



Duke's Microbiome report

Pet Name: Duke

Age: 3 years 6 months

Sex: Male

Date of report: July 19, 2022

Collection Date: July 5, 2022

Species: Dog

Breed: American English
Coonhound, Labrador Retriever Mix

Diet: Dry Kibble

Sample ID: ADEM7N

Sample type: Gut

Summary

Your dog has a unique collection of thousands of different types of bacteria and other microbes (such as viruses, fungi, etc) in their gastrointestinal tract, referred to collectively as the gut microbiome. A healthy microbiome is crucial for your dog's overall health, from nutrient absorption to mental health. When bacteria become out of balance, they may contribute to the development of such disorders as inflammatory bowel disease (IBD), digestive issues, immune system reactions, diabetes, and even anxiety.

Using the latest scientific techniques, we analyzed the bacteria in Duke's gut microbiome, and compared it to our database, which is the largest collection of dog microbiome samples in the world.

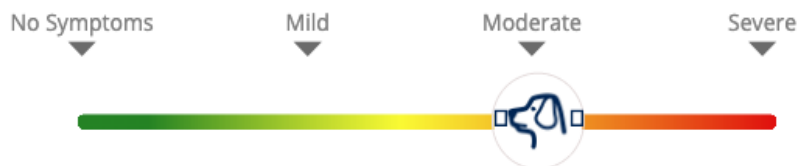


Duke has a **mild to moderate microbiome imbalance** when compared to healthy dogs. This means that the amounts and kinds of bacteria in Duke's gut microbiome are different from what we find in healthy dogs.

See the [overall comparison](#) and [core bacteria breakdown](#) tabs to learn more about which groups of bacteria are contributing to this imbalance.

Restore and Rebalance the Microbiome

Use the slider below to select the severity of Duke's symptoms to see our recommendations for what to do next:



Duke has a **mild to moderate** microbiome imbalance and moderate digestive or skin issues.

In addition to the Diet and Other Recommendations below, we recommend 30 capsules of the [Gut Restore Supplement](#) (one a day for 30 days, or more capsules per day for dogs weighing more than 80 pounds). If your pet has diarrhea, we also recommend a yeast-based probiotic called *Saccharomyces boulardii*.

If symptoms persist or return, consult your veterinarian or an AnimalBiome Animal Care Specialist. [Contact Us](#)

Diet Recommendations:

No diet recommendations at this time.

Other recommendations:



Get physical

Exercise has been found to improve microbiome diversity in pets. Provide your dog with opportunities for daily exercise whenever possible.



Stay hydrated

Duke needs plenty of fresh water daily to stay healthy, and so do the gut bacteria. Provide access to clean, fresh water every day.



Add variety

Introduce variety into your dog's diet to ensure you are supporting a variety of healthy gut bacteria. If your dog is particularly sensitive, be sure to give slow introductions to new foods or treats.



Medication and supplements influences

Overuse of medications like antibiotics, acid reducers, and NSAIDs can harm the microbiome. Talk to your veterinarian to see if it may be possible to safely reduce or eliminate these medications from your dog's regimen., be sure to give slow introductions to new foods or treats.

Microbiome Diversity

Your dog's microbiome diversity is a key measure of gut health. In general, higher bacterial diversity indicates better health and digestion, while lower diversity is associated with a number of health conditions, including inflammatory bowel disease and obesity. Bacterial diversity is a great place to start when examining your pet's microbiome, but remember that it is only one component of your pet's overall gut health.

Overall Diversity

The overall diversity score is based on a commonly used [measure of ecosystem diversity](#) that accounts for how many different types of bacteria are in the community (richness), as well as how evenly distributed these different types are in the community (evenness).



Richness

Richness is a count of the number of different kinds of bacteria found in a sample. In ecology, it is also used to characterize plants or animals found living in an ecosystem. For example, if there are three different kinds of animals in a wildlife park: lions, leopards, and elephants, species richness in the park equals three. In general, microbiomes with greater richness are healthier.



