

Technical Report

Significance of Betaine Hydrochloride in CanXida Remove (Formula RMV)

In CanXida Remove (Formula RMV), Betaine HCl incorporation can optimize drug absorption, foster microbial balance, and support overall digestive health.

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Executive Summary

Betaine hydrochloride (Betaine HCl) is a supplement used for improving stomach acidity. Betaine as sourced from natural substances like spinach, beetroots, and aquatic crustaceans, shows a nontoxic nature. Betaine hydrochloride (Betaine HCl) is associated with various health benefits, primarily focused on digestive health. It has been linked to improved drug absorption, boosted osmoregulation, enhanced nutrient absorption, and overall gut health. Betaine HCl is often used to address issues like hypochlorhydria, indigestion, GERD, and functional dyspepsia. Additionally, it plays a role in maintaining microbial balance and has been suggested for treating Candidiasis. Other potential benefits include impacts on liver and gallbladder function, and brain health.

Betaine, the primary component of Betaine HCl, is Generally Recognized as Safe (GRAS) by the U.S. FDA. Although Betaine HCl, as a dietary supplement, lacks FDA regulation and GRAS status, it is generally considered safe when used as directed. The incorporation of Betaine HCl in the CanXida Remove formula is vital for comprehensive digestive support, optimizing stomach acidity to address conditions like hypochlorhydria and indigestion, thereby promoting effective clearance of pathogens and enhancing overall well-being*.

** These statements have not been evaluated by Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.*

1. Introduction

A combination of betaine and hydrochloric acid is known as betaine hydrochloride (HCl). (NIH, 2023) Betaine HCl is intended to aid in the stomach phase of digestion and encourage the small intestine's production of pancreatic digestive juices. It is essential for preserving appropriate protein digestion, nutritional availability, and a balanced flora in the stomach. As the body's ability to produce hydrochloric acid declines with age. Betaine HCl helps address this natural decrease, supporting digestion, absorption, and immune health. (Yago et al., 2013)

Betaine is a stable and harmless substance that comes from natural sources such as spinach, beetroots, wheat bran, wheat germ, and aquatic crustaceans.(Filipčev et al., 2018)

Betaine hydrochloride is associated with various health benefits, primarily focused on digestive health. Additionally, it plays a role in maintaining microbial balance. Betaine HCl itself is a dietary supplement without FDA regulation, it is generally considered safe when used according to recommended guidelines*. However, caution is advised for individuals with specific medical conditions, and dosage should be carefully monitored.

2. Components of Betaine HCl

Betaine hydrochloride (HCl) is made of two components:

- **Betaine** (also known as trimethyl glycine)
- **Hydrochloric acid** (HCl)

2.1 Betaine

Trimethyl glycine, or betaine, is a quaternary ammonium molecule that is produced from the amino acid glycine. Its nitrogen atom is joined to three methyl groups.(Zhao et al., 2018)

Betaine can be acquired internally by the metabolism of choline or externally through dietary ingestion. (Willingham et al., 2020) Normal levels of betaine, range from 20 to 70 $\mu\text{mol/l}$ in human blood plasma. The liver, kidney, and testes contain the highest concentrations, while being present in almost all tissues. (Day & Kempson, 2016)

Whether consumed as a supplement or from food, betaine undergoes a similar breakdown process in the liver and kidney cells Three types of commercial betaine are available: betaine hydrochloride, synthetic anhydrous betaine, and natural anhydrous betaine. Betaine can be made chemically for use in

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secondary industries, or it can be extracted comparatively expensively from sugar beets or processed beetroot byproducts. (Altinisik et al., 2023)

Natural betaine is preferred over synthetic alternatives in the pharmaceutical, cosmetic, and healthcare industries due to its superior functional qualities.

Source:

It is present within the body but can also be found in various foods such as beets, spinach, whole grains, and some types of seafood (Filipčev et al., 2018)

Roles:

- **Methylation Cycle:** Betaine plays a crucial role in the body's methylation cycle. It acts as a provider of methyl groups, helping convert homocysteine to methionine. This is essential for DNA methylation, an important process in regulating genes.
- **Homocysteine Regulation:** Betaine's role in converting homocysteine to methionine contributes to regulating homocysteine levels in the blood.(Truitt et al., 2021) Elevated homocysteine is associated with

an increased risk of cardiovascular disease.

2.2 Hydrochloric Acid (HCl)

Hydrochloric acid (HCl) is a strong, corrosive acid formed by dissolving hydrogen chloride gas in water.

Hydrochloride (HCl), on the other hand, has an extremely low pH and is an acid. It is produced by the stomach to aid in immunity, nutrition absorption, and digestion. It's also known as the body's natural disinfectant and digester. Three to four quarts of hydrochloric acid are produced daily by a healthy digestive system. Stomach acidity is not only normal, but also essential.

Source:

Naturally produced by parietal cells in the gastric glands of the stomach.

Roles:

- **Digestive Function:** Essential for creating an acidic environment in the stomach, which is crucial for the activation of digestive enzymes and the breakdown of ingested food.

