

# EQUIBIOME

Analysis and Report  
of Gut Health

 Powered by Agxio



The bacteria of the hind gut make a huge contribution to the health of your horse, including temperament, energy levels, nutrient availability and vitamin production. Understanding the gut bacteria can give you an insight into the health of your horse and assist you in optimising a health plan which is individually tailored and highlights any potential dietary deficits.

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# ABOUT THE MICROBIOME

## The Microbiome

The microbiota comprises a community of bacteria that live in the gut of the horse.

The Good Gut Bacteria-

Make vitamins and allow minerals to be absorbed

Mend the gut wall and prevent ulcers and inflammation

Defend against the invasion of bad bacteria Increase energy and promote a good immune response

The Bad Gut Bacteria

Cause disease -colitis, colic, gastric ulcers and inflammation

Can cause imbalances, triggered by changes in diet, stress, commonly used medication, including the use of ulcer and pain medication

## Re-balancing the Gut

Is much easier if you know what and where these imbalances are. Scientific research has linked every common gastrointestinal health problem to the gut bacteria.

We Can Help.

The Equibiome Report identifies the bacteria causing the imbalances. It gets rid of the guess work around what supplements, forage, pellets, chaff etc. to feed your horse and helps to establish the best diet to improve horse's overall health.

To Contact Us

email- [sharon@equibiome.org](mailto:sharon@equibiome.org)

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# ABOUT THE MICROBIOME

## ABOUT YOUR REPORT

This report is an analysis of the 16S rRNA gene which is present in all bacteria and is the most accurate method of identifying bacterial species. It provides a real time snapshot of the hindgut microbial community of your horse. Whilst the test is a powerful management and analytical tool, it is not intended to be used to diagnose any illness, please consult your vet if your horse is in discomfort.

To generate this report The Illumina MiSeq is used, which is the most accurate and up to date technology, chosen by genomic researchers around the world.

In horses, the knowledge and science linking microbiome to health and disease, are in their infancy. In humans this is much more advanced because of the larger database of samples. It is our aim to gather as many samples of different groups (populations) of horses as we can, this will help to increase our knowledge and put it in line with human research, offering the best and most accurate service..

All figures in Part 1 and 2 appear as percentages of the total microbiome.

## The EquiBiome Data Library

We have the largest library of equine data in the world, used to identify and accurately describe the healthy biome.

The data base consists of faecal samples from the thoroughbreds in training, the wild Carneddau ponies, native ponies, horses at livery and obese horses.

Included are horses with laminitis, sarcoids, diarrhoea, Lyme's, grass sickness, infections, ulcers, hind gut discomfort, faecal water syndrome, and those with temperament and unsoundness Problems. We also have profiles of horses on medication such as antibiotics, Bute, NSAID's and Antacids.

Horses are herbivorous with a complex and diverse microbial hind gut community. An extensive and diverse microbial community enables the horse to extract a wide variety of nutrients from the ingested plant material.



# REPORT

## PART 01

### Who is In There?

The first part of the report focuses on the top groups of bacteria at genus level, where the major players are identified and nutritional contributions and benefits to your horse are highlighted. Bacteria are divided into groups to make them easier to understand and identify (see diagram below).



You will see in Part One, how important certain bacteria are to your horse's health. You will also see how by making some small changes to the diet, beneficial bacteria can be encouraged to increase in number, benefiting your horse. Some of the dietary changes mentioned in Part One are made by adding prebiotics, such as inulin. The definition of prebiotic is "a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon and thus improves host health". Inulin is only one example of how important plant chemicals can be to the biome, another group mentioned in the reports are plant polyphenols. Probiotics, in this report, relate to live bacteria which can be added as a supplement. Other recommended dietary changes relate to imbalances between the groups of bacteria that feed or digest carbohydrates, fats and protein. Making small changes in the amount or quality of these major nutrients can significantly improve the health of the gut and prevent any future opportunity for inflammation and colitis.

## PART 02

### What are they doing?

You will see in Part One, how important certain bacteria are to your horse's health. You will also see how by making some small changes to the diet, beneficial bacteria can be encouraged to increase in number, benefiting your horse. Some of the dietary changes mentioned in Part One are made by adding prebiotics, such as inulin. The definition of prebiotic is "a non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon and thus improves host health". Inulin is only one example of how important plant chemicals can be to the biome, another group mentioned in the reports are plant polyphenols. Probiotics, in this report, relate to live bacteria which can be added as a supplement. Other recommended dietary changes relate to imbalances between the groups of bacteria that feed or digest carbohydrates, fats and protein. Making small changes in the amount or quality of these major nutrients can significantly improve the health of the gut and prevent any future opportunity for inflammation and colitis.