Evenness

Evenness tells us how close in abundance the different kinds of bacteria that were found in the sample are. If a microbiome has four different kinds of bacteria and each makes up 25% of the microbiome, then it would have a very high evenness score. Alternatively, if one kind of bacteria makes up 90% of the microbiome and all the others are rare, then the sample would have a very low evenness score. In general, microbiomes with greater evenness are healthier. However, we do not expect the community of bacteria found in a microbiome sample to be perfectly even because some bacteria are expected to occur in high abundance and others are expected to be rare.



Dietary Insights

Good nutrition is a cornerstone of health and can help prevent common illnesses, boost the immune system, and positively influence the gut microbiome. There are more than a thousand different kinds of gut bacteria in your pet's microbiome, and each kind requires certain nutrients to survive. Therefore, the food your pet eats will influence which bacteria thrive in the gut.

When we analyze Duke's microbiome, we focus on six groups of bacteria: Fusobacteria, Firmicutes, Bacteroidetes, Proteobacteria, Actinobacteria, and Epsilonbacteraeota. Each of these groups is called a "phylum" (plural "phyla"). Each phylum is closely associated with the composition of your pet's food.



Fusobacteria are more abundant in animals in the [Order Carnivora](#) like cats and dogs than in humans. The amount of Fusobacteria in the microbiome is often related to the amount of protein in their diet. Higher-protein diets tend to support higher amounts of Fusobacteria. Fiber can also help modulate the amount of Fusobacteria in the gut microbiome: increasing fiber can help to reduce its levels and decreasing fiber can help to increase them.



Firmicutes are bacteria that help cats and dogs digest carbohydrates. Carbohydrates are found in most foods including plants, grains and animal meat. Firmicutes are more abundant when a pet's diet is higher in simple carbohydrates.

See this [article](#) for more information on carbohydrates and your dog's diet.



Bacteroidetes are abundant in the gut microbiome of cats and dogs. This group includes bacteria that are important for reducing inflammation in your pet's digestive system. The fiber in your pet's diet promotes the growth of Bacteroidetes. Dietary fiber is found in plants: fruits, vegetables, nuts, and grains, and comes from the portion of plants that is left undigested.



Proteobacteria and **Actinobacteria** are two phyla that help cats and dogs digest fat in their diet. In general, when a pet is on a high-fat diet, we detect more Proteobacteria and Actinobacteria. Increasing vegetable fiber in the diet, reducing caloric intake, and increasing activity levels can help to modulate their abundance.

