
the **RAW FEEDING
COMMUNITY**
NUTRITION SCIENCE FOR RAW FEEDERS
RawFeedingCommunity.com | @RawFeedingCommunity



Gastric pH in raw & kibble fed dogs

There are many differences in the digestion of fresh, raw food versus dry, extruded food. Many of these differences are some of the main reasons why raw diets can be superior to kibble. Minimally processed, animal based proteins are highly digestible and provide optimal amounts of a wide variety of amino acids, which are then used for

almost every metabolic function in the body. Antinutrients that can interfere with the absorption of vitamins and minerals are not a worry in low- or no-carbohydrate diets. [Raw diets have been shown to promote healthier gut flora](#) than dry food, improving digestion and overall health.

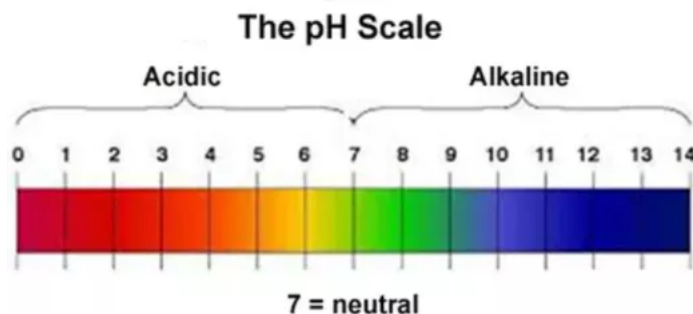
There are two main reasons why owners are discouraged against adding raw foods into the diet while still feeding kibble: digestion rates and gastric pH. Our wonderful admin Danielle Steenkamp, DVM helped us point out [the flaws in logic of the digestion rate idea](#) in her experiment/case study a couple years ago. In summary: digestion isn't like a traffic jam, and a healthy digestive system is capable of handling foods that require different rates of digestion – otherwise, our dogs wouldn't be able to eat raw meaty bones, since meat and bone also digest at different rates.

In this article, I will address the issue of gastric pH, how it relates to healthy function of the digestive system, and whether or not the claims are true...

Are kibble fed dogs' gastric pH values significantly less acidic than raw fed dogs', and does this mean dogs are unable to safely consume both raw and dry foods?

What is gastric pH, and why does it matter?

Gastric pH refers to the scale of acidity in the stomach. The pH scale ranges from 0 to 14, with the lowest numbers being the most acidic, the highest numbers being the most basic or alkaline, and 7 being neutral.



Gastric pH is a very important component of digestion. The environment in the stomach has to be welcoming to beneficial bacteria that help the body break down food, but also prevent pathogenic bacteria from surviving and causing infections.

The stomach also has to be an enzyme-friendly environment. There are a handful of different enzymes and hormones that assist in digestion, and many of them are either produced in the stomach, or their production is influenced by the environment of the stomach. The pH is a major factor affecting the production and activity of these hormones and enzymes [\[source\]](#).

A lesson in digestion

We will soon begin our lesson in digestion, but first, a quick lesson in psychology! Ever heard of [Pavlov's](#) dogs? Pavlov observed that his dogs began to salivate when his lab assistant walked into the room, even if they hadn't brought food with them, and hypothesized that the dogs associated the lab assistant with being fed. He discovered that he could associate the sound of a bell with food, thus causing his dogs to salivate at just the ring of a bell. That's what led to his discovery of what we call classical conditioning: a conditioned, but non-learned response to a stimuli.

In this case, the stimuli is the anticipation of food. Turns out, salivating isn't the only thing that happens when dogs anticipate food. In fact, just *thinking* about food can begin the first phase of digestion.

Before your dog even swallows a bite of food, the sight, smell, and even just the thought of food triggers the cephalic phase of digestion. Signals from the brain tell cells in the stomach wall to begin to secrete gastric juice. Tasting, chewing, and swallowing further intensify this response. Approximately a third of all gastric acid and pancreatic secretion occurs during this cephalic phase, which can last more than 4 hours in dogs [\[source\]](#).

Before this cute begging pup is even given a treat, the first stage of digestion has already begun!

After food has been swallowed and made its way to the stomach, the presence of food particles stimulates the secretion of a hormone called gastrin. Gastrin's job is to trigger the production of even more gastric acid, further acidifying the stomach. The extent of gastric acid production required will depend on the content of the meal; hormones regulating gastric acid production respond as needed. If the meal requires higher acidity, more gastric acid will be produced, and vice versa.

