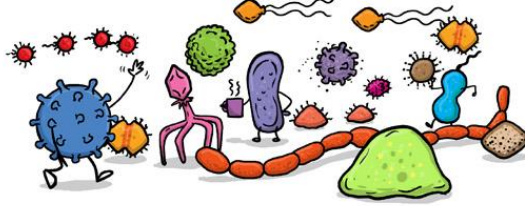
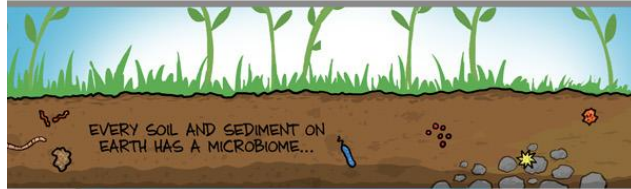


The Hidden World of MICROBIOMES



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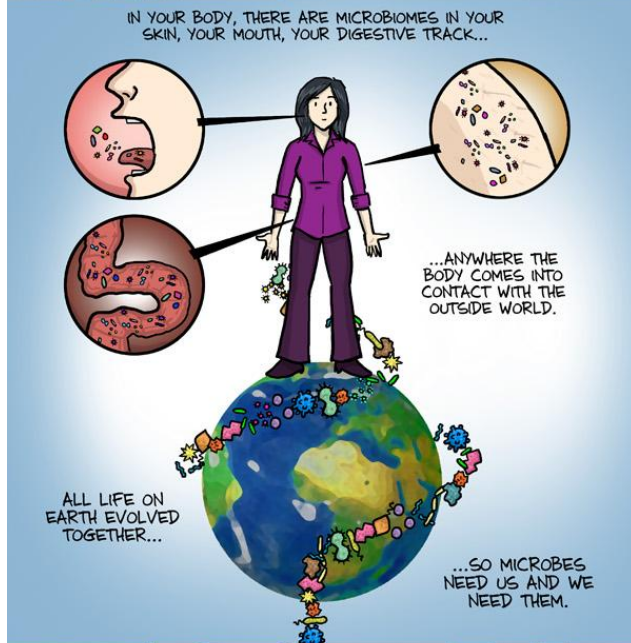
MICROBIOMES ARE COLLECTIONS OF MICROORGANISMS THAT LIVE TOGETHER IN A GIVEN ENVIRONMENT.



EVERY SOIL AND SEDIMENT ON EARTH HAS A MICROBIOME...



...THERE ARE MICROBIOMES IN THE OCEAN AND EVEN IN THE ATMOSPHERE.

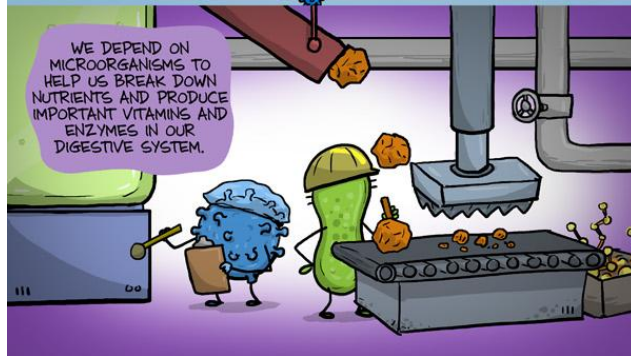


IN YOUR BODY, THERE ARE MICROBIOMES IN YOUR SKIN, YOUR MOUTH, YOUR DIGESTIVE TRACK...

...ANYWHERE THE BODY COMES INTO CONTACT WITH THE OUTSIDE WORLD.

ALL LIFE ON EARTH EVOLVED TOGETHER...

...SO MICROBES NEED US AND WE NEED THEM.



WE DEPEND ON MICROORGANISMS TO HELP US BREAK DOWN NUTRIENTS AND PRODUCE IMPORTANT VITAMINS AND ENZYMES IN OUR DIGESTIVE SYSTEM.

IT IS ESTIMATED THERE ARE OVER

1000

DIFFERENT KINDS OF MICROORGANISMS
LIVING INSIDE OUR BODIES, CONTAINING ABOUT

300x

MORE GENES THAN OUR OWN HUMAN CELLS.

IF YOU PUT TOGETHER ALL THE MICROORGANISMS INSIDE YOU
INTO ONE MASS, IT WOULD WEIGH AS MUCH AS 6 POUNDS. IN
COMPARISON, YOUR BRAIN WEIGHS ABOUT 3 POUNDS!

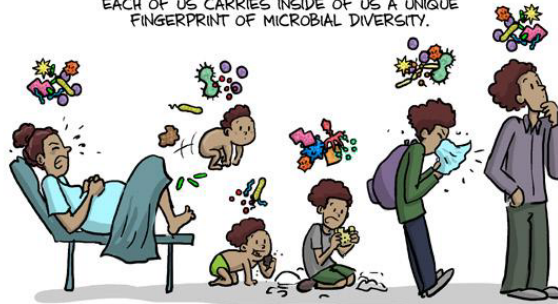


6 POUNDS



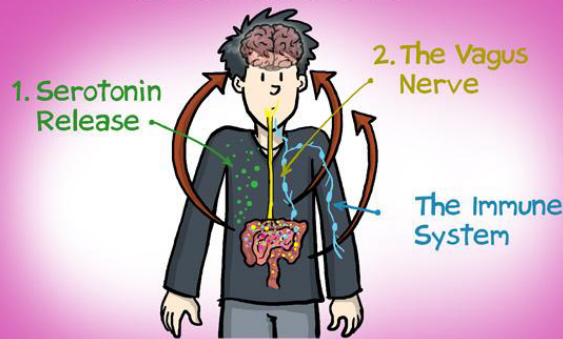
3 POUNDS

EACH OF US CARRIES INSIDE OF US A UNIQUE
FINGERPRINT OF MICROBIAL DIVERSITY.



YOUR UNIQUE MICROBIOME STARTS AS SOON AS YOU ARE
BORN, AND IS INFLUENCED BY YOUR DIET, YOUR EXPERIENCES,
WHAT YOU'RE EXPOSED TO AND WHERE YOU LIVE.

IN SOME CASES, YOUR MICROBIOMES CAN EVEN
AFFECT YOUR MOOD AND BEHAVIOR.



SCIENTISTS BELIEVE THERE ARE SEVERAL PATHWAYS
THROUGH WHICH THE BACTERIA AND OTHER MICROBES IN
YOUR BODY INFLUENCE YOUR BRAIN CHEMISTRY.

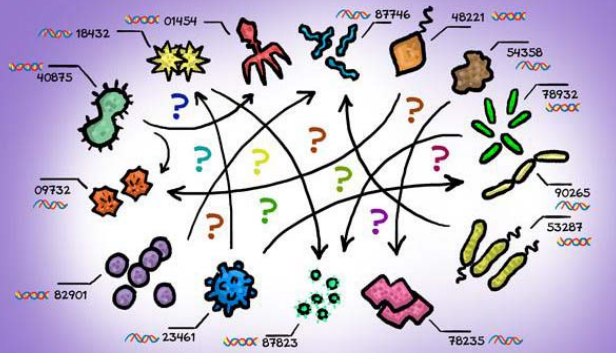
FOR EXAMPLE, EXPERIMENTS HAVE
SHOWN THAT ORGANISMS THAT
ARE RAISED IN COMPLETELY
STERILE ENVIRONMENTS...



...PERFORM DIFFERENTLY IN
TASKS RELATED TO LEARNING,
MEMORY AND SOCIAL BEHAVIOR.



CURRENTLY, SCIENTISTS DON'T HAVE A PERFECT
UNDERSTANDING OF HOW THESE MICROBIOMES WORK.



ALTHOUGH WE CAN CATALOGUE WITH INCREDIBLE PRECISION AND SPEED THE NUMBER OF MICROBES LIVING INSIDE OF US AND AROUND US, WE STILL HAVE A LARGE GAP IN KNOWING HOW THESE COMMUNITIES INTERACT WITH EACH OTHER AND WITH THEIR ENVIRONMENTS.

TO DEVELOP THE KINDS OF TOOLS NEEDED TO STUDY MICROBIAL COMMUNITIES AND HOW THEY FUNCTION, WE NEED A UNIFIED APPROACH THAT DRAWS ON MANY DIFFERENT DISCIPLINES.

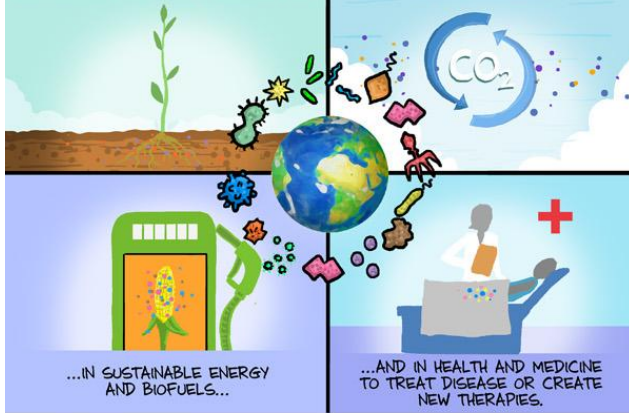


FROM THE INSIDE OF ONE CELL UP TO THE SIZE OF OUR ENTIRE PLANET, WE NEED NEW TECHNOLOGIES AND METHODS TO HELP US DECIPHER THE WORKING PRINCIPLES OF THESE COMMUNITIES.

IF WE CAN UNDERSTAND THESE COMPLEX SYSTEMS, IT WOULD HAVE A LARGE IMPACT IN HOW WE INTERACT WITH THE NATURAL WORLD.

THERE ARE APPLICATIONS IN AGRICULTURE AND CROP PRODUCTIVITY...

...IN CLIMATE SCIENCE AND CARBON CYCLING...



...IN SUSTAINABLE ENERGY AND BIOFUELS...

...AND IN HEALTH AND MEDICINE TO TREAT DISEASE OR CREATE NEW THERAPIES.

UNDERSTANDING MICROBIOMES MAY EVEN HELP US ONE DAY TO COLONIZE NEW PLANETS!

MICROBES WERE ON EARTH BEFORE US AND THEY ARE AN IMPORTANT PART OF WHAT MAKES OUR PLANET HABITABLE.

IF WE WANTED TO COLONIZE MARS, FOR EXAMPLE, IT WOULD BE CRITICAL TO UNDERSTAND THE ROLE MICROBES PLAY AND HOW THEY INTEGRATE WITH A NEW ECOSYSTEM.



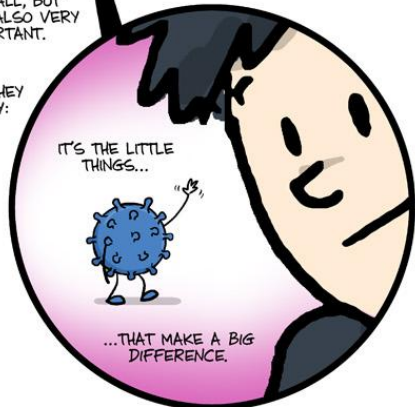
WE ARE ONLY JUST NOW BEGINNING TO UNDERSTAND THE FULL BREADTH OF SERVICES MICROBES HAVE TO OFFER!

THERE'S A WHOLE INVISIBLE MICROBIAL WORLD OUT THERE THAT WE DIDN'T KNOW EXISTED BEFORE, AND WE ARE ALMOST AT THE CUSP OF UNDERSTANDING THIS HUGE PART OF OUR ENVIRONMENT AND OUR OWN BODIES.



MICROBIOMES MAY BE SMALL, BUT THEY'RE ALSO VERY IMPORTANT.

AS THEY SAY:



IT'S THE LITTLE THINGS...

...THAT MAKE A BIG DIFFERENCE.

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