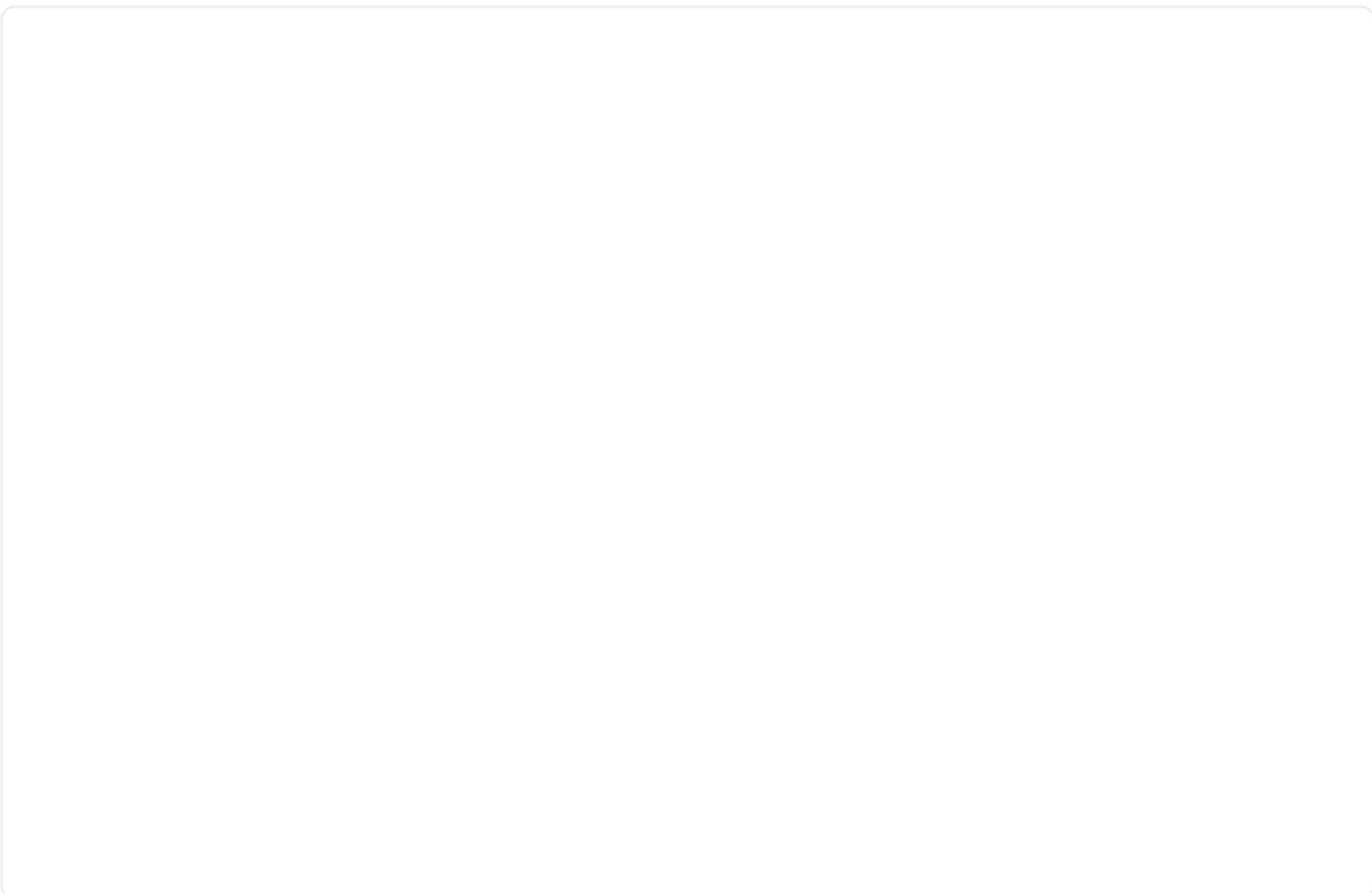
Although less abundant than Firmicutes, Bacteroidetes, and Fusobacteria in cats and dogs, bacteria in phylum Proteobacteria contribute a wide range of functions in the gut microbiome, particularly protein, carbohydrate, and lipid metabolism. In addition, **Proteobacteria** help to maintain the anaerobic (oxygen-free) environment that is essential for normal gut function.

Actinobacteria is a group that contains both potentially beneficial groups like Bifidobacterium (a group associated with young mammals that can be found in some probiotics) and potential frenemies like Collinsella that are considered pathobionts.



Epsilonbacteraeota is a new phylum that includes Campylobacter, Helicobacter, and Arcobacter, three groups of bacteria associated with the gastrointestinal tracts of cats and dogs that can act as opportunistic pathogens. Diet plays an important role in the ability of the healthy gut microbiome to resist colonization by these pathogens. Supporting a diverse microbiome through the addition of dietary fibers and not overfeeding your pet will help keep them in check.

All of these phyla are typically found in healthy pets. Because individual dog's may have different needs, there is no single food that is right for every dog. Comparing Duke's distribution of these phyla to healthy dog's will let you know if you should consider adjusting Duke's diet. See this [article](#) for suggestions on how to adjust your pet's diet.



Note: Bacteria that represents less than 3% of the total have been eliminated from this chart.

A number of research studies in humans have explored the relationship between the ratio of Firmicutes to Bacteroidetes (F:B) and obesity. In humans, F:B ratios tend to be higher in people that consume more carbohydrates. In dog's we have found the F:B Ratio to be a little more complicated, but still very useful.