During digestion of proteins, a substance called pepsinogen is secreted by the stomach wall. Below pH values of 4 [\[source\]](#), pepsinogen is converted to pepsin, an enzyme that helps break down proteins into smaller polypeptide chains and individual amino acids. Pepsin functions effectively between a pH of approximately 1.5 to 4.5, but is most active around a pH of 2 [\[source\]](#) to 3.5 [\[source\]](#). Since gastric acid has already been secreted before, during, and after the ingestion of food, the stomach is sufficiently acidic enough for pepsin's maximal activity.

Lipase, the enzyme that helps digest fats, is most active at a pH of 4 and is irreversibly inactivated at or below a pH of 1.5 [\[source\]](#). Since the acidic stomach environment isn't optimal for lipase, the majority of fat digestion in a dog takes place in the small intestine. Amylase in a dog is not present in the saliva like it is in humans, and it also isn't active in acidic environments, so the bulk of carbohydrate digestion also takes place in the small intestine.

The pH within the stomach also influences what happens outside of the stomach. When chyme (the mix of partially digested food and gastric juices) starts to leave the stomach, the acidic pH stimulates the hormones secretin and cholecystokinin to be produced in the duodenum (the first part of the small intestine). Their jobs are to

trigger the release of bicarbonate (which works to neutralize the acidic chyme so it doesn't damage the small intestine [[source](#)]), trigger the release of pancreatic enzymes (proteases to further digest protein, lipases to digest fat, and amylases to digest starch), trigger the liver to produce bile (which further aids in the digestion of fats in the small intestine), and begin to inhibit gastric acid production.

As the remainder of the chyme leaves the stomach, hormones like somatostatin further inhibit gastric acid production by preventing the release of any more hormones like gastrin or secretin.

Digestion continues into the jejunum and ileum of the small intestine.

... But since this article is primarily about *gastric* pH, not intestinal, our adventure through the digestive system doesn't need to go any further.

After the meal has been digested, the gastric pH will become less acidic, because it isn't necessary to sustain a highly acidic environment within the stomach unless gastric juices are needed for digestion; and if the stomach remains too acidic, ulcers could develop. So the pH of the stomach raises slightly, until the next time your dog anticipates taking another bite of food... and then all of this repeats again!

So, as you can see, gastric pH is definitely not constant. It is normal for gastric pH to fluctuate depending on what has been eaten, how much has been eaten, or how long it has been since something has been eaten. Adjusting the pH conditions of the stomach is a normal part of healthy digestion.

What is the difference in gastric pH in raw fed dogs vs kibble fed dogs?

Unfortunately, due to the invasive nature of measuring an animal's gastric pH, there are a limited number of studies measuring the gastric pH of dogs. The majority of the current studies don't necessarily focus on optimal canine digestion, but rather use the dog as a model to research pharmacokinetics and how gastric pH can affect the metabolism of certain drugs.

There have been no studies done comparing the gastric pH of raw fed dogs and kibble fed dogs that I am currently aware of (as of January 2018). Most of the recent studies have involved dogs eating a dry food diet, since that is the standard diet for dogs (much to raw feeders' dismay). However, what limited research we do have available demonstrates that dogs fed dry food still have highly acidic gastric pH: approximately 2 on average [sources: [1](#), [2](#), [3](#)].

It is very likely that the average gastric pH *does* differ slightly between kibble and raw fed dogs. It likely even differs slightly between kibble fed dogs depending on the protein, fat, and carbohydrate content of the kibble, or between dogs on different home cooked diets.

The bottom line is this: at this point in time, there has been no research specifically comparing the gastric pH of raw fed dogs and kibble fed dogs. There has been no research specifically investigating how mixing raw and kibble affects the gastric pH in a dog. Therefore, nobody can truly claim exactly how significant the difference in pH really is between raw vs kibble fed dogs. What we *can* do is make observations of a dog's digestive system and consider the evidence.

What does this mean regarding feeding raw and kibble together?

Any time a dog's diet is changed, there will be an adjustment period. Gastric pH is one factor in that adjustment. This is why a gradual transition is recommended whenever you switch from one diet to another. A gradual transition can be done when switching from kibble to raw too (which is my preferred method for most dogs).