### How does it work?

Part Two also looks at the relationships and the conversations between the bacteria, some relationships contribute to health, especially the health of the immune system and some contribute to ill health, increasing the opportunity for inflammation and dysbiosis.



# VETERINARY SUMMARY

Please find below an owner summary, a veterinary summary can be provided for your vet if required. We do have a Facebook Group called Equi-Biome Lounge (results discussion group) if you would like to join <https://www.facebook.com/groups/779557709048520/>

Making the dietary changes should improve the gut wall, the immune response and reduce the bacteria associated with inflammation. Rebalancing the biome generally takes 6 weeks to 2 months and a retest is recommended after 6-12 months. The Biome Foods can be purchased online at [www.equibiome.org](http://www.equibiome.org) if you need further help or information please email

[sharon@equibiome.org](mailto:sharon@equibiome.org)

Actions :-

1. One month course of Biome Food 5 also add oily herbs as recommended in Part One of the report, add a small amount of alfalfa, increase hedgerow grazing or add Biome Food 2.
2. Follow with a two month course of Biome Food 4, add Biome Food 1 and/or 6 to the diet of horses with a low good Clostridium or high pathogenic Clostridium (Part Two, Inflammation, Colitis IBD and Immune Response)
3. Feed Biome Food 7 as a maintenance prebiotic (good bacteria food)

If you need to increase Treponema, feed a Vit B, Biotin and an inulin / FOS probiotic.

To increase Blautia, increase the polyphenol content of the diet. There are many polyphenol dietary supplements available for horses, the highest polyphenol content can be found in grape seed extract, resveratrol, blueberry extract, quercetin, seaweed, beans, nuts etc. All herbs contain high levels of polyphenols.

Fibrobacter can be increased by adding a handful of whole oats to the daily feed. Sometimes the levels of fibrobacters are so low the oats come out whole in the faeces, but in time they will be broken down by the increasing population of fibrobacteria. Allowing the horse access to a hedgerow or trees is also a good way to increase the cellulytic fibre content.

If you horse has EMS / laminitis or is obese then having a below average percentage of fibrobacter is advised.

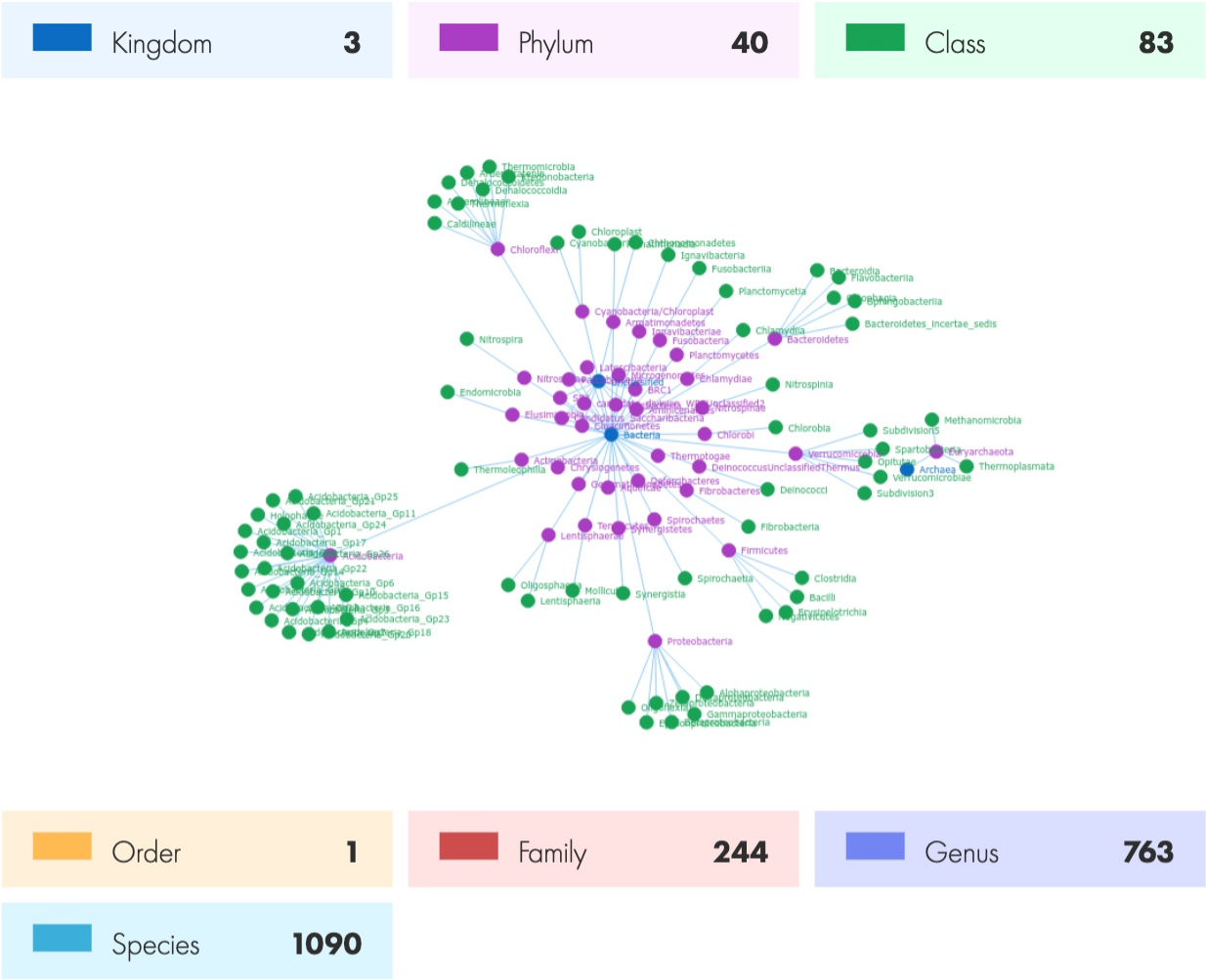
If Fibrobacters are too high, then add some tannins (found in sainfoin for example) to the diet.