In relatively healthy pets, a higher F:B ratio can indicate that the amount of carbohydrates in their diet should be reduced to maintain a healthy weight.

However, we have found that dog's with digestive or skin issues are often low in **Bacteroidetes**, an important group for reducing inflammation. This can lead to a high F:B Ratio even though the dog may be at a healthy weight or even underweight.

Firmicutes: Bacteroidetes Ratio: Healthy



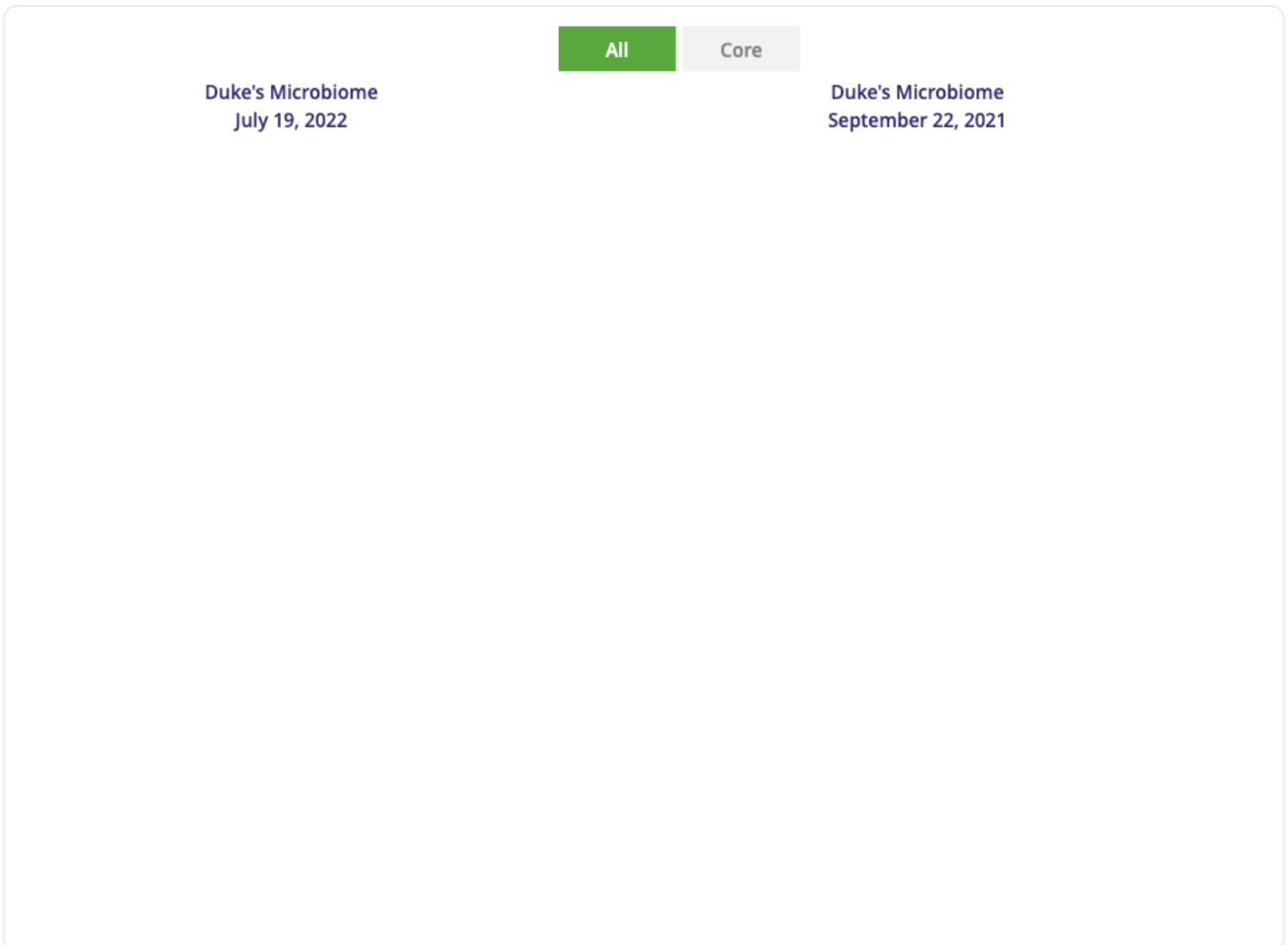
Overall Comparison

A little science refresher: The genus is a way that we classify smaller groups of species — in this case bacteria — to help us organize them. Genus is smaller than family and larger than species.

