gastric Mucosal Protection Effect of FucoMAX™ on Rats

Under experimental conditions, Ethanol was used (a recognized chemistry for such tests) to cause pathological GI mucosa infection, resulting in gastritis, gastric and intestinal mucosa tissue loss and ulcers.

Research studies suggest pretreatment with Fucoidan reduces gastric damage caused by ethanol.

Then FucoMAX™ was tested for its protective efficacy on ethanol-induced gastric damage in rats.

Research Method

The study included 50 Sprague Dawley male rats with body weights of 180 to 220 g. The test rats were divided randomly into five groups of 10: blank control group (Nor), model control group (Cont), positive

control group (P. Cont), low-dose test group (FMx-L) and high-dose test group (FMx-H).

The blank control group and model control group were fed with sterilized water once every day, while the positive control group was fed with 160 mg/kg cimetidine aqueous solution (a commercial drug, used in the treatment of peptic ulcers), and test groups were fed 25 mg/kg (FMx-L) and 167 mg/kg (FMx-H) FucoMAX aqueous solution once each day (equals to 1.5 g/d and 10.0 g/d respectively). The recommended dosage for human use is 1.0g/d).

After 30 days treatment, all of the test rats fasted for 24 hours, after which each group except the blank control group was fed with anhydrous ethanol (1.0 mL/rat) to induce gastric mucosal lesions. The animals were sacrificed after one hour. Gastric mucosal bleeding status and pathology of gastric mucosa were studied and biochemical indices (PGE2, MDA, SOD activity and NO concentration) were measured.

Prostaglandin E2 (PGE2) plays an important role in the inhibition of gastric acid production and exerts cytoprotection. Higher PGE2 is the strongest anti-inflammation activity made within the human body.

Superoxide dismutase (SOD) is a key enzyme of mucosal antioxidant protection and plays an important role in the pathogenic and healing processes of peptic ulcers. There is a negative relationship between the SOD activity and the severity of gastric mucosal damage.

Measurement of gastric mucosal malondialdehyde (MDA) concentration, which is the end-product of lipid peroxidation, is used to assess oxidative damage to membranes in patients with peptic ulcer and gastritis. SOD and MDA are two important biochemical factors indicating anti-oxidation activity.

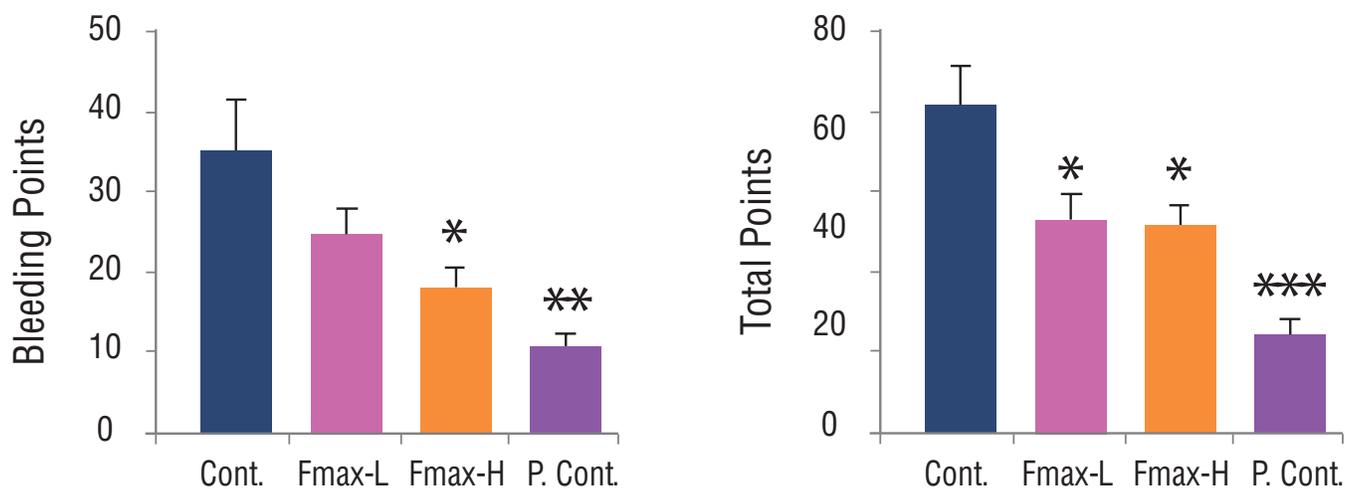


Figure 1. Gastric mucosal bleeding points of test groups. (Mean ± SE, T-test. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

Nitric oxide (NO) is believed to exert positive effects on mucosal defense in the GI system by signaling the endothelium smooth muscle of blood vessels to relax, resulting in vasodilation and increased blood flow.

Results and Discussion

Oral administration of anhydrous ethanol caused gastric mucosal injury and induced bleeding. The bleeding index was determined by counting bleeding

spots and measuring the width and length of bleeding spots under the microscope.