If Paludobacter is too high, the advise is to increase protein and decrease levels of digestible starch.

Paludobacter thrive on simple sugars which can be found in leafy grass, oats and digestible processed grains such as oats and maize.

Bacteriodes can be increased by adding foods containing glycans such as apples, carrots peas and bruised oats.

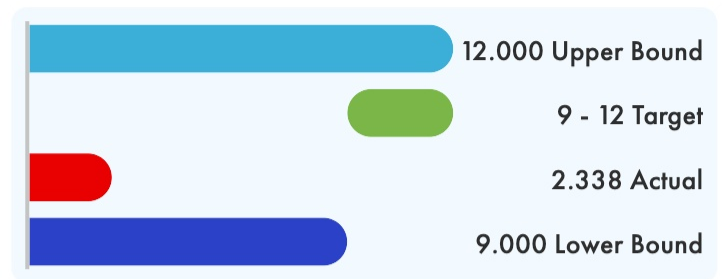
# BIOME ANALYSIS CHART



# PART 01

## TREPONEMA

Treponema help and assist other members of the biome, such as Bacteriodes succinogens and Ruminococcus Alba in breaking down the woody, stemmy parts of plant material. Treponema consume glucose and convert it into succinate, butyrate, acetate and formate. Succinate is an important antioxidant however when levels are too high inflammation and imbalance can occur within the gut. Treponema needs vitamins and minerals to thrive, such are calcium, vitamin B1, vitamin B3, vitamin B5, vitamin B6, vitamin B9 and biotin. It also needs inulin and fructo-oligosaccharides, arabinoxylan and guar gum (found in many equine probiotics)



### Dietary Advice

Check the dietary levels of calcium and provide a supplement for a two -month period to help increase treponema. Lactobacillus and bifidobacteria produce the B vitamins needed to increase levels of treponema if both are at low levels then providing a b vitamin supplement may be beneficial until the microbiome is restored. It is better for the horse to have a biome containing the recommended levels of vitamin producing bacteria than it is to supplement the diet.

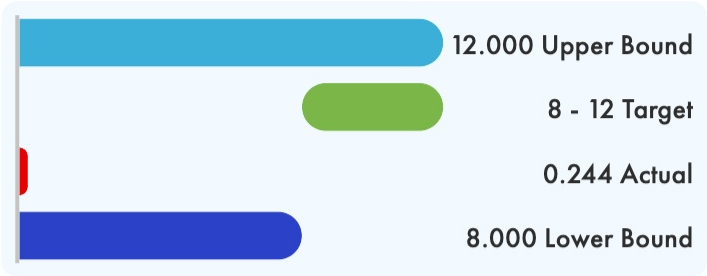




PART 01

BLAUTIA

An abundance of Blautia is linked to a healthy biome with recommended levels of 8%. Blautia is an important member of the gut- brain communication axis and contributes to the feeling of well -being and satiety or fullness after eating.