- **Activation of Pepsin:** Activates pepsin, a gastric enzyme that plays a key role in the digestion of proteins. Pepsin breaks down proteins into smaller peptides.

3. Health Benefits of Betaine Hydrochloride:

Betaine hydrochloride (Betaine HCl) is associated with several potential health benefits, (Table 1) primarily in the context of overall gut. Some of these benefits include:

3.1. Improves Drug Absorption

While betaine HCl is primarily known for its potential role in supporting digestion, there's limited evidence to suggest that it may influence drug absorption, particularly for certain drugs*.

Some studies have proposed that betaine HCl supplementation might affect the absorption of certain drugs by influencing the acidity of the stomach. Stomach acid, or gastric acid, plays a crucial role in the digestion of food and the absorption of certain substances, including drugs.

3.2. Enhance osmoregulation

Osmoregulation refers to the intricate process of regulating the balance of salt and water in the body (*homeostasis*), regardless of various factors such as diet, temperature, and the surrounding environment. Osmoregulation enables the transfer of nutrients and removal of waste products.

Betaine hydrochloride, a natural osmolyte, helps cells regulate volume and signaling. It enhances resilience in tough conditions by maintaining hydration, improving energy production, glucose breakdown, and lactate productivity. Additionally, it protects proteins, enzymes, and cells from stress through effective osmoregulation. (Arumugam et al., 2021)

3.3. Maintain Microbial Balance

Maintaining proper stomach acidity is also thought to contribute to a healthy microbial balance in the gut. Adequate acidity helps create an environment that discourages the growth of harmful bacteria.

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Table 1: List of specific clinical trials utilizing betaine hydrochloride and betaine as an active component for therapeutic or preventive purposes. Source: clinicaltrials.gov

Clinical trial ID	Health Condition	Status
NCT02758015	Healthy	Completed
NCT01237353	Pharmacodynamic	Completed
NCT00586911	Nonalcoholic Steatohepatitis	Completed
NCT01838941	Peroxisome Biogenesis Disorders	Completed
NCT02404337	Homocystinuria	Completed
NCT02403804	Healthy	Completed
NCT03073343	<ul style="list-style-type: none"> • ALT • Non-Insulin Dependent Diabetes • Non-Alcoholic Fatty Liver Disease 	Completed
NCT04585295	Healthy	RECRUITING
NCT05790070	<ul style="list-style-type: none"> • Betaine Supplementation • Blood Flow Restriction Training 	Completed
NCT01749982	Arsenic Metabolites Measured in Urine	Completed
NCT01950039	<ul style="list-style-type: none"> • Dysglycemia • Obesity 	Completed
NCT00283387	Hyperoxaluria	Completed
NCT02118142	Insulin Sensitivity	Completed
NCT01213719	Healthy Subjects	Completed

NCT01398046	Healthy Subjects	<i>Completed</i>
NCT00102843	<ul style="list-style-type: none"> • Cardiovascular Diseases • Healthy 	<i>Completed</i>
NCT01759875	Healthy	<i>Completed</i>
NCT03720249	Hyperhomocysteinemia	<i>Completed</i>
NCT01371357	Hyperhomocysteinemia	<i>Completed</i>
NCT03420976	Small Intestinal Bacterial Overgrowth	<i>Withdrawn</i>

3.4. Improves Nutrient Absorption

Betaine hydrochloride (Betaine HCl) is believed to enhance nutrient absorption by optimizing stomach acidity. (Guilliams & Drake, 2020) Betaine HCl can assist in the production of stomach acid, which can improve the digestion of proteins, making it easier for the body to absorb amino acids and minerals such as calcium and iron. As a result, this could enhance nutrient availability in the small intestine.

3.5. Improve Overall Gut Health:

Betaine hydrochloride (Betaine HCl) is frequently mentioned in discussions about digestive health, specifically in relation to addressing specific gut problems.

- **Hypochlorhydria:** Betaine HCl is commonly associated with addressing low stomach acid levels (hypochlorhydria). Proponents suggest that supplementing with Betaine HCl may help optimize stomach acidity, aiding in the digestion of food.(Yago et al., 2013b)
- **Indigestion:** Betaine HCl is sometimes used to alleviate indigestion by supporting proper stomach acid levels. Betaine HCl is thought to help by providing additional hydrochloric acid, which may aid in the digestion of proteins and enhance the absorption of nutrients Adequate stomach acid is essential for the effective breakdown of food.(Kines & Krupczak, 2016)

- **GERD (Gastroesophageal Reflux Disease):** While the relationship between Betaine HCl and GERD is debated, some suggest that improving stomach acidity may help prevent the backward flow of stomach acid into the esophagus.(Kines & Krupczak, 2016)
- **Functional Dyspepsia:** Functional dyspepsia is characterized by persistent or recurrent pain or discomfort centered in the upper abdomen. There are some indirect evidences that claim betaine HCl can be used to treat functional dyspepsia too.

