

13

DIARRRHEA

+1



Ignore last roll and re-roll die

Tiny amoeba-like creatures (protozoans) lurk in our intestines, feasting on bacteria and quietly shaping our microbiomes.

MicroBite Qn #1

13

DIARRHEA

+1



Ignore last roll and re-roll die

Although assumed to be representative, microbes from stool are distinct from those most closely associated with the gut lining.

13

DIARRHEA

+1



Ignore last roll and re-roll die

The microbiota of Fecal Microbiome Transplant (FMT) "super-donors" are highly successful in engrafting into recipients' guts. Ultimately though, host factors determine FMT receptivity.

MicroBite Qn #3

13

DIARRHEA

+1



Ignore last roll and re-roll die

After FMT, engrafted commensal microbes from a healthy donor keeps *C. difficile* at bay by limiting its access to nutrients and space, and by producing antimicrobial chemicals.

13

DIARRHEA

+1



Ignore last roll and re-roll die

Stool consistency is scored using a 7-point Bristol Stool Scale (BSS), where higher scores refer to loose stools (fast colon transit times) and low scores refer to hard stool (slow transit).

13

DIARRHEA

+1



Ignore last roll and re-roll die

Loose stool occurs when feces passes quickly through the colon. Bacteria avoid being flushed out by reproducing rapidly or sticking onto the intestinal lining and forming biofilms.

MicroBite Qn #6

13

DIARRHEA

+1



Ignore last roll and re-roll die

During natural birth, the mother's vaginal microbiota are the first to engraft into the newborn and greatly shape early life microbiota composition.

MicroBite Qn #7

13

DIARRHEA

+1



Ignore last roll and re-roll die

Stools from healthy donors have to be screened negative for pathogens before being introduced to the recipient's large intestine during fecal microbiota transplantation (FMT).

13

DIARRHEA

+1



Ignore last roll and re-roll die

Although colonization by *Helicobacter pylori* is a risk factor for gastric cancer, other microbes have since been implicated as co-conspirators as well.

13

DIARRHEA

+1



Ignore last roll and re-roll die

Drunk without drinking?
Auto-brewery syndrome can occur
when fungi in the gut ferment
carbohydrates into alcohol.

13

DIARRHEA

+1



Ignore last roll and re-roll die

Most of the probiotics we consume will be killed by our stomach acids or be passed out in our poop - only those that engraft in our gut can exert a longer-lasting impact!

MicroBite Qn #11

13

DIARRHEA

+1



Ignore last roll and re-roll die

Previously, microbiota characterization was limited to what we could culture. Culture-free methods like Next Generation Sequencing (NGS) get around that by identifying based on DNA.

13

DIARRHEA

+1



Ignore last roll and re-roll die

Diversity in the gut microbiome promotes healthy competition between species, promoting long-term stability and proper function.

MicroBite Qn #13

11

FACT-CHECK

7

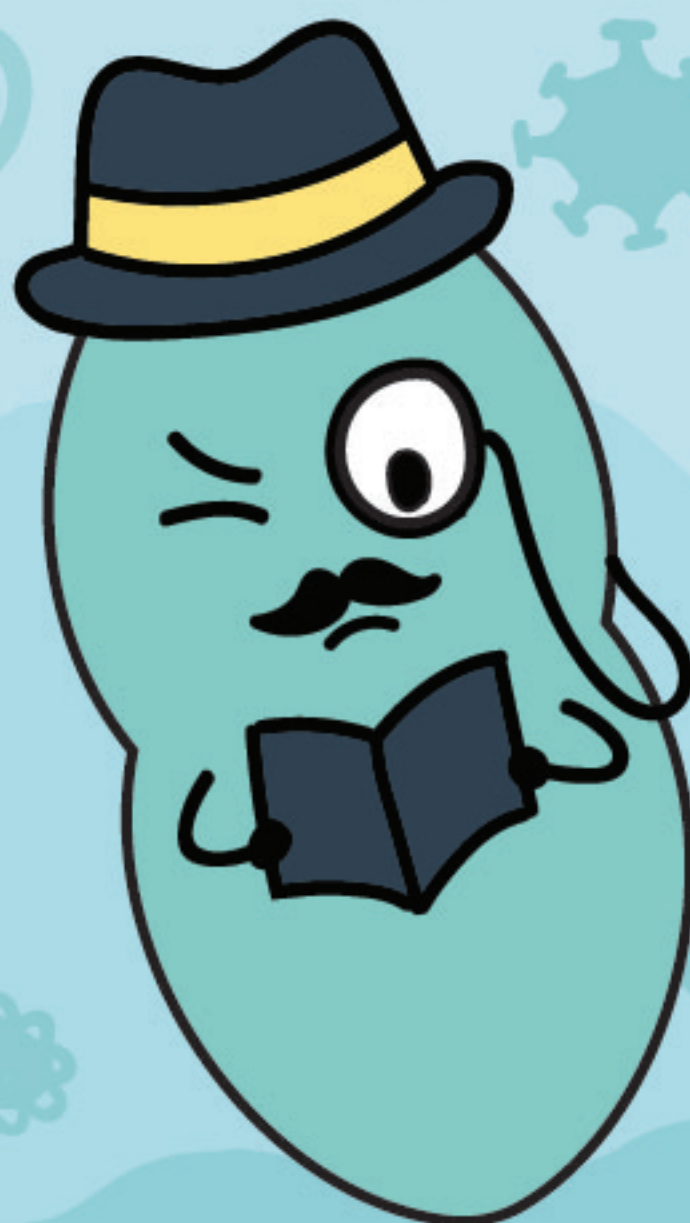
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Ignore last roll and stop rolling