However, the claim that kibble fed dogs actually have neutral or alkaline gastric pH values is completely unsubstantiated and verifiably false. An alkaline or neutral gastric pH would not be able to digest raw OR kibble, and would result in severe malnutrition.

What this means is that the significance of this difference in gastric pH between raw and kibble fed dogs has been highly exaggerated in order to fit some raw feeders' "all or nothing" agendas.

What we *do* know based on current research is that dogs fed dry food have highly acidic gastric pH values, and that a dog's digestive system is well equipped with a complex network of hormones and enzymes that regulate the production of gastric acid. We know that owners have been feeding raw and kibble together successfully for decades to thousands of dogs. And we know that fresh food is very beneficial to the health of our dogs. Considering all of this, if you ask me, it is safe to say we should be encouraging owners to add fresh foods to their dog's diets in whatever capacity they can.

Sometimes when singing the ([well deserved](#)) praises of raw food, raw feeders tend to succumb to bias and misinformation. There is a pervasive air of purism and elitism amongst some (if not many) circles of raw feeders, and it can become easy for them to forget just how many owners simply do not have the means to feed a completely raw diet, despite their best effort. Raw diets can be more expensive, labor intensive, time consuming, and require more resources (like prep and freezer/fridge space, accessibility to co-ops or butchers, etc) than feeding kibble.

But as many raw feeders witness the benefits of raw diets and learn more about the downfalls of dry food, their passion for optimal nutrition can foster a more extremist “all-or-nothing” mindset. I strongly believe this mindset is to the detriment of the dogs whose owners do not have the means to feed raw: instead of being encouraged to improve on their dog’s diets in any capacity they can, they are told that it is actually dangerous to introduce fresh foods into their dog’s diets.

And that is a shame.

Advertisements

Share this:



Like this:

Loading...

12 Comments

Add Yours →

Easy to understand breakdown feeding different proteins or kibble and raw together. Not a recommendation of kibble, lol. - Rawlicious Pet Food : Raw Dog Food Arizona : Raw meat and bones for dogs

April 24, 2018 at 11:03 am

[...] via Gastric pH in raw & kibble fed dogs [...]

★ Loading...

David Boothman

April 12, 2018 at 10:15 am

My experience the better the diet the less you have to be concerned about changing it. We mostly feed raw with some premium kibble so away at tests when they get all kibble the bacteria wont be entirely specialized. Don’t see a problem in the poop other than there is more of it as you would expect. However from time to time I forget to take food and then I scrounge regular kibble, usually ProPlan which is mostly corn. Again they have no problem except for even more poop. It seems the better the quality of the routine diet the more tolerant the dog is. This makes evolutionary sense. In the wild its catch as catch can but its mostly high quality wild prey. Other times they might eat anything if times are lean. I think the problem comes with dog food with the artwork on the bag being the main quality focus and the contents being nothing like anything experienced during evolution.

All this being said, multiple data appears to point to increased lifespan when even small amounts of raw fresh food are added a few days each week and the difference is measured in years. The finer details regarding canine nutrition appear to be a closely guarded secret to the point that almost all the no-grain kibble manufacturers were unaware of the anti-nutrient properties of legumes. This information however did leak out because virtually all pig food manufacturers add an extra enzyme ingredient to disarm the anti-nutrient properties of legumes. There’s nothing wrong with eating most things occasionally, its the the continuous year in year out feeding that accumulates the harm caused by the evolved pesticides that many foods contain. The native cunning built up over generations knew this well as we remember the sayings of old people. Incidentally the selective breeding of increasing pest resistant crops actually works because it increases the levels of natural pesticides the plants produce. Most seeds and nuts don’t want to be eaten on a regular basis, that is not why they evolved. The next generation is what its about and if its all eaten there wont be one. The cow counter measure is highly evolved, three fermentation stomachs which effectively destroy the natural pesticides. Only in the advanced West do we humans not ferment many things before they eat them. most native cultures are smarter and we do have some in the West who have learned from them when they wish to eat a high plant-based diet and not get sick. Your dog’s raw diet should be low plant-based unless you take steps to destroy the natural plant defenses. The kibble process may well be somewhat effective in doing this but it doesn’t work for the phytic acid in peas. Grains today contain very high levels of problem chemicals such as glutenins, gliadins and phytates. These can cause serious harm in some humans and animals and are not destroyed by heat. This is possibly why grain-free kibbles have grown in popularity.

