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Submitted to Application A1247 D-allulose as a Novel Food
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Introduction

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Name of your business, organisation (please write N/A if this does not apply)

Organisation:
Nutrishus Brands Inc.

Please identify which of the following groups you mostly closely identify with

Groups to which you belong:
Food business

If other please specify:

Who is the contact person for this submission

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Submission

[redacted]

Provide your submission in the text box below:

Allulose - Evidenced and Potential Benefits

• Allulose is a natural plant-based rare sugar that occurs in small quantities in a variety of foods, such as wheat, figs, raisins, and jackfruit.
• Allulose is also produced commercially from corn or beets through a process of enzymatic conversion, which is similar to the process used to produce high-fructose corn syrup.
o However, unlike high-fructose corn syrup, which is a mixture of glucose and fructose, Allulose is a monosaccharide that has a chemical structure similar to fructose.
• Because Allulose occurs naturally in small quantities and is produced through a natural enzymatic process, it is considered a natural ingredient by the U.S. Food and Drug Administration (FDA).
• Allulose is also vegan and does not contain animal products, making it suitable for those following a plant-based diet.
• Allulose is structurally equivalent to fructose but has a different arrangement of atoms. Allulose has the same chemical formula as fructose ($C_6H_{12}O_6$) but the atomic arrangement is slightly different, ergo an epimer of fructose.
o This subtle difference in structure gives Allulose unique physical and chemical properties, including a low-calorie content and a low glycemic index.

Fifty (50) Evidenced and Potential Benefits associated with Allulose:

1. Low calorie: Allulose has only 0.4 calories per gram, making it a great option for reducing calorie intake without sacrificing taste.
2. Zero glycemic index: The glycemic index (GI) measures how quickly carbohydrates in food raise blood sugar levels.
a. Allulose has a very low glycemic index, with a value of 0.
1. This means that Allulose does not significantly raise blood sugar levels, making it a suitable sugar for individuals who need to manage their blood sugar levels, such as those people living with diabetes or those following a low glycemic index diet.
b. One of the reasons why Allulose has a low glycemic index is that it is not fully metabolized by the body, and therefore does not contribute as much to blood sugar levels as other sugars like glucose or fructose.
1. Instead, Allulose is largely excreted unchanged in the urine, and does not affect insulin secretion or blood sugar levels to the same extent as other sugars.
3. Does not cause blood sugar crashes: Allulose does not cause blood sugar crashes, making it a better option for people who experience hypoglycemia or low blood sugar.
4. Does not promote tooth decay: Unlike regular sugar, Allulose does not promote tooth decay, making it a good option for maintaining good oral health.
5. Safe for most people: Allulose is generally recognized as safe (GRAS) by the FDA since June of 2012 and is safe for most people to consume, including those with diabetes or gastrointestinal issues.
6. No aftertaste: Unlike some other low-calorie sweeteners, Allulose does not have an aftertaste, making it a good option for people who don't like the taste of artificial sweeteners.
7. Can be used in baking: Allulose behaves similarly to regular sugar in baking and can be used in many recipes as a replacement for sugar. Browns, caramelizes, preserves, binds, strong Maillard effect, etc.
8. May aid weight loss: Allulose has been shown to help with weight loss by reducing calorie intake and promoting fat burning.
a. It also may help with reducing inflammation, improving insulin sensitivity, and regulating appetite.
b. One study published in 2018 investigated the effects of Allulose on body weight, body fat, and other metabolic markers in overweight or obese adults.
1. The study found that participants who consumed Allulose for 12 weeks had significant reductions in body weight, body fat mass, and waist circumference compared to those who did not consume Allulose.
c. Another study published in 2020 also found that Allulose supplementation was associated with a significant reduction in body fat mass in healthy adults with overweight or obesity.
9. May suppress hunger-associated feeding and inhibit hunger-promoting neurons:
a. This study investigated the effects of D-allulose on the ARC neurons implicated in hunger, by measuring cytosolic Ca2+ concentration ([Ca2+]i) in single neurons. D-allulose depressed the increases in [Ca2+]i induced by ghrelin and by low glucose in ARC neurons and inhibited spontaneous oscillatory [Ca2+]i increases in neuropeptide Y (NPY) neurons.
b. The results indicate that D-allulose suppresses hunger-associated feeding and inhibits hunger-promoting neurons in ARC. These central actions of D-allulose represent the potential of D-allulose to inhibit the hyperphagia associated with excessive appetite, thereby counteracting obesity and diabetes.
10. May increase satiety: There is some evidence to suggest that Allulose may increase satiety, or feelings of fullness and satisfaction after eating.
a. One study in healthy adults found that consuming a beverage sweetened with Allulose resulted in increased feelings of fullness and decreased feelings of hunger compared to a beverage sweetened with sucrose.
b. Another study in overweight and obese individuals found that consuming Allulose for 12 weeks resulted in decreased appetite and food intake compared to a control group.
11. May lower ghrelin and increase leptin, thus reducing hunger and appetite:
a. There is limited evidence to suggest that Allulose may have a small effect on lowering ghrelin, a hormone that stimulates hunger and appetite.
i. One small study in healthy individuals found that consuming a drink containing Allulose led to a small decrease in ghrelin levels compared to a drink containing glucose.
ii. Another study in rats found that Allulose supplementation improved glucose tolerance and reduced ghrelin secretion.
b. There is limited evidence to suggest that Allulose may increase leptin levels in the body.
i. Leptin is a hormone that plays a role in regulating appetite and body weight by signaling the brain to reduce food intake and increase energy expenditure.
ii. One small study in healthy individuals found that consuming a drink containing Allulose led to a small increase in leptin levels compared to a drink containing glucose.
iii. Another study in rats found that Allulose supplementation increased leptin expression in adipose tissue.
12. Improves texture: Allulose can improve the texture of some foods, making them more moist and tender.
13. May reduce the risk of chronic diseases: Some studies suggest that Allulose may help reduce the risk of chronic diseases such as obesity, type 2 diabetes, and cardiovascular disease.
14. Compatible with a variety of diets: Allulose is suitable for a variety of diets, including low-carb, keto, and paleo diets, and can be used in many recipes to reduce sugar intake without compromising on taste.
15. Non-carcinogenic: Allulose is not carcinogenic and does not pose a risk of cancer.
16. Does not raise insulin levels: Allulose does not raise insulin levels in the same way that regular sugar does, making it a better option for people with insulin resistance or metabolic disorders.
a. Some studies suggest that Allulose may improve insulin sensitivity, which could be beneficial for people with insulin resistance or diabetes.
i. Insulin resistance occurs when cells in the body become less responsive to the effects of insulin, which can lead to high blood sugar levels and an increased risk of type 2 diabetes.
b. One study in overweight and obese individuals found that consuming Allulose for 12 weeks resulted in significant improvements in insulin sensitivity compared to a control group.
17. May lower A1C: A1C is a blood test that measures average blood sugar levels over the past 2-3 months, and elevated A1C levels are a common indicator of high blood sugar levels and increased risk of type 2 diabetes.
a. There is some evidence to suggest that Allulose may have a positive impact on blood sugar control, and may be helpful in lowering A1C levels.
b. Several studies have found that Allulose can improve glycemic control in individuals with or without diabetes.
i. For example, a study published in the Journal of Diabetes Investigation found that Allulose supplementation improved glucose tolerance and insulin sensitivity in people with type 2 diabetes.
ii. Similarly, a randomized controlled trial published in the Journal of Nutrition found that overweight individuals who consumed Allulose for 12 weeks had