Healthy dogs have microbiomes with lots of different kinds of bacteria represented, and no single group of bacteria take up too much space. That means that there are lots of different bacteria to do all of the jobs that need to be done in your dog's gut.

If not enough bacteria are present, not all the jobs get done. If you see a type of bacterium that makes up more than 10% of your dog's sample and is not found in these levels in the healthy dog reference profile, these bacteria may be at an unhealthy level and because of this they are highlighted on the chart in bold text.

Healthy Dog Microbiome vs Duke's Microbiome



See a description of each bacteria on the next page. Are there bacteria listed in your pet's sample that aren't described here? Visit our Bacteria Library.

Note: All bacteria usually found in healthy Dog (the "Core Bacteria") are represented above as well as other bacteria found in your Dog 's sample that represent more than 0.1% of the total. For a full listing of bacteria present in this sample, please see the Appendix.

Core Bacteria Breakdown

Bacteroides

Duke's value: **28.6**

Healthy Range: **0.7 - 14.7**



Bacteria belonging to the Bacteroides genus help prevent harmful bacteria from colonizing in the gut. Pets with more of these bacteria tend to have healthier body weights. If your pet's sample is low in Bacteroides, consider adding a prebiotic supplement like psyllium husk powder, inulin, or acacia gum to help feed these bacteria. If Bacteroides levels are too high, consider adding a small amount of whole grain barley, seeds (including chia, flax, pumpkin, sunflower, and sesame seeds), or brown rice to the diet. Adding a small amount of both inulin and whole grains to the diet can improve overall diversity.

Blautia

Duke's value: **24.8**

Healthy Range: **2.0 - 15.7**



Bacteria belonging to the Blautia genus produce anti-inflammatory compounds that help protect the digestive tract from becoming damaged due to chronic inflammation. If your pet's sample is low in Blautia, it can be increased by adding a small amount of whole grain barley, seeds (including chia, flax, pumpkin, sunflower, and sesame seeds), or brown rice to the diet.

[Ruminococcus] gnavus group

Duke's value: **6.4**

Healthy Range: **0.6 - 5.5**



Bacteria belonging to the [Ruminococcus] genus possess potent anti-inflammatory properties and also help kill pathogens that have entered the digestive tract. To increase [Ruminococcus] levels, try adding a source of dietary fiber like psyllium husk, inulin, or acacia gum to your pet's diet.

Fusobacterium

Duke's value: **4.0**

Healthy Range: **2.2 - 28.5**



Bacteria belonging to the Fusobacterium genus help your pet digest animal proteins. If your pet lacks Fusobacterium, increasing the protein content in their diet will likely be helpful. At the same time, elevated levels of Fusobacterium are associated with diarrhea and chronic digestive issues, so moderation is key. To correct for levels of Fusobacterium above the healthy range, consider adding more dietary fiber to your pet's diet.

Escherichia Shigella

Duke's value: **3.5**

Healthy Range: **0.3 - 5.2**



Bacteria belonging to the Escherichia genus are normally present at low levels in many healthy pets. However, excessive levels of particular strains have been linked with chronic diarrhea and other health issues. If your pet has high levels of Escherichia Shigella, a bacteriophage cocktail called PreForPro is designed to reduce its levels.

Sutterella

Duke's value: **2.0**

Healthy Range: **0.8 - 3.7**



Bacteria belonging to the Sutterella genus help keep the immune system active, counteracting other types of bacteria that suppress the immune system. Moderate levels keep your pet safe from illness; at the same time, higher levels are associated with digestive issues like diarrhea and food sensitivities.