★ Loading...

Pleat

February 8, 2018 at 1:51 pm

A meal of mostly carbohydrates might inhibit the gastric acid production, but the more protein (raw meat in this case) is added to the meal, the more gastric acid will be produced.

Efficiency of digestion is best on a completely raw diet, of course, I'm not arguing that. I'm arguing that there is no solid evidence that proves feeding mixed is any worse than feeding just kibble alone. Of course feeding all raw is ideal, but that isn't possible for many owners. So, feeding mixed is the next best thing. Feeding kibble alone is not ideal for overall digestive health. Raw promotes better digestive health. This is why I say some raw is better than none at all.

★ Loading...

Lyn Thomson

February 8, 2018 at 1:45 pm

I can only see one study cited in the article from the 1960's. A great reference for people interested in this topic is a book called – “Why Stomach Acid is Good for You” Jonathan V Wright M.D. (with special thanks to June Perbohner, for her incredible dedication to finding and preserving copies of hundreds of research papers concerning stomach acid and disease from the 1800's onwards) The book was written to help people dealing with Heartburn, indigestion, reflux and GERD. In the absence of food the resting pH in the stomach is around 1-3. Food upsets the balance, Food automatically raises the pH in the surrounding fundus and body, kicking gastrin-HCL secretion in to higher gear, as stated in your article. The pH of the stomach then dictates what happens next – as long as the pH stays above 3, gastrin will continue to stimulate parietal cells to pump acid. As the pH drops back in to the 2-3 range , G cells slow their release of gastrin. G-cells also release gastrin in response to certain foods – including peptides, amino acids, calcium, and for people certain elements in coffee, wine and beer ! Gastrin has many functions – also stimulating acid release indirectly by signalling ECL cells to secrete histamine. The histamine binds to H2 receptors turning on the acid release pumps. Gastrin also controls the muscular actions of the stomach, gastrin reduces stomach motility, which slows gastric emptying which helps the stomach hold and process a large meal. Recognising which foods trigger gastrin release goes a long way to improving the digestive process for our pets. Raw Meat Bones and Bone broth are great digestive aids because of their amino acid profile and their ability to trigger gastrin release. Carbohydrates can keep the pH of the stomach at above pH 3 and lessen the release of gastrin therefore speeding up the time the meal is held in the stomach allowing less effective digestion to take place. Reducing acid means less pepsinogen, less pepsin, less secretin, less CCK, less pancreatic enzymes, and less bile. I'm not trying to be difficult here, but want to make it very clear that digestion is less efficient if a mixed meal is fed. I look forward to your comments and thank you for taking the time to discuss this really interesting topic.

★ Loading...

Pleat

February 7, 2018 at 2:59 pm

Also worth noting, many of the studies you refer to have indeed been cited in this article

★ Loading...

Pleat

February 7, 2018 at 2:58 pm

Yes, the presence of amino acids and peptide chains (in other words, protein) stimulate the production of gastric acid too.

This does not mean kibble and raw should not be fed together, though. Quite the opposite: higher protein could translate to more effective digestion. Thus, if you add raw to kibble, you are promoting a healthier digestive system as opposed to feeding just kibble alone.

As the article points out, the gastric acid production will vary slightly depending on the content of the meal. Different types of meals will result in different gastric acid production. High carb meals won't need as much acid to digest, so only a small amount of acid is produced. High protein meals need more, so more is produced. A mixed meal of kibble and raw will be higher protein than just kibble, thus stimulating more gastric acid to be produced during the digestion of that meal. Even a higher protein kibble vs a low protein kibble will have slightly different gastric acid production.

But the talking point people use to claim that mixing is dangerous is that the stomach acid isn't acidic enough to digest protein properly, or isn't acidic enough to be an environment that isn't friendly to pathogenic bacteria. This is what isn't true, and why I broke down the process of digestion in the stomach with an emphasis on gastric pH. You can see by following along the gastric digestion process in the article that even when a dog eats a lower protein meal, gastric acid is still produced regardless of the content of the meal – even BEFORE the meal is eaten. As the meal is digested, more gastric acid is produced as necessary.

★ Loading...

