



BROTH

What is Broth?

Bone broth or vegetable broth is a term used to represent a type of liquid food that is high in essential nutrients in a form that is highly absorbable. These nutrients are dependant of what is in the broth, but most contain an abundance of minerals, fat soluble vitamins and a wide range of amino acids, collagen and gelatin. Only bone broth contain collagen, gelatin and good levels of amino acids.

History

Evidence of the existence of broth and soups dates back 20,000 years. Broth has been the staple in many traditional cultures as an elixir for the immune system and curative powers (1). For example, in Asian countries broth is "revered for its preventative powers and as well as curative powers" (1). Chicken soup is well known in the Jewish culture as the "Jewish Penicillin". In Greece, beaten eggs mixed with lemon are commonly added to chicken broth as a traditional remedy for colds and digestive upset (2).

In 1908 significant changes occurred to the traditional broth making with the discovery of a chemical in seaweed called glutamate by a Japanese researcher that was responsible for the flavour enhancement of food (1). After discovering glutamate, he then combined it with sodium and made monosodium glutamate (MSG). It was thought this discovery would achieve the old fashioned 'broth' healing qualities without all the effort. MSG use gained momentum after the second world war once the food manufacturing industry began and processed food entered our homes.

Composition

There are nine significant ingredients in bone broth that play a significant role in human health.

- Collagen, Gelatin and Connective tissue by products
- Glycosaminoglycans
- Four amino acids - glycine, proline, glutamine, alanine
- Minerals
- Fat soluble vitamins.





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Collagen

Collagen makes up about 25-35% percent of the protein in your body. It is the glue that hold the bones and body together. There are many uses for collagen and there are 29 different types of collagen. Skin, tendons, internal organs, capillaries, digestive system, cornea are example. Collagen in bone broth is made up of amino acid complex systems in a liquid form. The main amino acids that form collagen are glycine, hydroxylysine and hydroxyproline.

Gelatin.

When collagen is simmered over time, it forms gelatin. This hydrolysis of collagen is irreversible and results in the breakdown of long collagen protein fibrils into smaller protein peptides. However, its

chemical composition is very similar to its parent molecule, collagen. (2) Gelatin is what gives bone broth or stock its jelly consistency once it has cooled.

Glycosaminoglycans (GAGs)

Glycosaminoglycans (GAGs) are complex carbohydrates that participate in many biological processes. They can attach to proteins in order to form proteoglycans, which are integral parts of

connective tissue and synovial fluid, the lubricant that surrounds the joint (2).

Glycine

Glycine is an amino acid that makes over 30% collagen. It has an important role as it helps to build other amino acids. Glycine plays a vital role in fat digestion, liver function and healthy blood. It is possibly the point of difference when it comes to choosing bone broth proteins over meat proteins. The Glycine ratio is much higher in bone broth.

Proline

Proline is an amino acid that makes up about 17% of collagen. Proline role is to help the stability of collagen and healthy cartilage and joints along with healthy skin and wound healing.

Glutamine

Glutamine is another important amino acid found in bone broth and is the most abundant amino acid in the blood. It is one of the few amino acids that can directly cross the blood-brain barrier and affect mood and behaviour in a possible and negative way. Glutamine is known to keep fluid retention inside the cells to help healthy cells to function, make more protein and help store energy.

Alanine

This is the fourth most prevalent amino acid in broth. Its role is in liver function and energy production through the process of glycolysis and gluconeogenesis and citric acids cycle. Without good supply of alanine your ability to switch stored energy back into energy will be impaired. This is vital for athlete and for all of us when we are fasting or exercising.



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Bone Marrow

Inside the centre cavity of the bone is the bone marrow, consisting of two types: red and yellow. Both types contain collagen. Red bone marrow is the manufacturing site for new immune cells and red blood cells, while yellow marrow consists of healthy fats. Bone marrow is high in phospholipids, these are the powerhouse fats that help and protect our brain and nervous system. It also contains vitamins and minerals especially Vit A, Vitamin D and Vitamin K.

Minerals

Bone is also full of a variety of minerals, including calcium, magnesium, copper, Iron, manganese, phosphorus, potassium, sodium. It is the process of long slow gentle simmering with the aid of acids like apple cider vinegar that enables these minerals to be released from the bone and into an ionic bioavailable form in the liquid broth. The levels of mineral are totally dependent on the health of the bone in the broth.