Dietary Advice

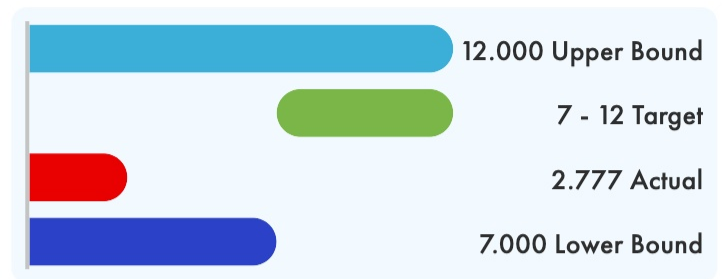
Low levels may indicate oxidative stress or ROS which is the balance between the release of free radicals and the ability of the body to deal with toxins. Blautia bacteria play an important role in the management of free radical damage within the gastrointestinal tract.



# PART 01

## FIBROBACTERES

Fibrobacter are important component of a normal healthy equine biome, they are responsible for the degradation of the 'woody' part of plants eaten by your horse. Digesting any type of cellulolytic (woody) fibre including straw and wood bark. Fibrobacter, make, store and recycle glycogen, this is thought to be a survival tactic by the horse to use in times when food is scarce. Fibrobacter make cellodextrin which is a type of glycogen that the other members of the gut community can use as food. Fibrobacter has an important job to do in stabilising the pH of the biome and as well as feeding the other gut bacteria it makes succinic, acetic and formic acid for the host (horse).



### Dietary Advice

Fibrobacter can be increased by adding a handful of chaff (hay/straw) and a handful of whole oats to the daily feed, this may be bruised but shouldn't be crushed. Sometimes the levels of fibrobacter are so low the oats come out whole in the faeces, but in time they will be broken down by the increasing population of fibrobacteria. Allowing the horse access to a hedgerow or trees is also a good way to increase the cellulolytic fibre content. If your horse has EMS/laminitis or is obese then having a slightly below average percentage of fibrobacter is advised, because of their capacity to turn cellulose (from any type of plant material) into glycogen, store it, recycle and then release it.

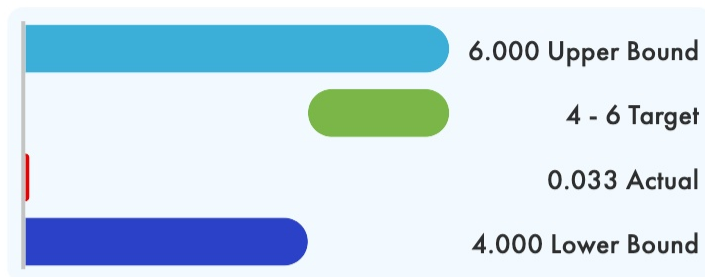


# PART 01

## PALUDIBACTER

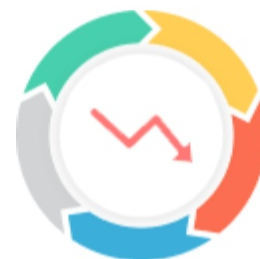
Paludibacter are a normal part of the equine microbial community and the average recommended levels are 4-6%. The bacterium was named because it was found living in swamps and marshes (palus-udis) and was rod shaped (bacter). Paludibacter proliferate in a pH of 6.6 to 7 and its job is to ferment simple sugars/starch/glucose into propionate and acetate.

Propionate helps to lower lipids, they are anti-inflammatory and lower cholesterol, acetate is one of the highest volatile fatty acids produced by the gut bacteria and processed in the liver.



### Dietary Advice

Levels below 4% indicate a need to increase starch and glucose, if your horse has EMS/IR or laminitis and has been on a severely restricted diet then increase the grazing time by another 10-15mins. Paludibacter thrive on simple sugars and easily digestible starch which can be found in leafy grass, oats, digestible processed grains such as oats and maize. Paludibacter fall following a course of antibiotics, recovery to normal levels can take around six months.

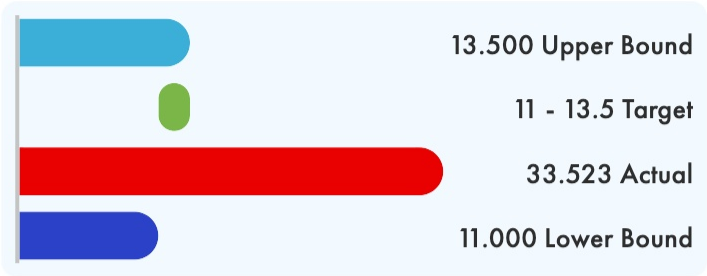




PART 01

CLOSTRIDIUM

Clostridia are very important members of the biome, the recommended average is 12.9%, clostridia is a genus containing many different species of bacteria, of which a few are pathogens (botulin) with links to diseases such as grass sickness. The majority, however, are very host friendly. Clostridia form part of the biome 'police force' defending the gut wall barrier against invading bacteria, they also signal for an immune response and they also interact with other bacteria within the biome, releasing friendly chemicals which help the bacteria get along together.