Lyn Thomson

February 7, 2018 at 2:19 pm

Hi Pleat

Great article but I think you have missed some very important points. My understanding is that the gastric pH of a kibble fed dog is no different from the gastric pH of a raw fed dog when the dog's are not eating. When the dog's eat, this is when the differences come in, depending on what the dog's eat, A dog fed completely raw, a dog fed raw plus kibble, and a dog fed kibble only will all have a varying degree of effective digestion going on at the time of eating. The important bit of science here is “what is it” that triggers the effective production of the changes in gastric acidity when eating, that then promotes the cascade of digestive enzymes that leads to the most effective digestion for the pet. There are many early studies (around the 1960's) when the gastric pouch of a dog was used to study human digestion dynamics. Gastric pouches from dogs were isolated and used in studies quite frequently so we do have some amazing science available to understand the function of a dog's stomach. (I am however very grateful that these days these types of studies would not be allowed for ethical reasons) These studies allow us to consider which foods are best at triggering efficient digestion in our dogs. And I think that the raw feeding community know that protein is the most important acid stimulating factor. So the argument is not about transit times for different foods, it's about the efficiency of digestion in the stomach when there is food present and the efficient triggering of the rest of the digestive cascade as the acid chyme leaves the stomach. I also don't feel that the raw feeding community are preaching an elitist version of “raw or nothing” as implied by your article. I think it's just common sense – feed foods that trigger the most efficient response from a carnivorous digestive system. There are many ways to feed raw foods

cheaply and effectively and I feel that raw feeding is incredibly accessible if owners are given sound advice re sourcing product themselves.

One of the studies is here – with an interpretation below –

Saint-Hilaire, S., Lavers, M.K., Kennedy, J. & Code, C.F. Gastroenterology 39 (1) July 1960

Carnivores require highly acidic gastric (stomach) contents following a meal, in order to promote safe and effective digestion.

The effect of protein, relative to other foods, on gastric acidity has long been known. A pivotal study by Saint-Hilaire et al (1960) used gastric pouches to measure the acid-stimulating effects of different foods.

“The foods with the highest secretory equivalent values belonged in the meat, fish, and dairy products categories.”

The foods with the least ability to stimulate acidity had the most carbohydrate content: fruit, bread, cereals, green peas, oatmeal and potatoes. Most of these foods are common ingredients in processed petfoods.

It was concluded: “protein was the most important acid-stimulating factor.”

★ Loading...

Josh

February 1, 2018 at 11:31 am

Great article, well put together and explained. I've raw fed for years but also offer my dogs a variety of food including kibble. One huge factor I've seen as a difference between raw and kibble is water consumption. Im sure it's not easy on the dogs system to rehydrate the food for digestion and then processing copious amounts of water as a byproduct (renal wise). As per fruit and vegetables they are probably not “necessary” but I believe they should be fed for variety and balance since we can't mimic the whole food diet such as in the wild 😊

Thanks for sharing!

★ Loading...

Plear Littlefield

January 31, 2018 at 10:15 am

Thank you for your kind words! That's the great thing about science: there is ALWAYS more to learn 🧐 I'm not in vet med but I do study biology.

★ Loading...

Corinne Chapman

January 31, 2018 at 10:02 am

I am so grateful and excited to receive your articles!!! As a Veterinarian I am a little ashamed to say that I have been recommending my clients feed raw separately from cooked foods as there had been no research to confirm to date. But what you are saying certainly makes sense. And I 100% agree, any little bit of whole foods that a person can add to kibble, all the better 😊 Keep writing so I can continue to learn! It's been over 20 years since Vet school for me! Maybe you need to run a course with me one day???

★ Loading...

Plear Littlefield

January 30, 2018 at 1:05 pm

Feeding fruit alongside meat is fine. Enough gastric acid will be produced to digest the meat because 1. Gastric acid is secreted during the cephalic phase and 2. The high protein content of the rest of the meal will trigger more gastric acid to be produced because the presence of peptide chains and amino acids stimulates further gastric acid production. The majority of the fruit will be digested in the small intestine but the meat will still be sufficiently digested in both the stomach and small intestine

★ Loading...

