

The Canine Healthy Soil Hypothesis

Exposure, especially as a young puppy, to healthy soil can help restore the dog's ancestral microbial communities and therefore enhance the overall health of the dog.

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Natural Pet Products

My purpose today is to ask you to help us test the healthy soil hypothesis

- Healthy soil can be obtained free or at low cost
- Make sure testing is done consistently, is comparable, meets publication standards and answers the questions we want to answer.
- No laboratory dogs needed

www.caninehealthysoil.com

The Canine Healthy Soil Team

- Steve Brown
 - Charlee Bear® Dogs, Charlee Bear® Dog Treats, Steve's Real Food for Pets, See Spot Live Longer, Unlocking the Canine Ancestral Diet, The Animal Diet Formulator
- Dr. Natasha Lilly, DVM
 - Co-Founder of RAHU, Animal Diet Formulator; Adjunct Professor College of Agriculture, Cal Poly University, San Luis Obispo
- James Pendergast
 - Commercial Pet food Formulation Consultant, Product Management & Veterinary Sales Director
- Advisors include
 - Dr. David C. Johnson, Soil Microbiologist/Molecular Biologist, New Mexico State, College of Engineering, Institute for Sustainable Agricultural Research
 - Dr. Tim LaSalle, Co-Founder of CSU Chico, Center for Regenerative Agriculture; Director of Outreach & Development; Adjunct Professor

What is healthy soil?

- Highly biodiverse, 1 gram may contain
 - 10 billion microbes plus phages
 - 2,000 – 10,000 species
- Clean, not treated with herbicides, pesticides, and chemical fertilizers.
- Sustainable, preferably produced on polyculture farms through Regenerative Agriculture methods.

Regenerative Agriculture

Regenerative Agriculture is a holistic land management practice that produces microbially-rich, healthy soil for healthy plants, animals, humans, and the environment.



The Center for
REGENERATIVE
AGRICULTURE
CALIFORNIA STATE UNIVERSITY, CHICO

Why we started this

- The foods we're feeding are getting better and better, but
- Generations are not getting healthier
 - We're going in circles
- Poor dogs can't afford our great foods
- "Something is missing"
 - "Some dogs eating raw and raw bones have great teeth, some have bad teeth. Why?"
- Steve's experiences with Charlee Bear® Dogs
- Eat dirt books and articles from scientists to popular writers
 - Eating Dirt: The Benefits of Being (Relatively) Filthy, Scientific American 2013

Eating dirt can be good for you - just ask babies

NY Times, Jane E. Brody, 2009



Some recent books

- Never Home Alone by Rob Dunn. 2018
- Dirt is Good: The Advantage of Germs for Your Child's Developing Immune System by Jack Gilbert, Rob Knight. 2017
- The Whole-Body Microbiome: How to Harness Microbes-Inside and Out-for Lifelong Health by Brett Finlay, Jessica Finley, 2019
 - Authors of Let them Eat Dirt, Saving Your Child from an Oversanitized World, 2016
- Eat Dirt: Why Leaky Gut May Be the Root Cause of Your Health Problems and 5 Surprising Steps to Cure It, Josh Axe. 2016

My Charlee Bear® Dog experience

- First 2 generations
- Last 3 generations
 - NO teeth problems
 - NO ear problems
 - NO hot spots
 - NO flea problems
 - 11 healthy pups /litter, compared to 7
 - 1.5 years longer life, longer healthspan



The dietary and environmental changes

- From “the best” kibble to ***balanced raw diets***

“We consume about 100 million bacterial cells with one apple...organically managed apples harbor a significantly more diverse microbiota than conventionally managed ones.”

An Apple a Day: Frontiers in Microbiology, July 2019.

- From rawhide to raw bones
- From traditional veterinarians to holistic veterinarians
 - Fewer vaccinations, minimal deworming, flea and tick, and heartworm medications
- From attempts-at-sterile environments to healthy soil environments
 - Starting at two weeks old, pups played in healthy soil most of the day



“Biology is in a revolution”

New Scientist headline, August 2019:

*“The diseases most people die of have been attributed to unhealthy lifestyles. But evidence now suggests bacteria are to blame, **heralding a revolution in medicine.**”*

Read more: <https://www.newscientist.com/article/mg24332420-900-have-we-found-the-true-cause-of-diabetes-stroke-and-alzheimers/#ixzz5w2TNt2oN>

Dog and human microbiome are similar

“The structural and functional similarity of the dog microbiome to the human one implies that, as human studies are predictive of results in dogs, dog studies may be predictive of results in humans. Thus, dog studies provide a double benefit: for dogs directly and for their potential to generalize to humans.”