Dietary Advice

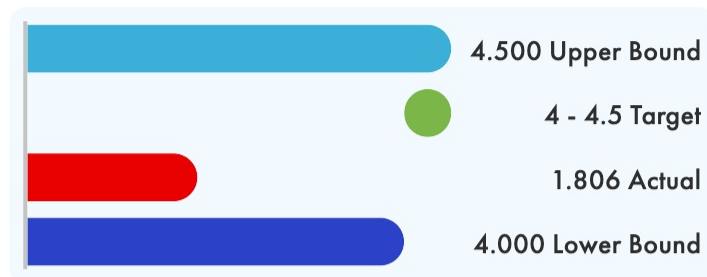
Certain clostridium species increase in infections and illness (c. difficile, botulin) if your horse has symptoms of discomfort or infection please check with your vet with reference to the high levels seen in these test results. Please also see the related section in Part Two



# PART 01

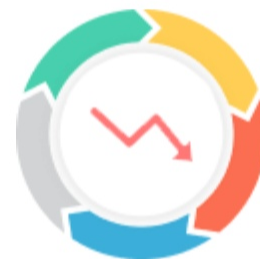
## BACTEROIDES

Bacteriodes belong to the family that help digest to carbohydrates, the recommended levels are between 4.5- 8%. When the ratio of bacteriodes are too high then the horse is more likely to gain weight. Bacteriodes are very flexible and can adjust to any dietary ingredients containing sugar/carbohydrates, extracting nutrients as easily from fresh spring grass or woody hay. If the bacteriodes are too high, then your horse is over efficient system at extracting starch and carbohydrates from the food he eats. If bacteriodes are too low this can reduce energy levels and ability to put on weight.



### Dietary Advice

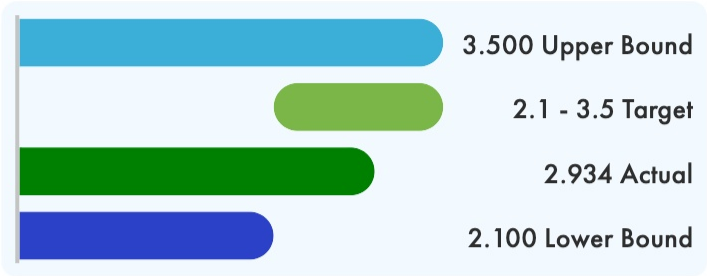
Low levels of bacteriodes are also associated with the use of long- term antibiotic or NSAID use. Administration of antibiotics that kill Gram-positive bacteria are also capable of depleting the Gram-negative phylum Bacteriodes, the levels can recover within a month, but in some horses, full recovery can take up to 2 years.



PART 01

DYSGONOMONAS

Dysgonomonas is a biofilm forming bacteria, linked to inflammation when present in the biome at high levels. Increased levels of Dysgonomonas were found in the hind gut microbial profiles of horses diagnosed with EGGD, 89%of a group of 100 racehorses with EGGD had levels of dysgonomonas above 3.5%.



Dietary Advice

With the recommended changes in diet and the addition of Biome Foods levels of Dysgonomonas should help to reduce levels to below 2.0%.





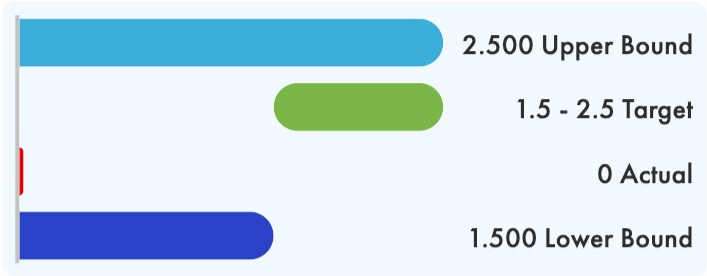
PART 01

METHYLACIDAPHILUM

Methylacidiphilum- linked to metabolism and the production of methane. Called a methanogen these remove hydrogen atoms to speed up fermentation of polysaccharides and carbohydrates. They increase the production of short-chain fatty acids that are subsequently absorbed in the intestines making an additional source of energy. In high levels these cause bloating and weight gain.