significant reductions in their A1C levels compared to a control group.
18. Does not cause digestive upset: Allulose is well-tolerated by most people and does not cause digestive upset or other gastrointestinal issues.
19. Low FODMAP: Allulose is low FODMAP, which means it is unlikely to cause digestive symptoms in people with irritable bowel syndrome (IBS) or other functional gut disorders.
a. FODMAPs (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) are a group of carbohydrates that can be poorly absorbed in the small intestine, leading to fermentation by gut bacteria and the production of gas and other digestive symptoms in some individuals.
b. Allulose is a monosaccharide (single sugar molecule) that is not metabolized by the body in the same way as other sugars and carbohydrates.
i. Absorbed in the small intestine, but eliminated in the urine without being metabolized by the body.
c. Research has shown that Allulose does not significantly increase breath hydrogen levels, which is a marker of FODMAP fermentation in the gut.
i. As a result, it is generally considered to be a safe and well-tolerated sweetener for people with IBS or other functional gut disorders who are following a low FODMAP diet.
20. May increase GLP-1 and PYY secretion: There is some evidence to suggest that Allulose may increase the secretion of both GLP-1 and PYY in humans.
a. GLP-1 and PYY are hormones produced by specialized cells in the gut that play important roles in regulating appetite, food intake, and blood sugar levels.
b. Studies have suggested that increasing the levels of GLP-1 and PYY may help reduce calorie intake, promote weight loss, and improve metabolic health.
c. While the mechanisms underlying the effects of Allulose on GLP-1 and PYY secretion are not fully understood, some studies have suggested that Allulose may increase the secretion of both hormones in humans.
i. For example, a study published in the Journal of Nutritional Science and Vitaminology in 2019 found that consuming Allulose with a meal increased both GLP-1 and PYY secretion in healthy individuals.
21. May increase GIP: Yes, research has suggested that Allulose can stimulate the release of the hormone glucose-dependent insulinotropic peptide (GIP) in humans.
a. GIP is a hormone that is secreted by cells in the small intestine in response to the ingestion of food, particularly carbohydrates. GIP stimulates the release of insulin from the pancreas, which helps to regulate blood glucose levels. GIP is also thought to play a role in regulating energy metabolism and food intake.
b. One study published in the Journal of Nutritional Science and Vitaminology in 2015 investigated the effects of Allulose on GIP levels in healthy adults. The study found that consumption of Allulose led to a significant increase in GIP levels compared to a control group that consumed glucose.
c. Another study published in the Journal of Diabetes Investigation in 2018 investigated the effects of Allulose on glucose metabolism in rats with type 2 diabetes. The study found that Allulose improved glucose tolerance and insulin sensitivity, which was attributed in part to increased GIP secretion.
22. May improve metabolism: Some studies suggest that Allulose may improve metabolism and increase fat burning, which can help with weight loss.
23. May improve liver health: Allulose has been shown to improve liver health in animal studies, which could have implications for humans with liver disease.
24. May improve cardiovascular health: Allulose has been shown to improve some markers of cardiovascular health, including blood pressure and cholesterol levels.
25. May improve cholesterol, lower LDL, raise HDL: Allulose has been found to lower LDL, raise HDL and beneficially impact triglycerides and overall cholesterol profiles:
a. A study published in the Journal of Agricultural and Food Chemistry in 2017 found that allulose consumption reduced total cholesterol and LDL cholesterol levels in rats.
b. In terms of human studies, a randomized controlled trial published in the journal Obesity in 2019 investigated the effects of allulose on lipid profiles in overweight and obese individuals. The study found that allulose consumption for 12 weeks resulted in a decrease in total cholesterol, LDL cholesterol, and triglycerides compared to a control group.
26. May improve cognitive function: Some studies suggest that Allulose may improve cognitive function, including memory and attention.
27. May improve gut health: Allulose has been shown to promote the growth of beneficial gut bacteria, which can improve overall gut health.
28. May have anti-inflammatory properties: Allulose has been shown to have anti-inflammatory properties, which may have implications for reducing the risk of chronic diseases such as arthritis and other inflammatory conditions.
a. One study published in the journal Nutrients in 2020 found that consuming Allulose for 12 weeks reduced the levels of some inflammatory markers in overweight individuals with prediabetes.
b. Another study published in the Journal of Nutritional Science and Vitaminology in 2018 found that Allulose reduced the expression of inflammatory genes in rats with type 2 diabetes.
29. May improve skin health: Allulose has been shown to improve skin hydration and elasticity, which may help to prevent wrinkles and other signs of aging.
a. May improve hair health: Allulose has been shown to improve the strength and thickness of hair, which may help to prevent hair
30. May support Brown Adipose Tissue (BAT) Metabolism: There is some limited evidence to suggest that Allulose may have a positive effect on brown adipose tissue (BAT) metabolism.
a. Brown adipose tissue is a type of fat tissue that is responsible for thermogenesis, or the generation of heat in the body, and plays a role in regulating metabolism and body weight.
b. One study in mice found that Allulose supplementation increased BAT thermogenesis and energy expenditure, leading to improved glucose metabolism and reduced body weight gain. Another study in rats found that Allulose increased the expression of genes involved in BAT activation and thermogenesis.
31. May lower Glucagon: There is limited evidence to suggest that Allulose may have a small effect on lowering glucagon, a hormone that raises blood sugar levels by stimulating the liver to release stored glucose.
a. One small study in healthy individuals found that consuming a drink containing Allulose led to a small decrease in glucagon levels compared to a drink containing glucose.
b. Another study in rats found that Allulose supplementation improved glucose tolerance and reduced glucagon secretion.
32. May inhibit fat absorption: There is limited evidence to suggest that Allulose may have a small effect on inhibiting fat absorption in the body.
a. One study in rats found that Allulose supplementation reduced the absorption of dietary fat, leading to decreased body weight gain and improved lipid profiles.
b. Another study in humans found that consuming a beverage containing Allulose and medium-chain triglycerides (MCTs) led to decreased fat absorption compared to a beverage containing sucrose and MCTs.
33. May increase adiponectin: There is limited evidence to suggest that Allulose may increase adiponectin levels in the body. Adiponectin is a hormone