Margarat

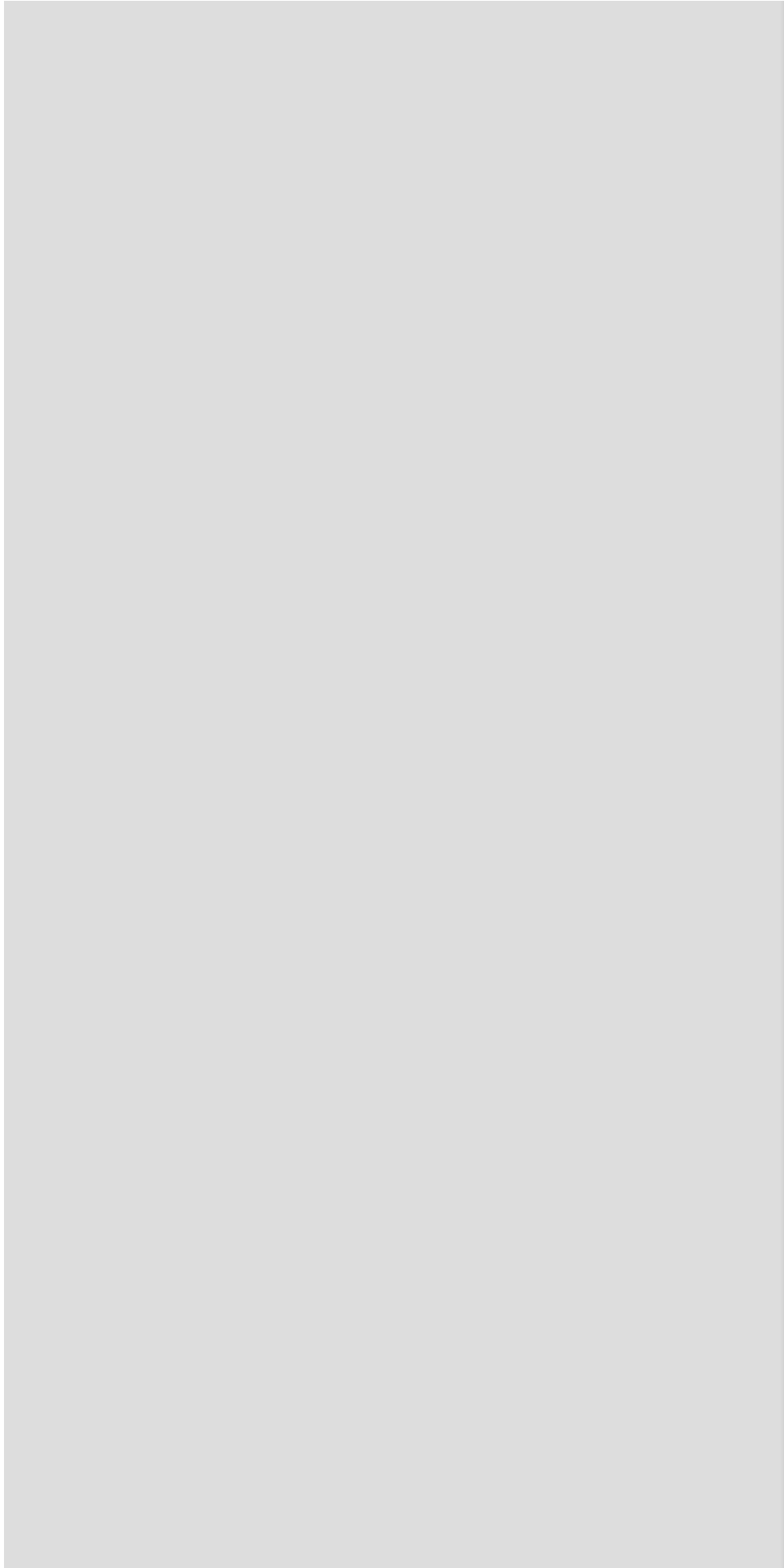
January 30, 2018 at 12:20 pm

I'd like to know if I've been propagating a myth: that fruit, when fed with a meat-based meal, can mess up the appropriate timing of digestion. I'm not talking about a couple of blueberries, but the handing-out of a half of a banana or apple for “dessert.” It's been my understanding that high sugar foods are emptied out of the stomach more quickly, so that if the duodenum is triggered by the fruit to dump into the SI than the meat will go with it and GI problems may result. I'd love to hear your thoughts on this. Thanks for an excellent post.

★ Loading...

You must [log in](#) to post a comment.

RELATED POSTS



No bones about it: the scoop on bone

Is the hype true, or has bone broth just become the newest
Advertisements

Share this:

