

Pathogen

 $Clostridium\ botulin\ (botulism)$

When this species is in play you cannot play any food cards (salad, bread, milk, lasagna).
Resistance:

- Ampicillin
- Tetracycline

This microbe is responsible for botulism, a kind of food poisoning



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Pathogen Clostridium dificile

When this species is in play you cannot play any "beneficial only" microbes (except using "Probiotics").

Resistance:

- Kanamycin
- Tetracycline

Antiobiotic-resistant C. dificile is an increasing problem in hospitals



Pathogen Clostridium dificile

When this species is in play you cannot play any "beneficial only" microbes (except using "Probiotics").

Resistance:

- Kanamycin
- Tetracycline

Antiobiotic-resistant C. dificile is an increasing problem in hospitals



Pathogen

Yersinia pestis (plague)

Resistance:

• Kanamycin

This is the microbe responsible for bubonic plague

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Aicrobe &

Pathogen

Yersinia pestis (plague)

Resistance:

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Pathogen Salmonella enterica

Resistance:

• Ampicillin

A common source of food poisoning, often associated with poultry



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A common source of food poisoning, often associated with poultry



Pathogen Mucobacterium

Mycobacterium leprae (leprosy)

Resistance:

 \bullet Tetracycline

Once a significant problem, leprosy is now treatable with antibiotics

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-2

-2



Pathogen

 $Mycobac\check{terium}$ leprae (leprosy)

Resistance:

• Tetracycline

Once a significant problem, leprosy is now treatable with antibiotics



Opportunistic

Lactobacillusreuteri

Synthesizes vitamin B12 when in beneficial zone. Not resistant

Humans are unable to synthesize this vitamin alone







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Synthesizes vitamin B12 when in beneficial zone. Not resistant

Humans are unable to synthesize this vitamin alone









Opportunistic $Biar{f}iar{d}obacterium$ longum

Synthesizes vitamin B1 (thiamine) when in beneficial zone.

Not resistant

Humans are unable to synthesize this vitamin alone







Opportunistic $Biar{f}iar{d}obacterium$ longum

Synthesizes vitamin B1 (thiamine) when in beneficial zone.

Not resistant

Humans are unable to synthesize this vitamin alone







Opportunistic Escherichia coli

Synthesizes vitamin K when in beneficial zone. Not resistant

E. coli is normally an important part of your gut microbiome









Opportunistic $Escherichia\ coli$

Synthesizes vitamin K when in beneficial zone. Not resistant

E. coli is normally an important part of your gut microbiome









Opportunistic Fusobacterium nu-

cleatum

If less than 3 microbes in your beneficial zone at end of turn, becomes a pathogen. Returns at end of any turn you have 3+ microbes there.

Not resistant

Common in humans, but overrepresented in some health issues





Opportunistic Fusobacterium nucleatum

If less than 3 microbes in your beneficial zone at end of turn, becomes a pathogen. Returns at end of any turn you have 3+ microbes there.

Not resistant

Common in humans, but overrepresented in some health issues





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If less than 3 microbes in your beneficial zone at end of turn, becomes a pathogen. Returns at end of any turn you have 3+ microbes there. Not resistant

Common in humans, but overrepresented in some $health\ issues$





Opportunistic

Lactobacillusrhamnosus

When this species is in your beneficial zone you can digest lactose and grains.

Not resistant

While generally considered safe (even used in probiotics), L. rhamnosus can also cause problems.





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L/G





Opportunistic $\bar{Prevotella}$

melaninogenica

When this species is in your beneficial zone you can digest grains and plants.

Not resistant

P. melaninogenica lives in the mouth and can both help digest carbohydrates and lead to peridontal disease

G/P





Opportunistic $\bar{Prevotella}$

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When this species is in your beneficial zone you can digest grains and plants.

Not resistant

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G/P





Opportunistic

Treponema carateum

When this species is in your beneficial zone you can digest plants and lactose.

Not resistant

T. carateum has been known to cause human disease, but members of this genus may also be important in digesting fiber.

P/L





Opportunistic

Treponema carateum

When this species is in your beneficial zone you can digest plants and lactose.

Not resistant

T. carateum has been known to cause human disease, but members of this genus may also be important in digesting fiber.

P/L





Beneficial

Micavibrio aeruginos a vor us

During your turn you may sacrifice this microbe to destroy a microbe in your pathogen zone. Not resistant

M. aeruginosavorus is being studied as a living antibacterial



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Beneficial

Lactobacillus acidophilus

When this species is in play you can digest lactose.

Not resistant

This microbe is common in dairy products and probiotics

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Beneficial

 ${\small Lactobacillus~aci- \\ dophilus}$

When this species is in play you can digest lactose.

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Beneficial

 $Rothia\ mucilagi- \\ nosa$

When this species is in play you can digest grains.