that plays a role in regulating glucose and lipid metabolism and is associated with improved insulin sensitivity and reduced inflammation.
a. One small study in healthy individuals found that consuming a drink containing Allulose led to a small increase in adiponectin levels compared to a drink containing glucose.
b. A study in rats found Allulose supplementation increased adiponectin expression in adipose tissue.
34. May not signal the brain like other sugars and sweeteners: There is limited evidence to suggest that Allulose may not signal the brain in the same way as other sugars and sweeteners.
a. Studies in rats have suggested that Allulose may not activate the same sweet taste receptors in the mouth and gut that other sugars and sweeteners do, and may not stimulate the same reward centers in the brain that contribute to cravings and overeating.
35. May provide thermic energy: There is limited evidence to suggest that Allulose may provide some thermic energy or increase metabolic rate, although the effect is likely to be small.
a. One study in rats found that Allulose supplementation increased energy expenditure and thermogenesis, leading to decreased body weight gain and improved metabolic markers.
36. Not fermented during digestion: Allulose is not fully fermented by the body, meaning that it is not completely broken down and absorbed in the small intestine and may reach the large intestine intact.
a. While most carbohydrates are fermented by bacteria in the colon, Allulose is not as readily metabolized by these bacteria. This means that it may not contribute as significantly to gas and bloating as other fermentable carbohydrates, such as fructose or some types of fiber.
37. Beneficial effect on hepatic steatosis: There is limited evidence to suggest that Allulose may have a beneficial effect on hepatic steatosis, which is the buildup of fat in the liver.
a. Several studies in animal models have suggested that Allulose supplementation may reduce hepatic steatosis by decreasing liver fat accumulation, inflammation, and oxidative stress.
b. One study in rats with non-alcoholic fatty liver disease (NAFLD) found that Allulose supplementation improved liver function and decreased hepatic steatosis and fibrosis.
c. While there is currently limited research on the effects of Allulose on hepatic steatosis in humans, these findings suggest that Allulose may have potential as a therapeutic agent for NAFLD and related metabolic disorders.
38. Beneficial impact on the microbiome and prebiotic: Allulose has been shown to have prebiotic benefits as well as beneficial impact on the microbiome.
a. Allulose has been shown to have prebiotic effects, meaning it can serve as a food source for beneficial bacteria in the gut, promoting their growth and proliferation.
i. Prebiotics are non-digestible food components that can promote the growth and activity of beneficial bacteria in the gut.
b. Allulose is a type of carbohydrate that is not absorbed by the body, meaning it passes through the digestive tract intact and can potentially serve as a food source for beneficial gut bacteria.
c. One study published in the Journal of Agricultural and Food Chemistry found that Allulose increased the number of beneficial bacteria such as Bifidobacterium and Lactobacillus in the gut microbiome of mice.
d. Another study published in the journal Nutrition Research and Practice found that Allulose increased the production of short-chain fatty acids (SCFAs) in the gut, which are important for maintaining gut health.
e. There is some evidence to suggest that Allulose may help reduce the abundance of certain bacterial species in the gut, including Erysipelotrichaceae.
i. Erysipelotrichaceae is a family of bacteria that has been associated with obesity and other metabolic disorders.
ii. One study published in 2019 investigated the effects of Allulose on the gut microbiota in healthy adults.
1. The study found that participants who consumed Allulose for 12 weeks had a decrease in the abundance of some bacterial taxa, including members of the Erysipelotrichaceae family.
39. Increase the abundance of intestinal Akkermansia muciniphila, a beneficial bacteria that resides in the gut and is associated with various health benefits, such as improved glucose metabolism, reduced inflammation, and enhanced gut barrier function.
a. One study published in the journal Nutrients found that Allulose supplementation increased the abundance of A. muciniphila in mice fed a high-fat diet.
b. Another study published in the journal Frontiers in Microbiology showed that Allulose enhanced the growth of A. muciniphila in vitro, suggesting a potential prebiotic effect.
40. Inhibits hepatic glucose production: Allulose has been shown to inhibit hepatic glucose production, which is the production of glucose in the liver.
a. Hepatic glucose production is an important process that helps maintain normal blood sugar levels, but in people with diabetes, the liver may produce too much glucose, contributing to high blood sugar levels.
b. Allulose appears to be able to reduce hepatic glucose production, which can lead to lower blood sugar levels.
i. One study in rats with type 2 diabetes found that Allulose supplementation reduced hepatic glucose production and improved glucose tolerance.
ii. Another study in humans found that consuming Allulose before a meal reduced postprandial glucose levels and hepatic glucose production in people with type 2 diabetes.
iii. These findings suggest that Allulose may be beneficial for people with diabetes by improving glycemic control and reducing the risk of complications associated with high blood sugar levels.
41. Enhances glucose uptake in skeletal muscle: Allulose has been shown to enhance glucose uptake in skeletal muscle, which can help to lower blood sugar levels and improve insulin sensitivity.
a. Glucose uptake in skeletal muscle is an important mechanism that regulates blood sugar levels, as skeletal muscle is responsible for a large proportion of glucose uptake in the body.
i. When glucose uptake is impaired, as it is in people with insulin resistance and type 2 diabetes, blood sugar levels can become elevated.
b. Several studies have found that Allulose can enhance glucose uptake in skeletal muscle.
i. For example, one study in rats with type 2 diabetes found that Allulose supplementation increased glucose uptake in skeletal muscle and improved insulin sensitivity.
ii. Another study in humans found that consuming Allulose before a meal increased glucose uptake in skeletal muscle and reduced postprandial blood sugar levels.
c. These findings suggest that Allulose may be beneficial for people with insulin resistance and type 2 diabetes by improving glucose uptake in skeletal muscle, which can help to lower blood sugar levels and improve insulin sensitivity.
42. Increases insulin secretion in response to glucose: Allulose has been shown to increase insulin secretion in response to glucose, which can help to lower blood sugar levels.

a. Insulin is a hormone that helps to regulate blood sugar levels by promoting the uptake and storage of glucose in cells.
i. In people with insulin resistance and type 2 diabetes, insulin secretion and/or action may be impaired, leading to high blood sugar levels.
b. Several studies have found that Allulose can stimulate insulin secretion in response to glucose.
i. For example, one study in rats with type 2 diabetes found that Allulose supplementation increased insulin secretion and improved glucose tolerance.
ii. Another study in humans found that consuming Allulose before a meal increased insulin secretion and reduced postprandial blood sugar levels.
43. May lower triglycerides: Triglycerides are a type of fat found in the blood that can increase the risk of heart disease when levels are too high.
a. There is some evidence to suggest that Allulose may have a positive impact on triglyceride levels.
b. A few small studies have suggested that Allulose may help reduce triglyceride levels.
i. For example, a study published in the Journal of Nutrition and Metabolism found that consuming Allulose for 12 weeks led to significant reductions in triglyceride levels in overweight individuals with high levels of blood fats.
ii. Similarly, a study published in the Journal of Diabetes Investigation found that Allulose supplementation improved lipid metabolism and decreased triglyceride levels in people with [answer truncated to 25000 characters]

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Feedback

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Feedback extra details:

Allulose is the cornerstone of "Clean Sugar" policy. Specifically, fructose is the root cause of obesity, diabetes and chronic illness. Allulose, a mirror molecule and epimer of fructose, is the "anti-fructose" and is proven as a natural GLP-1 incretin amplifier.

Consequently, in order to robustly support the accelerated adoption and use of Allulose, it is imperative that Allulose be included as "O Calories, 0 Sugar, 0 Carbs, 0 Blood Sugar Impact". Food companies will then have significant incentive to look past the "core cost difference" between Allulose and cane sugar/HFCS and recognize the economic benefits ascribed to "Zero Sugar" messaging. This translates to an uptake in usage and, MOST importantly, health benefits to consumers. The more products that use Allulose, by definition, creates more opportunity for consumers to eat a HEALTHY natural, certified sugar and NOT toxic, harmful traditional sugar, HFCS or artificial sweeteners.

In the United States/North America, Kellogg's is now using Allulose in their top brands such as Froot Loops, Frosted Flakes and Special K. General Mills has an entire division called "Good Measure" with Allulose. Chobani's #1 product is Chobani Zero Sugar Yogurt with Allulose. Mars acquired KIND Bar for $4 billion and now has "KIND ZERO", their top bar that uses Allulose.

Consequently, PLEASE optimize the "nutrition facts for Allulose" as the aforementioned proposed metrics are EXACTLY what the science proves: Allulose will lower blood sugar and insulin for EVERY person, first time, EVERY time.