Health Benefits

Skin Health

Skin is composed of two layers: the epidermis and the dermis. The epidermis, or upper layer, is made of keratinocytes and is largely responsible for skin barrier function. Underneath is the dermis, which is a dense matrix of collagen and GAGs (Glycosaminoglycans) that provide structural and nutritive support. Keratin, collagen, and GAGs are abundant in bone broth.

Metabolic and Cardiovascular Health

Glycine, an amino acid that is particularly abundant in bone broth. Glycine plays a role in blood sugar balancing and supporting cardiovascular health.

Muscles and Performance

Glycine is also important for the synthesis of haemoglobin and myoglobin, which transport oxygen throughout the blood and muscle tissue, respectively. Alanine is vital in maintaining energy production when exercising. Both phosphorus and magnesium are present in bone broth in modest amounts.

Bones and Joints

It should be obvious that the best way to get the nutrients necessary to build bone is from consuming bone-based foods. Drinking bone broth provides all the raw materials for building healthy bones, including: Calcium, Phosphorus, Amino acids.

Gut Health

A healthy colon contains a single, tight layer of cells (epithelial), a thick mucus layer, and a diverse collection of microbes. The colon wall is constantly changing, getting damaged and healing itself. It is a never-ending cycle. Gelatin absorbs water and helps maintain the layer of mucus that keeps gut microbes away from the intestinal barrier. Gelatin and glycine have also been shown to reduce the inflammation in the colon. Glutamine also helps maintain the integrity of the gut mucosa and intestinal barrier.



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Digestion

Bone broth has so many benefits to gut health it is hard to include all of them in this handout. Drinking broth with meals is an excellent way to aid digestion. Glycine stimulates the production of stomach acid, which is essential for the proper digestion of any meal. Glycine is also an important component of bile acid, which is released to aid in the digestion of fats in the small intestine. Bile acid is important for maintaining normal blood cholesterol levels. The presence of gelatin in the gut also draws fluid into the intestine, which improves gut motility and supports healthy bowel movements.

Detoxification, Liver Function, and Kidney Health

Glycine also stimulates the production of glutathione, the body's master antioxidant. Glycine also reduces oxidative stress (chronic inflammation out of control) in people with metabolic syndrome. Proline plays a role in removing old cells, clearing up waste products, and recycles raw materials for use in healthy cells. Glutamine, on the other hand, acts as a transporter of waste products to the kidney.

Eye Health

The cornea is a very important part of the eye and is made up of collagen.

Brain Health

Numerous components of bone broth benefit the nervous system. The healthy fats in bone broth—particularly if it's made with marrow bones—provide a source of fuel and raw material for the brain. Calcium is essential for nerve conduction. When a nerve cell is stimulated, the influx of calcium triggers neurotransmitter release, allowing the signal to be passed on to the next nerve cell.

Mood and Sleep

For some people, bone broth helps improve both mood and sleep. Glycine is an inhibitory neurotransmitter, meaning it can decrease anxiety, promote mental calmness and help with sleep. One study found that three grams of glycine given to subjects before bedtime produced measurable improvements in sleep quality.

Immune Function

While ancient folk wisdom suggests that a hot cup of bone broth can help soothe the sick and cure the common cold, modern studies have confirmed that the components of bone broth can boost the immune system. For example, glycine receptors have been identified on the outer surface of several different types of immune cells. The effect is a dampening of the immune response, resulting in reduced inflammatory signalling molecules and oxidative stress that may reduce damage to lungs and other tissues. A component of bone broth has been shown to influence B cell function, T cell function, and macrophage activity.

(References available on request)





Amino Acids in 710ml of Chicken Bone Broth

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Amino Acids	Long-Cooked Broth (mg)	Short-Cooked Broth (mg)
Glycine	5320	1350
Glutamic acid (glutamine)	3040	1100
Proline	2960	727
Alanine	2320	643
Aspartic acid	1660	483
Threonine	642	211
Serine	728	257
Valine	543	191
Isoleucine	395	129
Leucine	829	277
Tyrosine	229	102
Phenylalanine	577	170
Lysine	909	383
Histidine	281	296
Arginine	2090	512
Cystine	<72.1	<71.3
Methionine	289	78.4

Both long and short-term broths were prepared by Kim Schuette of Biodynamic Wellness, Solana Beach, California. Certificate Analyses from Covance Laboratories, August 12, 2013.



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Essential amino acids (Percentage)				
Amino acids	Category	Beef	Lamb	Pork
Lysine	Essential	8.2	7.5	7.9
Leucine	Essential	8.5	7.2	7.6
Isoleucine	Essential	5.0	4.7	4.8
Cystine	Essential	1.5	1.5	1.2
Threonine	Essential	4.2	4.8	5.2
Methionine	Essential	2.2	2.4	2.6
Tryptophan	Essential	1.3	1.2	1.5
Phenylalanine	Essential	4.1	3.8	4.3
Arginine	Essential	6.4	6.8	6.6
Histidine	Essential	2.8	2.9	3.1
Valine	Essential	5.6	5.1	5.2
Non-essential amino acids				
Amino acid	Category	Beef	Lamb	Pork
Proline	Non-essential	5.2	4.7	4.4
Glutamic acid	Non-essential	14.3	14.5	14.6
Aspartic acid	Non-essential	8.9	8.6	8.8
Glycine	Non-essential	7.2	6.8	6.0
Tyrosine	Non-essential	3.3	3.3	3.1
Serine	Non-essential	3.9	3.8	4.1
Alanine	Non-essential	6.3	6.2	6.4

Ref: Ahmad et al, Nutritional Composition of Meat 2018



Amino Acid Comparison in Protein powders, meat and broth

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Amino Acid Name	Product	Product	Product	Beef	Chicken Broth
	BioPro	Peptipro	NES	Raw meat	
	gm/100	gm/100 %	gm/100 gm	gm/100	gm/100
Essential Amino Acids					
Branch Chain Amino Acids					
Isoleucine	5.24	1.30	1.14	5.0	0.55
Leucine	8.19g	2.50	2.85	8.5	1.16
Valine	5.41g	2.40	2.49	5.6	0.76
Essential Amino Acids					
Lysine	4.60g	2.90	0.50	8.2	1.27
Methionine	2.07g	0.40	0.82	2.2	0.40
Phenylalanine	3.94g	1.30	1.87	4.1	0.81
Threonine	4.27g	1.70	1.73	4.2	0.89
Tryptophan	1.40g			1.3	
Histidine	2.01g	0.60	0.63	2.8	0.40
Taurine					
Non -Essential Amino Acids					
Alanine	4.41g	12.10	8.49	6.3	3.3
Arginine	6.13g	4.90	8.18	6.4	2.1
Aspartic Acid	8.19g	5.00	5.65	8.9	2.3
Cysteine	2.16g			1.5	0.1
Glycine	2.83g	29.30	23.1	7.2	7.5
Glutamic Acid	15.48g	8.30	9.50	14.3	4.3
Proline	5.49g	13.10	13.8	5.2	4.2
Serine	4.42g	3.10	3.30	3.9	1.01
Tyrosine	3.69g	0.20	0.75	3.3	0.03

Compiled by Liza Twohill 2020



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Recipes, sources & Learning

Homemade bone broth is simple to make. Ask your local farmers or butcher if they have soup bones, or roast a whole pastured chicken and save the bones for cooking broth. Chicken feet, chicken necks, calves' feet, and marrow bones are particularly valuable additions to broth. Pre-made bone broth is also a good option. Just be sure to follow these steps when you shop.

Buy Organic, Pasture-Raised Bone Broth

Buying broth that is organic and made from pasture-raised animals or wild-caught fish will minimize the toxins and maximize the nutrients. When it comes to sourcing it, you can make your own bone broth

at home, or you can purchase it pre-made. However, if you choose to get your hands on this liquid gold, be sure to make bone broth a staple in your diet.

Avoid Cans

Don't buy bone broth that comes in cans or other plastic food containers that contain bisphenol A (BPA) or BPA substitutes. BPA is a potent endocrine disruptor that carries a host of health risks.

Bone Broth – for any animal bones

2KG of beef, lamb, pork or chicken bones (meaty rib or neck/knuckle bones)

4 litres cold filtered water

¼ -½ cup apple cider vinegar

3 onions coarsely chopped

3 carrots coarsely chopped

3 celery sticks & leaves

Sprig fresh thyme

1 bay leaf

6 black peppercorns

3 tablespoons of salt

1 bunch of parsley

Place the bones in saucepan and cover with vinegar and water for ½ hour. Add remaining water and vegetables. Bring it to a boil. A large amount of scum will come to the top, continue to take this off. After allowing it to boil for a little while reduce to simmer for 8-24 hrs. This will reduce the stock. Add parsley ½ hour before finishing. It is best to use a slow cooker as this will provide a low simmer and avoid food sticking to the bottom.

Strain while hot/warm and discard veggies and bones.

You will be left with a very gelatinous liquid. This is your stock you will add to soups, cooking, etc. Freeze in containers to use at your convenience. The stock will keep for only three days after making, however, you must bring to the boil each time before eating.

Variation of bones can be used to this recipe.



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Potassium Broth

It is a cleansing and alkalizing drink which supplies a great amount of nutrients especially the mineral POTASSIUM.

This broth is good to drink on arising and before retiring, or during the day when one is "off colour", has colds/flu's, any infections to reduce the body overload. It is also of great assistance in rheumatic diseases.

- 2-3 large unpeeled potatoes, chopped roughly
- 1 cup carrots unpeeled, chopped roughly in chunks
- 1 cup red beetroot, unpeeled in chunks
- 1 cup celery, leaves and all, chopped in long pieces
- 1 cup any available vegetable green: beetroot tops, turnips tops, parsley, cabbage, dark lettuce leaves, silver beet leaves, etc Add garlic cloves & onion.

Use stainless steel or enamel big pot/saucepan. Fill it up with water say about 2 litres of water cut up all vegetables directly into the water to prevent oxidation. Cover with a lid and cook slowly for about 1/2 hour. Let it stand for another 1/2 hour, strain, cool until warm and drink freely. If not all used immediately keep in the fridge and warm it up only before serving.

Optional: Add a boned meat to add bulk and protein to the soup, eg. Ox tail, lamb shank etc

Pumpkin or Squash Soup

GFCF/SCD/GAPS/Paleo/BED/LOD/FG, Egg-Free/Nut-Free

For LOD, note that ginger is a little higher in oxalate than garlic.

To save time, use squash baked from the previous night's dinner.

Ingredients

- 2 cups acorn or butternut squash
- 1½ cups chicken broth
- ½ cup onions
- 1 teaspoon minced garlic or ginger
- 1 teaspoon salt
- Ghee or oil

Method

1. Cut squash in half length-wise and scoop out seeds. Place flat side down on baking dish with ½ inch of water on bottom. Prick the squash with a fork. Bake in oven for 20-40 minutes at 375 degrees until soft.
2. Sauté onions in ghee or other oil until soft, approximately 10-15 minutes. Add ginger or garlic in the last few minutes of sautéing.
3. Add squash, broth and salt. Puree with a hand blender in the pot or transfer to a blender to blend.
4. To serve, heat the soup until simmering, pour into bowls and dress with a swirl of coconut cream and parsley leaf, if desired.



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Stew

GFCF, Egg-Free/Nut-Free

Ingredients

- Pastured beef (stew meat cuts) or lamb shanks
- 2 cups of beef (or chicken) stock
- 1 cup of water
- 4 carrots (chopped)
- 2-3 parsnips (chopped)
- 1 head of cauliflower (chopped)
- 2 stalks celery (finely chopped)
- 1 small onion (finely chopped)
- ½ to 1 bunch of greens such as kale (finely chopped)

Method

1. Place all ingredients except greens in a crock pot or slow cooker.
2. Cook for 6-8 hours – start on high until simmering (could take 5 or more hours), then turn down to low.
3. Add the chopped greens and/or kale in the last 30 minutes of cooking.

SCD Stew

GFCF/SCD/GAPS/Paleo/BED/FG, Egg-Free/Nut-Free

Ingredients

- Pastured beef (stew meat cuts) or lamb shanks
- 2 cups of beef or chicken stock
- 1 cup of water
- 4 carrots
- 2 stalks of celery
- 2 heads of cauliflower
- 1 celery root
- 2 stalks celery (finely chopped)
- 1 small onion (finely chopped)
- ½ - 1 bunch of greens such as kale (finely chopped)

Method

1. Place all ingredients except greens in a crock pot or slow cooker.
2. Cook for 6-8 hours – start on high until simmering (could take 5 or more hours), then turn down to low.
3. Add the chopped greens and/or kale in the last 30 minutes of cooking.