Dietary Advice

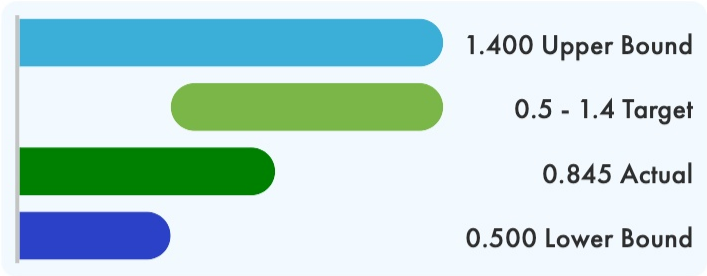
Making the dietary changes recommended in this report should help to increase numbers of this bacteria.



PART 01

OSCILLOSPIRA

Oscillospira, has been linked to leanness, levels are decreased in diseases that are inflammatory. It produces butyrate that helps keep the gut wall healthy.



Dietary Advice

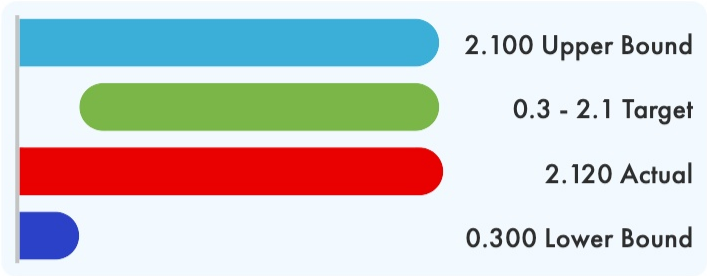
Levels within the recommended percent.



PART 01

ERYSIPELOTRICHIA

Erysipelotrichia - from the firmicute family, produce trimethylamine-N-oxide (TMAO), a gut flora-dependent metabolite resulting from the oxidation of trimethylamine (TMA). It produces TMA from dietary amines, like choline and L-carnitine. Inflammatory in nature, if present in high level, it can be reduced with a course of antibiotics.



Dietary Advice

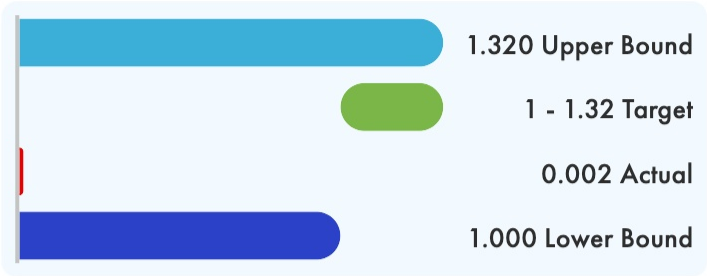
High levels are linked to inflammation, reduction is possible using natural plant antimicrobial compounds, the most effective is essential oil of myrtle.



PART 01

PEDIOCOCCUS

Pediococcus - protects against infectious parasitic diseases, has a direct link to the immune system, may also contribute towards a protection against Bartonella and Borrelia



Dietary Advice

Making the recommended dietary changes within this report, should help to restore levels of this bacteria.

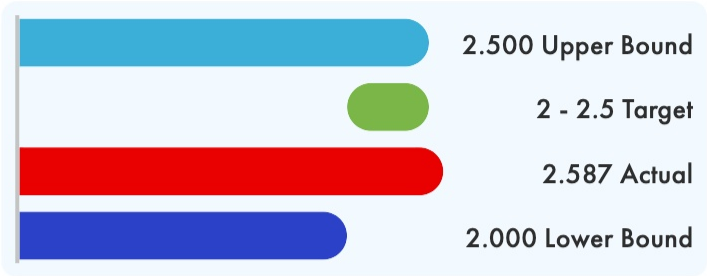




PART 01

PREVOTELLA

Prevotella helps to breakdown protein and carbohydrates in a diet. If present in high numbers they can become opportunistic pathogens. Having a low level of Prevotella predisposes the horse to acidosis.



Dietary Advice



## Dietary Advice

Name of Bacteria	Lower Bound	Actual Value	Upper Bound	Target	Action
Verrucomicrobia Akkermansia	1.500	0.001	3.000	2.5 - 3	BeAware
Verrucomicrobia Methylacidiphales	0.250	0.000	2.000	0.25 - 2	BeAware
Akkermansia. muciniphila	0.250	0.000	1.000	0.25 - 1	BeAware
Lachnospiraceae Blautia	8.000	0.000	12.000	8 - 12	BeAware

Verrucomicrobia Akkermansia and Methylacidophilum helps maintain the integrity of the mucin layer and reduces bowel inflammation. Optimum glucose metabolism is calculated to be 2.5- 3%, lower levels indicate a sluggish/poor glucose metabolism.