Not resistant

R. mucilaginosa can degrade gluten in the human mouth but the importance of this is unknown

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Not resistant

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Not resistant

R. mucilaginosa can degrade gluten in the human mouth but the importance of this is unknown

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Beneficial $Bacteroides\ ovatus$

When this species is in play you can digest plants.

Not resistant

B. ovatus is found in most people and can help digest dietary fiber





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Prebiotics

This card allows you to play an additional microbe this turn.

Prebiotics are nondigestable compounds that stimulate bacterial growth or activity



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nfection

Fungal Infection

If target player has less than three microbes in their beneficial zone they lose 2 health during each checkup. Discard when they have three or more microbes in their beneficial zone.

A healthy microbiome helps protect against fungal infections



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If target player has less than three microbes in their beneficial zone they lose 2 health during each checkup. Discard when they have three or more microbes in their beneficial zone.

A healthy microbiome helps protect against fungal infections

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Infection &

$No so comial\ In fection$

Only playable on a player who has received antibiotics or a fecal transplant this game. Remove this card when a player gains health (not including checkups).

"Nosocomial infection" is the medical term for a hospital-aquired infection.



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"Nosocomial infection" is the medical term for a hospital-aquired infection.



Salad

If you have the ability to digest plants, gain 1 health immediately for each microbe with that ability.

Feed those microbes

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Event §

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Bread

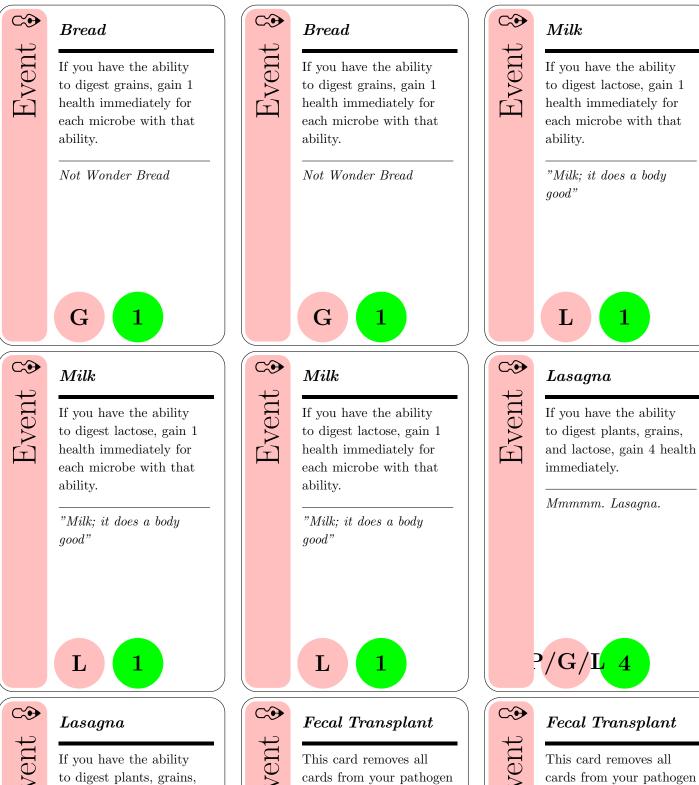
Event

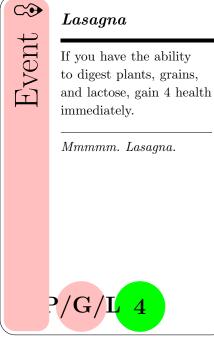
If you have the ability to digest grains, gain 1 health immediately for each microbe with that ability.

Not Wonder Bread

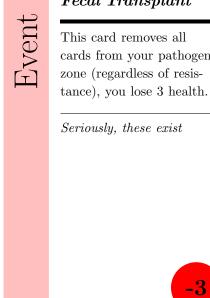
 \mathbf{G}

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Fecal Transplant This card removes all cards from your pathogen zone (regardless of resistance), you lose 3 health. Seriously, these exist





Vitamins

For each vitamin producing microbe in your beneficial zone, gain 1 health immediately.

Probably better in your gut than in a pill





Homeopathy

Play this card for no effect whatsoever.

But hey, no side effects.

Event

Vitamins

For each vitamin producing microbe in your beneficial zone, gain 1 health immediately.

Probably better in your gut than in a pill





$Bacteriophage \ the rapy$

Destroy any one microbe in play.

Bacteriophages are viruses that attack only bacteria

vent

Vitamins

For each vitamin producing microbe in your beneficial zone, gain 1 health immediately.

Probably better in your gut than in a pill





rent {

$Bacteriophage \\ the rapy$

Destroy any one microbe in play.

Bacteriophages are viruses that attack only bacteria



Lateral gene transfer

Move any plasmid in play to another microbe within the same player.