Don't throw the baby out with the bathwater! Within the same species (e.g. *E. coli* or *E. faecalis*), some strains may cause diseases while others are part of a healthy microbiome.

11

FACT-CHECK

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Ignore last roll and stop rolling

Gut microbiota can impact the effectiveness of medication. For instance, Akkermansia bacteria can increase the effectiveness of anti-cancer drugs.

11

FACT-CHECK

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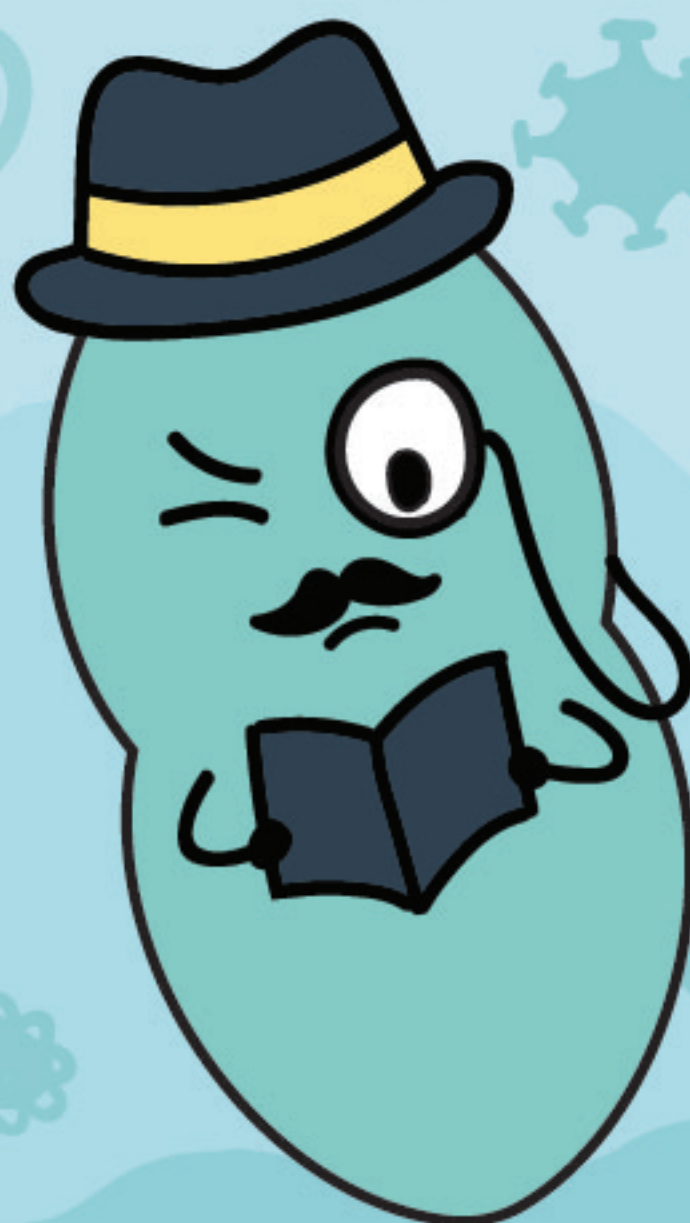
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Ignore last roll and stop rolling

Research often finds links (associations) between the gut microbiome and various health conditions. However, whether gut microbes actually cause those diseases isn't always clear.

11

FACT-CHECK

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Ignore last roll and stop rolling

More isn't always better! Probiotics that boast higher colony-forming units (CFU) don't necessarily make them more effective. The right strain for the job may be more important.

11

FACT-CHECK

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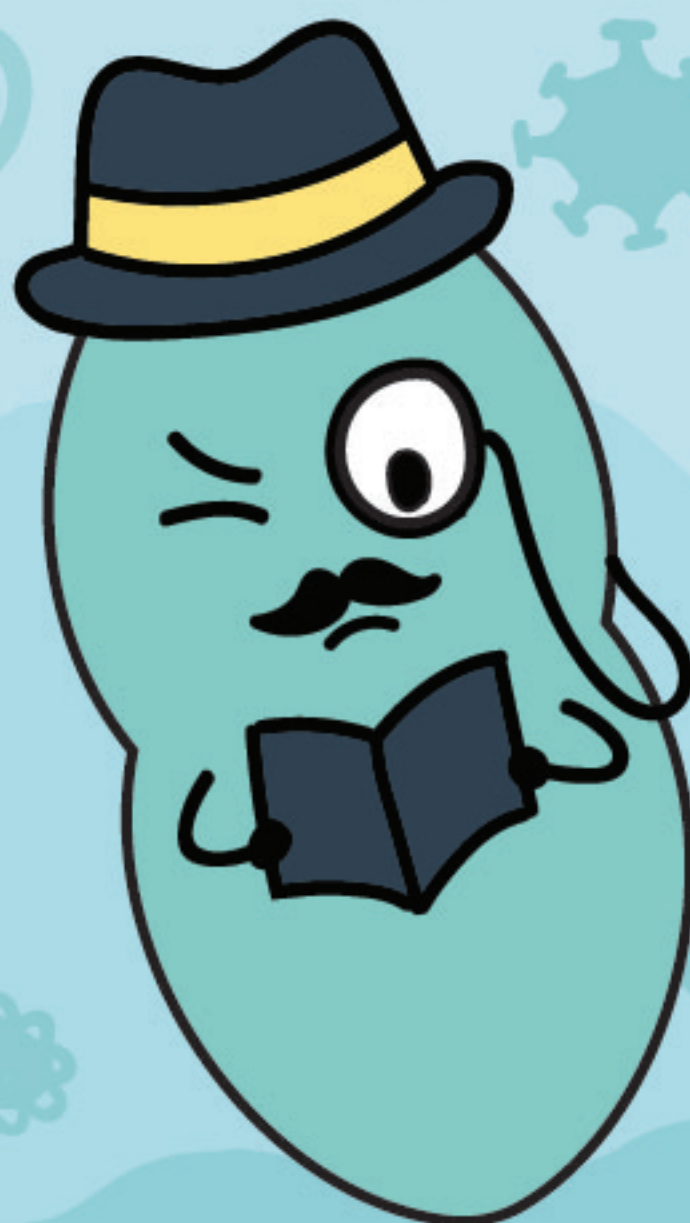
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Ignore last roll and stop rolling

With all sorts of claims, supplements and cosmetics (unlike medicines) are not required to prove they work! But they cannot claim to diagnose/treat/prevent disease.

11

FACT-CHECK

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III



Ignore last roll and stop rolling

The natural transfer of beneficial vaginal microbes during childbirth fails to occur when a baby is delivered by C-section.

11

FACT-CHECK

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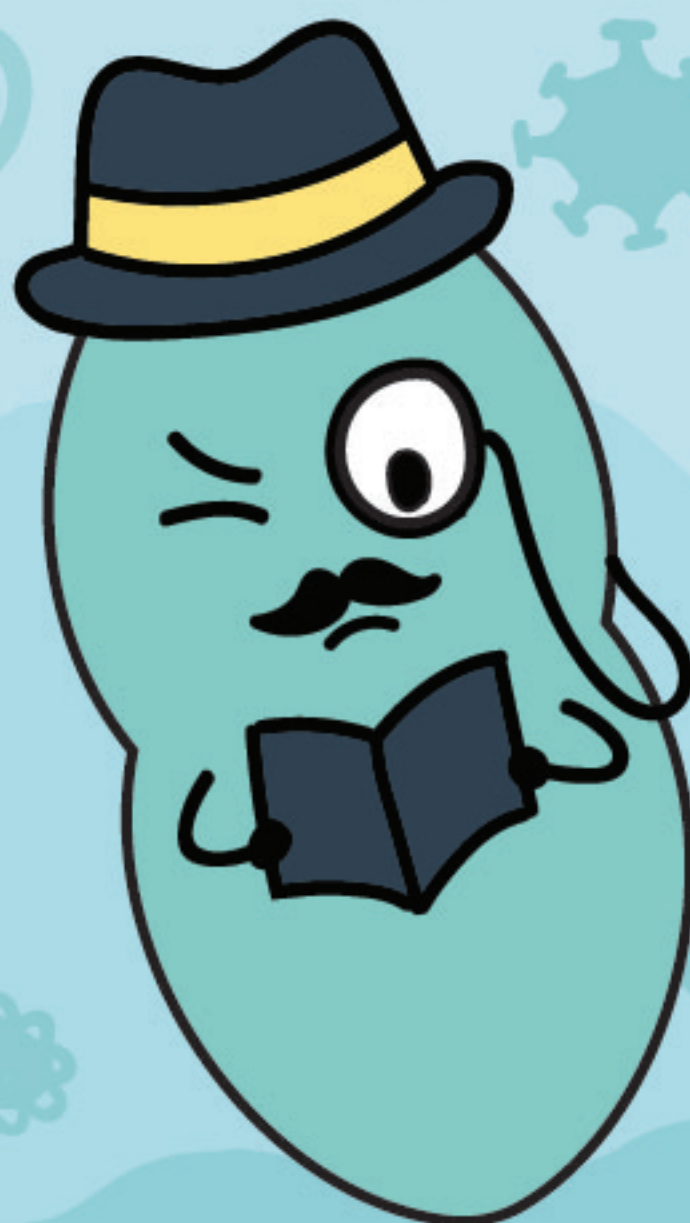
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Ignore last roll and stop rolling

Gut microbes digest what we cannot, increasing the energy we extract from food. Hmmm... Is that a good or bad thing?

11

FACT-CHECK

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Ignore last roll and stop rolling

Good gut microbes strengthen our gut lining, preventing it from becoming “leaky” so undigested food, pathogens and toxins do not enter our blood.

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FACT-CHECK

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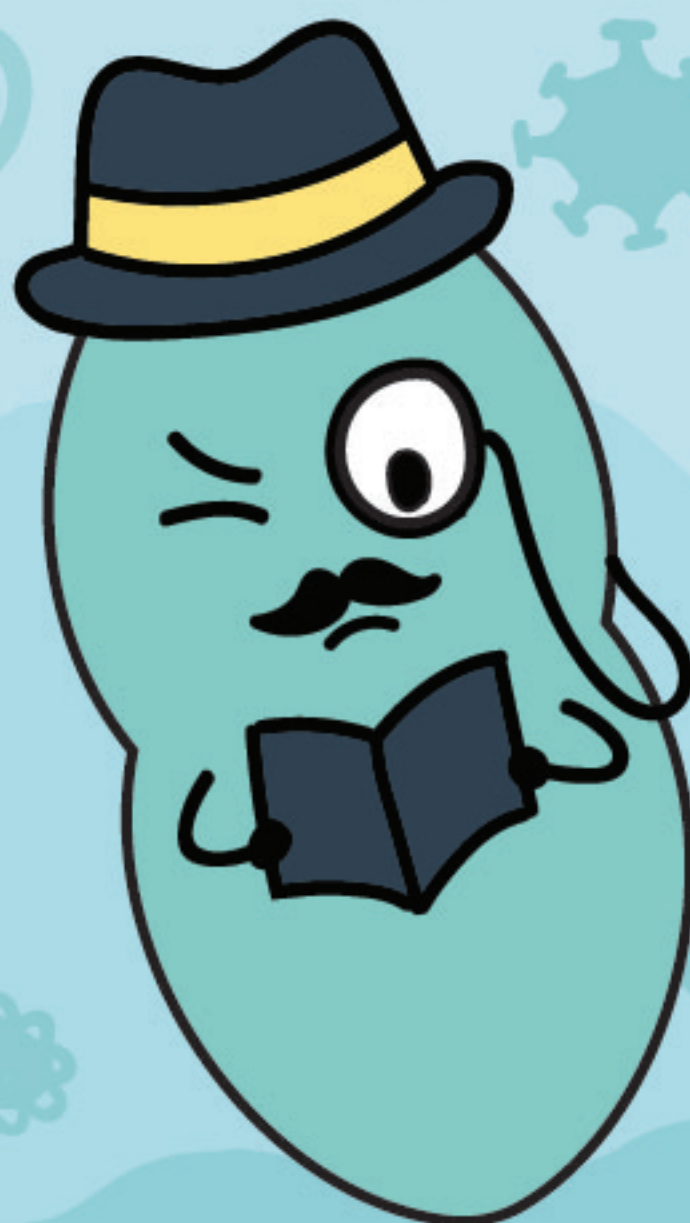
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Ignore last roll and stop rolling

Healthy gut microbiota promotes maturation of our brain and immune system, but early repeated exposure to antibiotics is linked to ADHD and autoimmune disorders.

11

FACT-CHECK

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Ignore last roll and stop rolling

You may have seen labels of "good" and "bad" bacteria, but the distinction isn't always clear. Microbial diversity and balance (evenness) is the key!

11

FACT-CHECK

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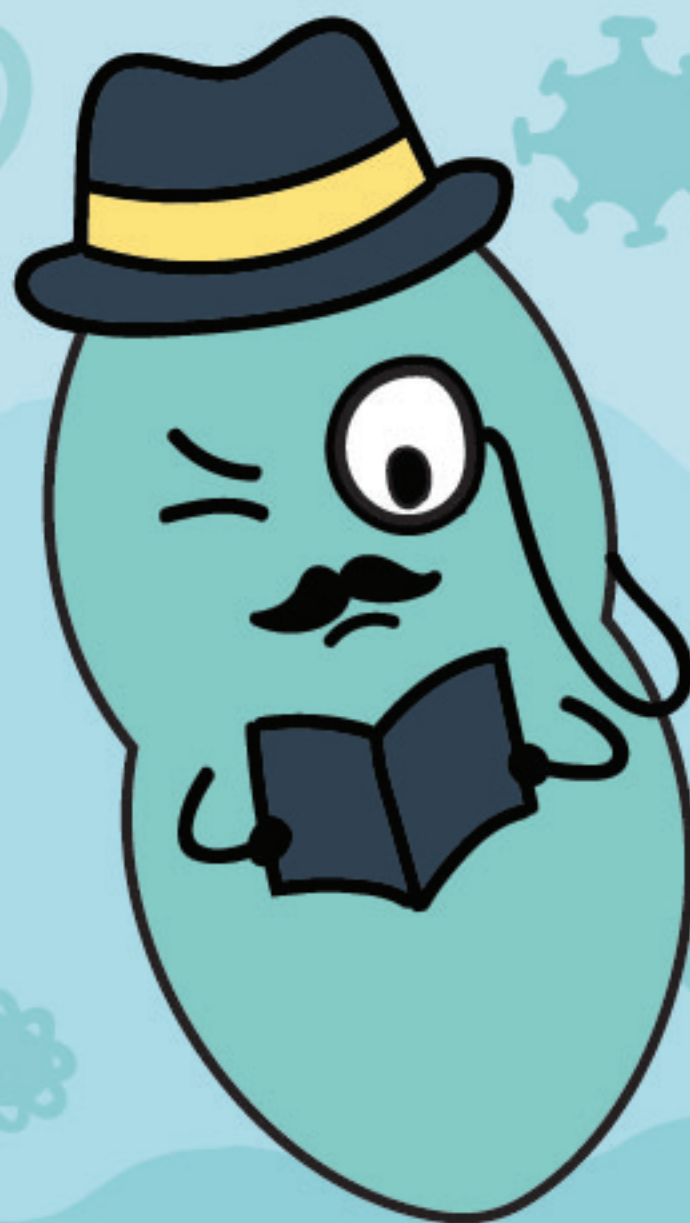
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Ignore last roll and stop rolling

Single-cellular animal-like microbes, like the gut parasite *Blastocystis*, may kill off pathogens and promote healthy microbiota.

9

CONVICTION & CONSISTENCY

6

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II

1

III



Use any of your chips twice

Our diet greatly shapes our microbiomes, but these changes and associated benefits only last as long as our diets do. So conviction and consistency is key!

MicroBite Qn #25

9

CONVICTION
&
CONSISTENCY

6

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III



Use any of your chips twice

The gut microbiome has been linked to healthy development and functioning of the skin, brain, muscles, heart, kidneys, lungs and even bones!

MicroBite Qn #26

9

CONVICTION
&
CONSISTENCY

6

I

2

II

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III



Use any of your chips twice

Our lifestyle and environment (including exercise, sunlight exposure and climate) all influence our microbiome. We influence our microbes as much as they influence us!

MicroBite Qn #27

9

CONVICTION & CONSISTENCY

6

I

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III



Use any of your chips twice

Regular application of creams that contain prebiotics may promote the growth of healthy skin microbiota that make it harder for acne-causing bacteria to thrive.

9

CONVICTION
&
CONSISTENCY

6

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III



Use any of your chips twice

Gut microbiota can influence our feelings of hunger and even determine our cravings by producing hormones and neurotransmitters.

9

CONVICTION
&
CONSISTENCY

6

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Use any of your chips twice

Regular consumption of a varied and balanced diet rich in prebiotic fibers will enrich the proportion of health-promoting gut commensal. So persevere!

9

CONVICTION
&
CONSISTENCY

6

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Use any of your chips twice

Gut viromes (the community of viruses) of twins are similar at infancy but completely diverge by adulthood, highlighting the role of environmental factors in determining composition.

9

CONVICTION
&
CONSISTENCY

6

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III



Use any of your chips twice

Brush your teeth to reduce the chances of dementia?! Studies show that *P. gingivalis* bacteria that cause gum disease (gingivitis) are also associated with Alzheimer's disease.

9

CONVICTION
&
CONSISTENCY

6

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2

II

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III



Use any of your chips twice

Frequent use of contact lenses alters the eye microbiota such that it more closely resembles the skin microbiota.

7

TAKE A
SUPPLEMENT

5

I

3

II

1

III



Roll die for pro/pre/synbiotics
to choose a card from waste pile

Synbiotics, the combination of
probiotics and prebiotics, may
remedy the atypical gut microbiomes
of babies born via C-section.

7

TAKE A
SUPPLEMENT

5

I

3

II

1

III



Roll die for pro/pre/synbiotics
to choose a card from waste pile

If prebiotics are food for probiotics,
what are postbiotics? They are
health-promoting metabolic waste
products of probiotics like short chain
fatty acids, enzymes and antimicrobials.

7

TAKE A
SUPPLEMENT

5

I

3

II

1

III



Roll die for pro/pre/synbiotics
to choose a card from waste pile

Paraprobiotics are dead probiotics
whose remains continue to signal
the microbiome and immune cells,
promoting gut barrier function. Talk
about being "undead"!

7

TAKE A
SUPPLEMENT

5

I

3

II

1

III



Roll die for pro/pre/synbiotics
to choose a card from waste pile

To resist destruction by stomach acids,
probiotics may be naturally or
artificially encapsulated in biofilms
(e.g. in kefir grains or with alginate),
or sold as very hardy endospores.

7

TAKE A
SUPPLEMENT

5

I

3

II

1

III



Roll die for pro/pre/synbiotics
to choose a card from waste pile

Complex sugars (prebiotics) in
breastmilk, called human milk
oligosaccharides, promote the
growth of beneficial Bifidobacteria
in baby's gut!

7

TAKE A
SUPPLEMENT

5

I

3

II

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III



Roll die for pro/pre/synbiotics
to choose a card from waste pile

Mwah! An average of 80 million
bacteria are transferred in a 10
second kiss! As such, couples who
kiss often have similar oral
microbiota profiles.

7

TAKE A
SUPPLEMENT

5

I

3

II

1

III



Roll die for pro/pre/synbiotics
to choose a card from waste pile

Take it slow! Consuming too much
probiotics too quickly may cause
stomach discomfort, bloating and
diarrhea.

7

CHASE A
TREND

4

I

2

II

0

III



Force someone to roll the die

Clinical trials show that avocados increase the proportion of fiber-fermenting microbes that produce health-promoting short chain fatty acids (SCFA).

7

CHASE A
TREND

4

I

2

II

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III



Force someone to roll the die

The Mediterranean diet (rich in vegetables, fish, nuts and grains) promotes gut microbiomes that are associated with healthy longevity.

7

CHASE A
TREND

4

I

2

II

0

III



Force someone to roll the die

A diverse and balanced skin microbiome, not one depleted of microbes, is important for healthy and functional skin. Beyond beauty, the skin has many functions we often take for granted!

7

CHASE A
TREND

4

I

2

II

0

III



Force someone to roll the die

While most probiotic supplements contain one or a few species, fresh produce (fruits and vegetables) typically come with their own natural and diverse microbiota!

7

CHASE A
TREND

4

I

2

II

0

III



Force someone to roll the die

Exposure to harmless microbes early in life (children raised in homes with pets) trains the immune system to tolerate non-harmful stimuli and reduces the risk of allergies.

Puppy power!

7

CHASE A
TREND

4

I

2

II

0

III



Force someone to roll the die

“Probiotics” is a buzzword found on many products which may not actually contain any live microorganisms! Storage conditions and the ingredients list should give you a clue.

7

CHASE A
TREND

4

I

2

II

0

III



Force someone to roll the die

You are special and your microbiome is unique! But broad categories (enterotypes) provide a handle on diversity and allow development of consumer products for specific enterotypes.

4

PHAGE THERAPY

3

I

0

II

0

III



Kill all engrafted cards of a specified type of one player

Bacteriophages only infect very specific host bacteria as they lack the receptors to infect other microbial or humans cells.

4

PHAGE THERAPY

3

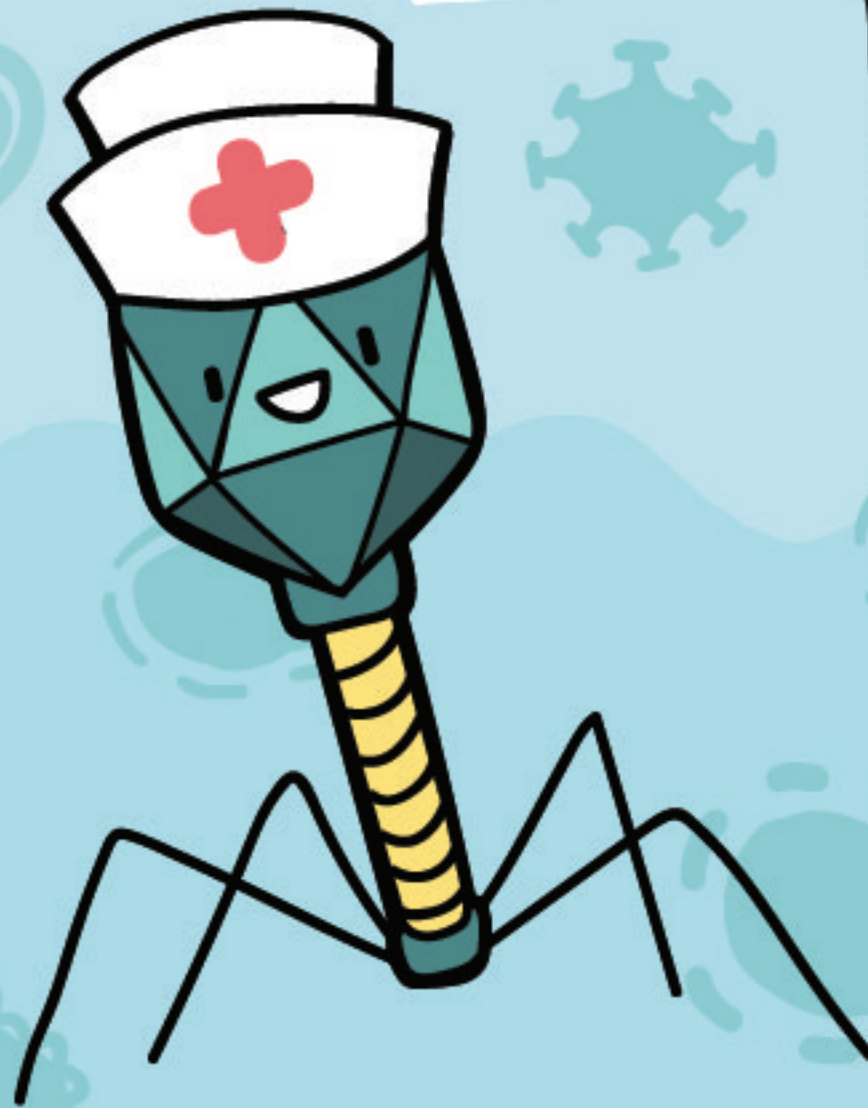
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III



Kill all engrafted cards of a specified type of one player

Bacteriophages used in phage therapy are "lytic": they infect, replicate within, and burst (lyse) their hosts to release "baby" viruses that seek out new hosts.

4

PHAGE THERAPY

3

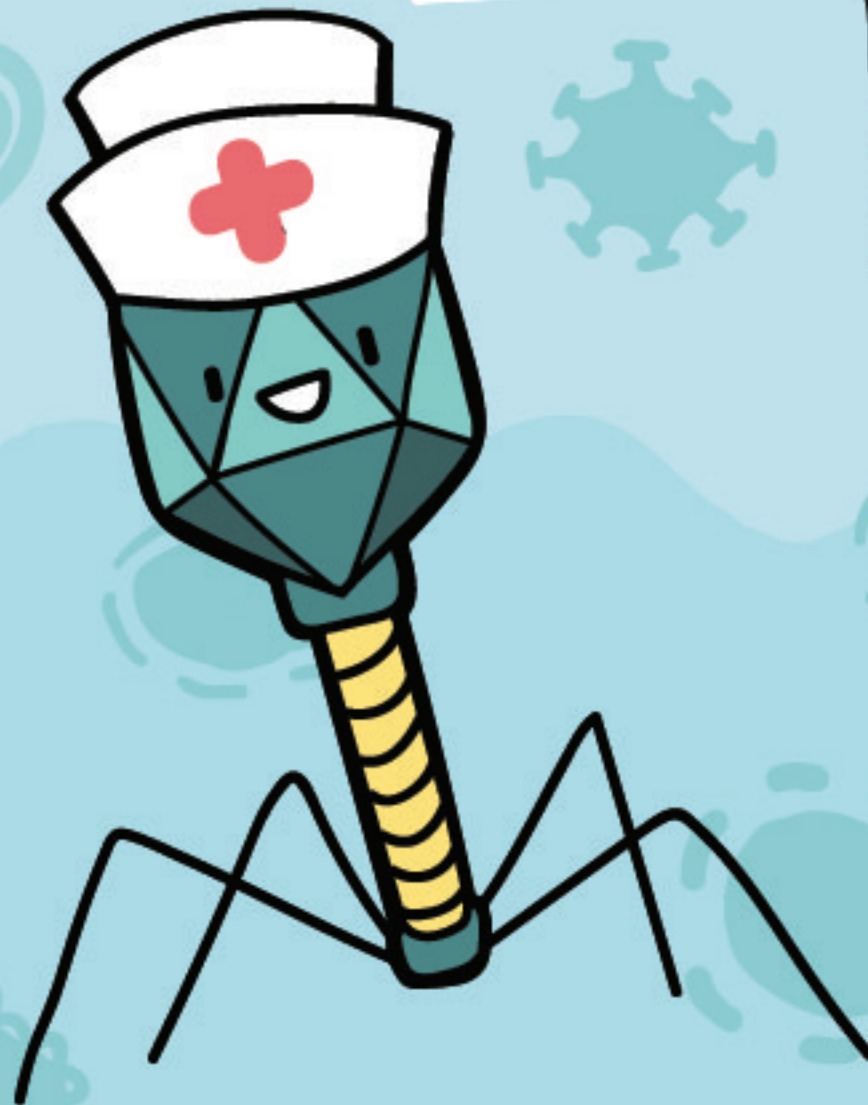
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Kill all engrafted cards of a specified type of one player

Bacteria in biofilms can be more resistant to phages than free-living (planktonic) bacteria as phages are less effective at penetrating the protective glue-y matrix of the biofilm.

4

PHAGE THERAPY

3

I

0

II

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III



Kill all engrafted cards of a specified type of one player

Phage therapy isn't perfect: pathogens may not be eradicated, bacteria may develop phage resistance, and bystander bacteria unintentionally harmed due to polymicrobial interactions.

3

ANTIBIOTIC- DEPLETED GUT



Block steal/kill, draw
2 from deck

While important in treating bacterial infections, antibiotics inadvertently end up killing good bacteria too, leaving our gut susceptible to colonization by antibiotic-resistant pathogens.

3

ANTIBIOTIC- DEPLETED GUT



Block steal/kill, draw
2 from deck

A drug-resistant pathogen that survives an antibiotics onslaught will find itself with much less competition from gut commensals for resources, growing rapidly to dominate the gut.

3

ANTIBIOTIC- DEPLETED GUT



Block steal/kill, draw
2 from deck

Domination of *Clostridioides difficile* in the gut causes antibiotic-associated diarrhea. Restoration of a balanced microbiome through fecal microbiota transplant (FMT) helps reverse this.

2

BIOFILM STABILIZED



Block and reverse steal/kill

The earliest studied human microbiome is dental plaque. Multispecies biofilms on teeth were first observed by Antonie van Leeuwenhoek (inventor of the microscope) > 300 years ago!

MicroBite Qn #55

2

BIOFILM STABILIZED



Block and reverse steal/kill

What goes in, must come out...
Unless it sticks! Most microbes that
are intentionally introduced will be
pooped out, and only those that
engraft will sustain more long-term
impact.

TOKEN MENU



If you have this token, start by exchanging for an unclaimed token.



Draw up to 2 cards from deck.



ENGRAFT up to 2 cards by placing them on the table face down.



Draw up to 1 card and ENGRAFT up to 1 card face down.



Steal 1 random card from another player's hand.



Draw 1 card and ask corresponding MicroBite Question. Those who answer correctly may ENGRAFT 1 card face up. For every card they ENGRAFT, you draw 1 card OR ENGRAFT 1 card face down.

QUICK START

Player #1: 3 cards, #2: 4, #3: 5, #4: 6 cards

1. Roll die and collect token. You may roll repeatedly to collect more tokens, but turn ends if you roll the same token again.
2. Use token(s), beginning with Epiphany, and strategically ENGRAFT cards.
3. If desired, play any card(s) in hand and discard afterwards.
4. Turn ends, next player begins step 1.
5. Game ends when the deck runs out and current player completes their turn.
6. Only ENGRAFTED cards are scored. Cards in hand are discarded.
7. Points depend on who has the majority of each card type.



NO GUTS
NO GLORY!