Akkermansia Muciniphila is considered to be a good measure of a healthy biome it is directly linked to insulin sensitivity. It is also an important anti-inflammatory, helps repair the gut wall and has a direct relationship with the immune system. Increased levels of A. muciniphila is also linked to improved metabolism. Feed Biome Food 7 to increase numbers, this product consists of arabinogalactan, arabinoxylan, beta glucan, fructooligosaccharide, polyphenols and inulin, feed for 6 months.

Blautia is anti-inflammatory, antimicrobial and correlates to good metabolism, blautia contribute greatly to the overall health of the biome, though it should not be above the 8-10% as it then seems to disrupt rather than help metabolism.

Feeding Biome Food Seven will help increase all the bacteria within this group, it is better to feed the commensal bacteria already within the biome rather than repopulate with live bacteria that are different from the species already living in your horse's gastrointestinal tract.

PART 02

GUT WALL RENEWAL

Dietary Advice

Name of Bacteria	Lower Bound	Actual Value	Upper Bound	Target	Action
Akkermansia. muciniphila	0.250	0.000	1.000	0.25 - 1	BeAware
Roseburia	0.100	0.326	0.200	0.1 - 0.2	BeAware
Eubacteria	0.100	0.000	0.200	0.1 - 0.2	BeAware

The members of this group of bacteria help to renew the gut wall, if enough are present within the biome then the gut wall will be stronger and healthier.

The gut wall exists to protect the inside of the horse from any outside environmental or bacteria invaders which may cause ill health. Some bacteria are pathogenic and can cause disease if allowed to translocate or travel across the gut wall.

With 2 groups in the green, and 1 in the red indicates slightly less protection and a slightly lower renewal mechanism for the gut wall. As the dietary changes are made as recommended in Part One this should help move the se groups into the green healthy zone, making the biome more healthy.

### Dietary Advice

Name of Bacteria	Lower Bound	Actual Value	Upper Bound	Target	Action
Bifidobacterium	0.600	0.000	2.000	0.6 - 2	BeAware
Lactobacillus	0.840	0.891	1.000	0.84 - 1	Healthy
Escherichia Coli	0.500	0.000	0.800	0.5 - 0.8	BeAware
Actinobacteria	1.000	0.700	3.000	1 - 3	BeAware
Clostridiales	26.000	33.329	36.000	26 - 36	Healthy

The gut bacteria in this group are part of the control mechanism that exists between the gut and the brain. Low numbers of bifidobacterium and lactobacillus are directly linked to biome stress, with further links to stress related conditions such as anxiety and IBD.

A high percentage of horses are low in bifidobacterium and lactobacillus and there are many over the counter products available containing both together. Supplementing for 4-6 weeks should be sufficient to increase numbers within the biome.

Horses with a low reading for Clostridiales are more prone to gastric ulcer diseases, hydrogen is produced by the bacteria of this order, it acts as a powerful antioxidant against free radical damage and oxidative stress that is evident in horses diagnosed with gastric ulcer syndrome. Biome food 6 is food for the Clostridiales bacteria.

Biome Food 7 will provide the food for these bacteria, increasing the plant polyphenols, by feeding herbs such as rosemary, oregano and thyme will also help. Inulin (in Biome Food Seven) which should be included in the daily diet after the 4-6 weeks supplementation with the live bacteria has finished.



### Dietary Advice

Name of Bacteria	Lower Bound	Actual Value	Upper Bound	Target	Action
Proteobacteria	2.000	3.294	7.000	2 - 7	Healthy
Planctomycetes	0.013	0.013	0.017	0.013 - 0.017	Healthy
Fusobacteria	3.000	0.022	7.000	3 - 7	BeAware
Actinobacteria	1.500	0.700	3.000	1.5 - 3	BeAware
Bacteroidetes	20.000	34.450	25.000	20 - 25	BeAware
Tenericutes	0.700	1.002	1.000	0.7 - 1	BeAware
Burkholderiales	1.000	0.107	1.600	1 - 1.6	BeAware
Enterobacter	0.005	0.000	0.500	0.05 - 0.5	BeAware

Horses with inflammation, Colitis and Inflammatory Bowel Syndrome have different gut bacteria profiles than healthy horses, they have higher levels of bad bacteria and lower levels of those that are beneficial.