Lachnospiraceae type 1

Duke's value: 1.3

Healthy Range: 0.5 - 6.3



Bacteria belonging to the Lachnospiraceae family possess potent anti-inflammatory properties and also help kill pathogens that have entered the digestive tract. To increase Lachnospiraceae levels, try adding a source of dietary fiber like psyllium husk, inulin, or acacia gum to your pet's diet.

Peptoclostridium

Duke's value: 0.3

Healthy Range: 2.5 - 16.0



Bacteria belonging to the Peptoclostridium genus help protect your pet against a number of intestinal pathogens, including Clostridium difficile and certain harmful strains of Escherichia coli. Pets with healthy levels of Peptoclostridium tend to have healthier immune and digestive systems. These bacteria may be deficient in overweight or obese pets.

Faecalibacterium

Duke's value: 0.2

Healthy Range: 0.6 - 6.4



Bacteria belonging to the Faecalibacterium genus are more abundant in active pets at healthy weights. These bacteria also help combat inflammation in the body. Pets with inflammatory bowel disease (IBD) and other chronic inflammatory conditions tend to have low levels of Faecalibacterium.

Alloprevotella

Duke's value: 0.0

Healthy Range: 1.1 - 7.9



Bacteria belonging to the Alloprevotella genus help digest proteins and complex carbohydrates in your pet's diet. They produce special compounds that fight inflammation in the digestive tract and throughout the body. If Alloprevotella levels are too low in your pet's sample, it can be increased by the addition of a small amount of whole grain barley, seeds (including chia, flax, pumpkin, sunflower, and sesame seeds), or brown rice to the diet. If Alloprevotella levels are too high, the addition of inulin to the diet should help to bring its levels down. Adding a small amount of both inulin and whole grains to the diet can improve overall diversity.

Catenibacterium type 2

Duke's value: 0.0

Healthy Range: 0.5 - 8.1



Bacteria belonging to the Catenibacterium genus help your pet digest carbohydrates. They tend to be more abundant in animals consuming diets high in fat and sugars. As a result, over abundance of Catenibacterium are associated with increased risk for a number of health issues, including cardiovascular disease. To help decrease a larger Catenibacterium population, consider switching to a food with more protein and less carbohydrate.

Clostridium

Duke's value: 0.0

Healthy Range: 0.4 - 7.3



Bacteria belonging to the Clostridium genus have been linked with high-protein, low-carbohydrate diets, which are recommended for healthy weight loss. They also tend to be more abundant in pets that are fed raw diets. But too much Clostridium can be problematic; to reduce Clostridium levels, consider adding Saccharomyces boulardii, a yeast-based probiotic, to your pet's regimen. This strain of yeast helps decrease the amount of Clostridium bacteria in the gut. Adding a small amount of a soluble fiber (psyllium husk powder, inulin, or acacia gum) and reducing intake of whole grains in your pet's diet may help to lower Clostridium levels.

Collinsella

Duke's value: 0.0

Healthy Range: 0.7 - 12.3



Bacteria belonging to the Collinsella genus help detoxify poisons and protect the gut against pathogens. While Collinsella are helpful in moderate amounts, an overgrowth can be problematic: elevated levels of Collinsella have been associated with diarrhea and inflammatory bowel disease (IBD). Increasing fiber consumption (psyllium husk powder, inulin, or acacia gum) may help to keep Collinsella levels in check.

Lachnospiraceae type 10

Duke's value: 0.0

Healthy Range: 0.4 - 1.9



Bacteria belonging to the Lachnospiraceae family possess potent anti-inflammatory properties and also help kill pathogens that have entered the digestive tract. To increase Lachnospiraceae levels, try adding a source of dietary fiber like psyllium husk, inulin, or acacia gum to your pet's diet.