3.6. Treating Candidiasis:

Betaine hydrochloride effectively hinders the excessive growth of candida and prevents its establishment in the small intestine.

The secretion of hydrochloric acid from the stomach, along with pancreatic enzymes and bile, effectively inhibits the overgrowth of Candida and prevents its penetration into the absorptive surfaces of the small intestine. If there is a decrease in the secretion of any of these vital digestive components, it can result in the proliferation of Candida in the gastrointestinal tract. (Murray, 2020)

3.7. Other Health Benefits:

Betaine hydrochloride (Betaine HCl) provides diverse health benefits, impacting liver and gallbladder function, physical performance, and brain health. It supports bile production, acts as a liver protectant, and may enhance resistance against conditions like non-alcoholic fatty liver disease. Studies suggest its potential to improve physical performance and contribute to better brain function.(Arumugam et al., 2021; Kathirvel et al., 2010)

4. Biosafety Profile of Betaine HCl

Betaine is a naturally occurring compound is classified as Generally Recognized as Safe (GRAS) by the U.S. Food and Drug Administration (FDA). Cystadane (betaine anhydrous, oral solution) has received approval from both the FDA and EMA for the treatment of homocystinuria.

Betaine HCl is a dietary supplement without FDA regulation or standardized dosing guidelines. Over-the-counter drugs with Betaine HCl are not FDA-recognized as safe or effective, but personal testimonials and informal reports suggest potential benefits for various medical conditions.

Betaine hydrochloride can increase stomach acid. There is a concern that the hydrochloric acid produced from betaine hydrochloride might irritate stomach and cause heat burns when overdosed*. The dosage of betaine HCl can differ from person to person. It is generally advised to begin with a lower dosage and gradually raise it, while keeping an eye out for any negative reactions. (Guilliams & Drake, 2020; Willingham et al., 2020)

It is important for individuals with specific medical conditions, such as peptic ulcers or a history of gastritis, to exercise caution and seek guidance prior to considering the use of betaine HCl supplements. In addition, it may not be suitable for everyone, and individuals with pre-existing digestive conditions should consult a doctor for guidance and proper dosage.

Betaine HCl is considered safe when used according to recommended guidelines. However, as with any supplement, its safety and effectiveness are still being studied and can vary from person to person.

5. Effective Targets of Betaine HCl

Stomach acid serves as a critical defense mechanism against intestinal infections caused by ingested bacteria. (Martinsen et al., 2019)

Insufficient stomach acidity, often resulting in undigested food, creates an environment where harmful bacteria can thrive. (Martinsen et al., 2019; Tennant et al., 2008) This condition, known as Small Intestinal Bacterial Overgrowth (SIBO), poses a risk to gut health.

These includes:

- **Helicobacter pylori (H. pylori):**

In some situations, H. pylori can thrive in low stomach acid, causing gastritis and peptic ulcers.

- **Salmonella:**

This bacterium can be associated with food poisoning and is more likely to survive and multiply in an environment with lower stomach acidity.

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- **Campylobacter jejuni:**

Another bacterium linked to foodborne illness, *Campylobacter jejuni*, may find a more favorable environment in the presence of reduced stomach acid.

- **Clostridium difficile (C. difficile):**

Clostridium difficile, commonly referred to as *C. difficile*, is notorious for inducing antibiotic-associated diarrhoea. This bacterium tends to multiply when the stomach's inherent protective barrier is compromised.

- **Candida (Yeast):**

Candida, a type of yeast, can overgrow in the digestive tract when stomach acidity is reduced. This overgrowth may lead to conditions such as oral thrush, genital yeast infections, and systemic candidiasis.

Betaine HCl, by increasing stomach acidity, contributes to bolstering immunity and enhancing gastrointestinal protection*. This general reinforcement helps prevent the proliferation of harmful bacteria, supporting overall gut health. (Guilliams & Drake, 2020)

6. Significance of Betaine HCl Extract in CanXida Remove

Canxida Remove formula is a versatile dietary supplement with a range of potential health benefits. Betaine Hydrochloride stands out as a highly valuable ingredient in this supplement for its diverse range of positive attributes.

Betaine Hydrochloride in the Canxida Remove formula can optimize stomach acidity, addressing conditions like hypochlorhydria and indigestion. It might also enhance absorption of other ingredients within the Canxida Remove formula due to its better drug absorption properties.

Betaine HCl in the Canxida Remove formula plays a pivotal role by contributing to osmoregulation, improved hydration, optimized nutrient uptake, and the promotion of a healthy microbial balance, collectively creating an environment less conducive to *Candida* growth*.

Furthermore, betaine HCl can potentially address issues like GERD and functional dyspepsia by improving stomach acidity. Thus, aid in improving overall gut health*.

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In conclusion, the incorporation of Betaine hydrochloride in the Canxida Remove formula offers a comprehensive approach to

health. It can contribute to digestive support, better nutrient and drug absorption, microbial balance, and overall well-being.

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