After oral administration of test substances for 30 days, the FMx-L and FMx-H groups showed significantly smaller gastric mucosal bleeding index scores compared with the model control group ($P < 0.05$, Figure 1).

The gastric mucosa histopathological scores of FMx-L and FMx-H groups were lower than that of model control groups ($P < 0.01$, Figure 2).

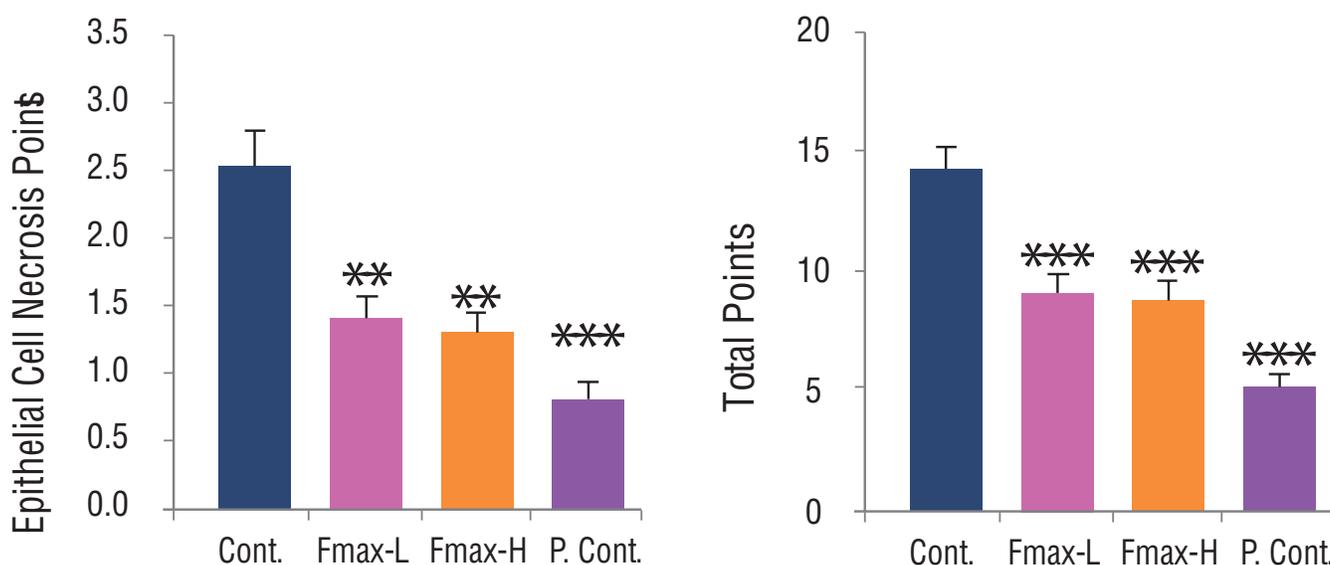


Figure 2. Gastric mucosal histopathological points of test groups. (Mean ± SE, T-test. ** $p < 0.01$, *** $p < 0.001$)

After oral administration of test substances for 30 days, the contents of PGE-2 and NO in rat gastric tissue were significantly increased in FMx-L and FMx-H groups and then compared with the model control group (Figure 3).

The SOD activity of FMx-H group was increased compared with the model control group ($P < 0.05$, Figure 3). Both FMx-L and FMx-H groups showed decreased levels of MDA in gastric tissues, compared with the model control group ($P < 0.05$, Figure 3).

This study suggests ethanol-induced damage of rat gastric mucosal was attenuated by pretreatment of FucoMAX™ both in low dosage and high dosage. The histopathological and biochemical studies demonstrated the protective effect of FucoMAX™ compared with model group and healing effect as well as cimetidine.

The study of biochemical factors PGE2, SOD, MDA and NO also indicated that the gastric mucosal protective effect of FucoMAX™ might be related to its anti-inflammation and anti-oxidation functions.

Other Studies of the Effects of Fucoidan Upon Gastrointestinal Protection

Animal studies indicate Fucoidan reduce the gastric damage caused by NSAIDs.

In a rat model, aspirin given by gavage (400 mg/kg body weight) caused gastric ulceration, with gastric lesions characterized by disruption of the mucosal layer and increased serum levels of aspartate transaminase (AST) and alanine transaminase (ALT).

1. Animals were pre-treated with Fucoidan with an oral dose of 0.02 g/kg/d body weight, for two weeks; before the delivery of aspirin reduced stomach lesions, reduced disruption of the mucosal layer and with no increase in transaminases.

Aspirin increased the levels of the pro-inflammatory cytokines, interferon (IL)-6 and gamma-interferon, and decreased the level of the anti-inflammatory IL-10.

Fucoidan reduced the effect of aspirin on IL-6 and IL-10, but had no effect on levels of gamma-interferon. These findings suggested Fucoidan may protect against gastric damage caused by aspirin.