Megamonas

Duke's value: 0.0

Healthy Range: 2.7 - 34.6



Bacteria belonging to the Megamonas genus help regulate your pet's metabolism. Megamonas bacteria kick into high gear if your pet stops eating or is unable to absorb nutrients from their food; in these cases, the Megamonas bacteria help preserve energy so your pet does not lose weight. When too much Megamonas bacteria is present, however, it can make your pet more prone to becoming overweight.

Phascolarctobacterium type 2

Duke's value: 0.0

Healthy Range: 0.5 - 4.3



Bacteria belonging to the Phascolarctobacterium type 2 genus are considered health-promoting bacteria. This genus is associated with healthier body weights in dogs. In cats, it can be overly abundant in obese individuals. It is also more abundant in insulin sensitive individuals. Insulin sensitivity refers to how sensitive the body's cells are to insulin. High insulin sensitivity allows the body's cells to use blood glucose more effectively, reducing blood sugar. Increasing representation of this genus through healthful lifestyle (exercise, sleep) and dietary changes (fewer carbohydrates, more unsaturated fats, and more soluble fiber) may help to improve insulin sensitivity.

Prevotella

Duke's value: 0.0





Healthy Range: 2.0 - 31.2


































Bacteria belonging to the Prevotella genus help digest carbohydrates in your pet's diet. They are present in moderate amounts in most healthy pets, but when they become too abundant, they are associated with unhealthy levels of inflammation. Prevotella may even play a role in chronic conditions like Inflammatory Bowel Disease (IBD). If your pet has too much Prevotella, consider decreasing or eliminating simple carbohydrates from their diet. This includes grains, starches, fruits, and vegetables.





Appendix

















Legend

-  Your dog has the right amount of this group of bacteria compared to healthy dogs.
-  Your dog has a lower or higher amount of this group of bacteria compared to healthy dogs but, we have not found low amounts of this group of bacteria to be associated with a health condition.
-  Your dog is at the lower or higher end of the healthy range when compared to healthy dogs.
-  Your dog has significantly more or less of this bacteria when compared to healthy dogs.

The total may not equal 100% due to rounding

	Range for Healthy Dog 	Duke Sample Date: July 5, 2022	Duke Sample Date: September 22, 2021
Core Bacteria			
Bacteroides	0.7 - 14.7	 28.6	 0.0
Blautia	2.0 - 15.7	 24.8	 10.4
[Ruminococcus] Gnavus Group	0.6 - 5.5	 6.4	 6.5
Fusobacterium	2.2 - 28.5	 4.0	 1.2
Escherichia Shigella	0.3 - 5.2	 3.5	 0.0
Sutterella	0.8 - 3.7	 2.0	 0.6
Lachnospiraceae Type 1	0.5 - 6.3	 1.3	 0.9
Peptoclostridium	2.5 - 16.0	 0.3	 0.0
Faecalibacterium	0.6 - 6.4	 0.2	 0.0
Alloprevotella	1.1 - 7.9	 0.0	 0.0
Catenibacterium Type 2	0.5 - 8.1	 0.0	 0.0
Clostridium	0.4 - 7.3	 0.0	 0.0
Collinsella	0.7 - 12.3	 0.0	 0.6
Lachnospiraceae Type 10	0.4 - 1.9	 0.0	 1.1
Megamonas	2.7 - 34.6	 0.0	 15.7

Phascolarctobacterium Type 2	0.5 - 4.3	 0.0	 0.0
Prevotella	2.0 - 31.2	 0.0	 0.0

Other Bacteria				
Streptococcus	0.0 - 5.0	 20.5	 59.3	
Erysipelotrichaceae Type 4	0.0 - 5.0	 2.1	 0.0	
Romboutsia	0.0 - 5.0	 2.0	 0.8	
Peptostreptococcaceae Type 1	0.0 - 5.0	 1.7	 0.2	
[Ruminococcus] Gauvreauii Group	0.0 - 5.0	 0.7	 0.2	
Turicibacter Type 2	0.0 - 5.0	 0.7	 0.5	
Campylobacter Type 1	0.0 - 0.5	 0.5	 0.0	
Anaerostipes	0.0 - 5.0	 0.1	 1.2	