The bacteria profile for inflammation is listed in the table above, i.e. those identified by research as being linked to dysbiosis and inflammation (please see list of references).

An amber/red Be Aware reading is an indication of dysbiosis requiring action is taken to restore a well-balanced and stable biome, the green indicates a healthy stable gut environment.

Please follow the dietary recommendations as described in Part One, the overall aim is to increase the levels of good gut bacteria to create an environment where the good gut bacteria can increase and thrive, Part One describes this in detail.

Please consult your vet if your horse is in discomfort.

### Dietary Advice

Name of Bacteria	Lower Bound	Actual Value	Upper Bound	Target	Action
Clostridium	11.000	33.523	13.500	11 - 13.5	BeAware
Clostridium Histolyticum	0.100	0.000	0.500	0.1 - 0.5	BeAware
Clostridium Sardinense		0.000	0.050	0 - 0.05	Healthy
Clostridium Baratii		0.000	0.010	0 - 0.01	Healthy
Clostridium Perfringens		0.000	0.250	0 - 0.25	Healthy

The bacteria in the gut are a large beneficial ecosystem, having many important roles, one of the top priorities is to initiate a healthy immune system response.

Intestinal balance produces the signals that cause healthy immune response, to protect against disease in all part of the body, vital for health, performance and energy.

Good, commensal bacteria regulate the mucosal immune system and bad, pathogenic bacteria cause immune system dysfunction resulting in disease.

This part of the report looks at the balance between the good clostridium promoting a health immune system and the bad promoting disease and or poor health.

The bad pathogenic bacteria have been given individual readings ie. Histolyticum, Sardinense, Baratii and Perfringens, whilst the good species are listed as a group ie. clostridium.

If levels of good clostridium are low add Biome food 1 to the diet, if levels of pathogenic bacteria are high then add Biome food 6 to help reduce levels as your horse will have a reduced immune response and less protection against gastrointestinal diseases.

## PART 02

### GUT/LUNG AXIS - ASTHMA

#### Dietary Advice

Name of Bacteria	Lower Bound	Actual Value	Upper Bound	Target	Action
Clostridium	11.000	33.523	13.500	11 - 13.5	BeAware
Bacteroides	4.000	1.806	4.500	4 - 4.5	BeAware
Bacteroides Fragilis		0.000	0.100	0 - 0.1	Healthy
Lactobacillaceae	1.200	0.000	1.700	1.2 - 1.7	BeAware
Rothia		0.000		0 - 0	Healthy
veillonellaceae	1.300	0.644	1.500	1.3 - 1.5	BeAware

The gut and the lung share a mucus membrane and immune system, bacteroides and fragilis spp. are inflammatory in nature, directly linked to poor lung function. Clostridium initiates a healthy immune response, if levels are too high the horse will be exposed to an ongoing inflammatory reaction if too low the immune response will be poor. An amber/red reading of any bacteria within this group is an indication that lung health is less than optimal. Following the advice in Part One of the report should help to reduce pathogenic and inflammatory bacteria.

# PART 02

## GASTRIC ULCER SYNDROME

### Dietary Advice

Name of Bacteria	Lower Bound	Actual Value	Upper Bound	Target	Action
Treponema	9.000	2.338	12.000	9 - 12	BeAware
Blautia	8.000	0.244	12.000	8 - 12	BeAware
Fibrobacteres	7.000	2.777	12.000	7 - 12	BeAware
Paludibacter	4.000	0.033	6.000	4 - 6	BeAware
Clostridium	11.000	33.523	13.500	11 - 13.5	BeAware
Dysgonomonas	2.100	2.934	3.500	2.1 - 3.5	Healthy
Methylococcus	1.500	0.000	2.500	1.5 - 2.5	BeAware
Oscillospira	0.500	0.845	1.400	0.5 - 1.4	Healthy
Erysipelotrichia	0.300	2.120	2.100	0.3 - 2.1	BeAware
Pedococcus	1.000	0.002	1.320	1 - 1.32	BeAware
Prevotella	2.000	2.587	2.500	2 - 2.5	BeAware
Sphingobacteria	2.100	0.000	4.000	2.1 - 4	BeAware

Horses with gastric ulcers have a different microbiome profile than healthy horses. More levels in the amber/red zone is an indication of dysbiosis linked to ulceration, following the dietary advice in section one plus the addition of Biome Food 7 will increase the levels of gut bacteria linked to health.





# EquiBiome

Microbial Analysis of the Hind Gut

## Get in Touch



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## Connect With Us



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LinkedIn: **EquiBiome**

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# REFERENCES

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