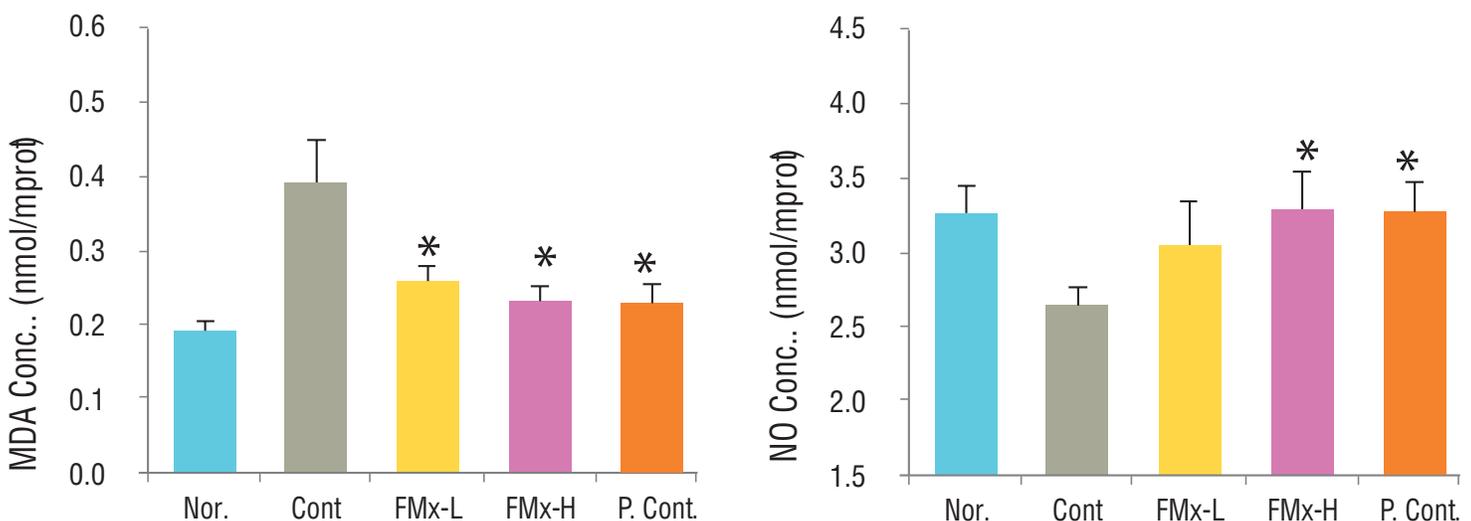


Figure 3. Biochemical indexes of gastric tissue of test groups. (Mean \pm SE, T-test. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

In another rat model, gastric damage and an increase in myeloperoxidase (MPO) were induced by indomethacin, 20 mg/kg via intra-gastric administration.

2. Fucoidan (25 mg/kg, intravenous therapy) prevented the gastric lesions, the increase in MPO activity and the infiltration of neutrophils. Indomethacin also caused an increase in gastric epithelial expression of iNOS, which was positively correlated with gastric damage.

Fucoidan may have an effect on *H. pylori*-induced ulcers. Fucoidan (from *Cladosiphon okamuranus*) inhibited *H. pylori* attachment to porcine gastric mucin in vitro at pH 2.0 and 4.0.

In an in vivo model with Mongolian gerbils, Fucoidan reduced the gastritis caused by *H. pylori*, as well as reducing the prevalence of *H. pylori* in the infected animals.

3. Fucoidan was given in doses of 0.05 and 0.5 percent in the drinking water, three days before inoculation and then throughout the experiment.

Six weeks after inoculation, Fucoidan suppressed the gastritis in a dose-dependent manner and the higher dose reduced colonization of the bacteria by 80 percent.

Timing appeared to be important, as treatment with Fucoidan two weeks after inoculation of *H. pylori* did not provide any benefit.

The authors of the study have found, and suggest, that Fucoidan may help prevent *H. Pylori*'s infection.

Summary

BGG's FucoMAX™ is an extract of natural polysaccharides from carefully sourced organic brown seaweed that is tested on a batch-by-batch basis, and monitored to ensure that BGG's FucoMAX™ only contains the highest levels of Fucoidan.

By utilizing state-of-the-art technology and BGG's proprietary process, FucoMAX™ is produced with high

Fucoidan content and ultra-low heavy metal contamination.

Our research studies indicate that FucoMAX™ protects against GI mucosa damage induced by ethanol in rats. The histopathology and biochemical markers of gastric mucosa were significantly improved by administration of FucoMAX™ compared with model groups.

Other studies also indicate that Fucoidan attenuates the symptom(s) of *H. pylori*-induced GI ulcers. These studies have revealed that FucoMAX™ may improve gastric activity, ease stomach discomfort, bloating, heartburn, stomach ache and other postprandial symptoms.

BGG's FucoMAX™ is a safe ingredient (GRAS Certified) that benefits peptic healthcare products by adding a natural Fucoidan that can maximally protect against GI damage, and without side effects.

References:

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3. Shibata, H. et al. "Preventive effects of Cladosiphon Fucoidan against *Helicobacter pylori* infection in Mongolian gerbils." *Helicobacter.* **2003**, 8, 59-65.

For More Information

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