 $Microbes\ love\ to\ share$



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Move any plasmid in play to another microbe within the same player.

Microbes love to share



Lateral gene transfer

Move any plasmid in play to another microbe within the same player.

Microbes love to share



Event

Probiotics

Draw cards from the deck and place the first nonpathogen Microbe in your beneficial area. Reshuffle deck afterwards. Does not count as playing a microbe this turn.

Probiotics are defined as microbes that have a putative health benefit when ingested

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Tetracycline resistance plasmid

Gives any single microbe resistance to Tetracycline.

A plasmid is a small circular piece of DNA containing genetic information



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$Kanamycin\ resistance\ plasmid$

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Change in health

Move any opportunistic microbe from beneficial to pathogen, or vice versa.

Changes in your health or the composition of your microbe can cause some species to run amok



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Antibiotic: Tetracycline

Target player may remove up to 2 non-tetracycline resistant microbes from their pathogen zone, and loses half of the non-tetracycline resistant microbes in their beneficial zone (rounded down) and 1 health. See "Plasmid" rules.

Once widely-used, resistance is now common

-1

$\begin{array}{c} Antibiotic:\ Tetracycline \end{array}$

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Once widely-used, resistance is now common

Jvent

Antibiotic: Kanamycin

Target player may remove up to 2 non-kanamycin resistant microbes from their pathogen zone, and loses half of the non-kanamycin resistant microbes in their beneficial zone (rounded down) and 1 health. See "Plasmid" rules.

Produced by Streptomyces kanamyceticus



Antibiotic: Kanamycin

Target player may remove up to 2 non-kanamycin resistant microbes from their pathogen zone, and loses half of the non-kanamycin resistant microbes in their beneficial zone (rounded down) and 1 health. See "Plasmid" rules.

Produced by Streptomyces kanamyceticus



Antibiotic: Kanamycin

Target player may remove up to 2 non-kanamycin resistant microbes from their pathogen zone, and loses half of the non-kanamycin resistant microbes in their beneficial zone (rounded down) and 1 health. See "Plasmid" rules.

Produced by Streptomyces kanamyceticus



$\begin{array}{c} Antibiotic \colon Ampi-\\ cillin \end{array}$

Target player may remove up to 2 non-ampicillin resistant microbes from their pathogen zone, and loses half of the non-ampicillin resistant microbes in their beneficial zone (rounded down) and 1 health. See "Plasmid" rules.

From the penicillin family

-



Antibiotic: Ampicillin

Target player may remove up to 2 non-ampicillin resistant microbes from their pathogen zone, and loses half of the non-ampicillin resistant microbes in their beneficial zone (rounded down) and 1 health. See "Plasmid" rules.

From the penicillin family

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Antibiotic: Ampicillin Target player may remove up to 2 non-ampicillin

Target player may remove up to 2 non-ampicillin resistant microbes from their pathogen zone, and loses half of the non-ampicillin resistant microbes in their beneficial zone (rounded down) and 1 health. See "Plasmid" rules.

From the penicillin family

-1

$\begin{array}{c} Microbial\ Diver-\\ sity \end{array}$

If you have at least 4 microbes in your beneficial zone, remove a microbe from your pathogen zone.

There appears to be a correlation between diversity of microbiota and health

c⊛ →

Microbial Diversity

If you have at least 4 microbes in your beneficial zone, remove a microbe from your pathogen zone.

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☆

Event

Go to work sick

You lose 2 health and give a microbe from your pathogen zone to target player.

Stay home!

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Go to work sick

You lose 2 health and give a microbe from your pathogen zone to target player.

Stay home!

_'



$Airplane\ trip$

Each player passes one microbe in play to the player on their left (if that microbe is opportunistic, it moves to the same type of zone on the target player).

Sharing is caring



Airplane trip

Each player passes one microbe in play to the player on their left (if that microbe is opportunistic, it moves to the same type of zone on the target player).

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Bus trip

Each player passes one microbe in play to the player on their right (if that microbe is opportunistic, it moves to the same type of zone on the target player).

Sharing is caring



Event

$Bus\ trip$

Each player passes one microbe in play to the player on their right (if that microbe is opportunistic, it moves to the same type of zone on the target player).

Sharing is caring

Event

Raid the pharmacy

Search the deck for any antibiotic of your choice (tetracycline, kanamycin, or ampicillin). Show to all players. Shuffle the deck afterwards.

We're not suggesting you do this

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Search the deck for any antibiotic of your choice (tetracycline, kanamycin, or ampicillin). Show to all players. Shuffle the deck afterwards.

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Checkup

Every player scores their microbiome. Positive health for cards in the beneficial zone and negative health for cards in the pathogen zone. Health gain/loss indicated in the green/red circles.

Got a healthy microbiome?



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