Similarity of the dog and human gut microbiomes in gene content and response to diet; Microbiome 6, # 72 (2018)

<https://microbiomejournal.biomedcentral.com/articles/10.1186/s40168-018-0450-3>

The dog's microbiota probably affects every aspect of health

Inflammation, allergies, obesity, diabetes, teeth, breath, skin and coat, cancer, brain and temperament, the immune system, arthritis, ability to learn and remember....

The canine ancestral environment: full of microbial-rich mud, soil and dirt



Starting at birth, soil-based microbes colonize every environmental niche on and in naturally-raised puppies.



Microbes in soil and mammals

- 1 gram of soil may have
 - 10 billion microbes,
 - 2,000 – 10,000 species,
 - 32 different phyla
- Non-Westernized human microbiome may have
 - 25 phyla,
 - an average 2,000 genera
 - 5,000 species,
 - and 316 million genes.

Dumb Kids Playing on Freeway Get Squashed

*Domain, kingdom, **phyla**, family, genus, species, strains*

The Healthy Soil Hypothesis corollary

Vitamin supplements are to whole foods as

Probiotic supplements are to Healthy Soil

Vitamins: example thiamine.

Supplement: 100,000 ppm thiamine and no other nutrients

Natural foods: at most 25-30 ppm thiamine, hundreds of other nutrients

Microbes:

Probiotic supplements: 10- 20 species, 10 - 50 billion microbes /g

Soil: usually 2,000+ species, 500,000 to 10 billion microbes /g

Today's puppy environment: harsh cleaning chemicals, air fresheners, antimicrobial soaps, and new indoor microbes

Many puppies may never play in dirt until they get to their new homes, if then



Dogs evolved with their microbes

“Many microorganisms in the intestine seem to have developed in sync with their host animals over millions of years.”

Host diet and evolutionary history explain different aspects of gut microbiome diversity among vertebrate clades. *Nature Communications*, 2019; 10 (1) DOI: 10.1038/s41467-019-10191-3

We, and our dogs, are missing our “old friends”

- *“Given the ongoing extinction of our ancient commensal organisms, the future of a healthy human microbiome may include restoration of our ancestral microbial ecology.”ⁱ*
- *“It is possible that gut microorganisms harboured for long periods of human existence, including the VANISH taxa, shaped human biology over millennia.”*
 - The ancestral and industrialized gut microbiota and implications for human health, Nature Reviews, June 2019

Soil-based *Mycobacterium vaccae* may reduce stress

“This is just one strain of one species of one type of bacterium that is found in the soil but there are millions of other strains in soils,” Lowry said. “We are just beginning to see the tip of the iceberg in terms of identifying the mechanisms through which they have evolved to keep us healthy. It should inspire awe in all of us.”

Integrative Physiology Professor Christopher Lowry, U Colorado, **Healthy fat hidden in dirt may fend off anxiety disorders**

<https://neurosciencenews.com/dirt-fat-anxiety-14108/>

Missing our partners in evolution

“As human societies have migrated to urban environments, we have lost touch with a host of bacterial species that play a role in regulating our immune system, and this is helping to fuel an epidemic of inflammatory disease,” says Lowry.

Why dirt may be nature’s original stress-buster

<https://www.colorado.edu/today/2019/05/09/natures-original-stress-buster>

The asthma-protective effect of polyculture farms, Amish Dust studies

“The asthma-protective effect of farms appears to be associated with rich home dust microbiota.” Farm-like indoor microbiota in non-farm homes protects children from asthma development Nature Medicine (2019)

Amish (Rural) vs. non-Amish (Urban) Infant Fecal Microbiotas Are Highly Diverse and Their Transplantation Lead to Differences in Mucosal Immune Maturation in a Humanized Germfree Piglet Model Frontiers in Immunology, July 2019

Stable, diverse communities resist pathogens; all the environmental niches are occupied

The emergence and spread of antimicrobial resistance (AMR) can only be described as a catastrophic problem for human and animal health. It is projected that there would be [more deaths due to AMR than cancer by 2050](#).

*Special series: Antimicrobial resistance and the microbiome,
Microbiome, 2019 (BMC)*

As a general rule, early exposure to diverse communities of microbes is important

“This work highlights early life as a possibly crucial time for setting up host-microbe metabolic interactions....”

“the composition of the gut microbiota in early life is emerging as a factor in helping achieve and maintain good health in the years to come.”

Gut Microbiota, Interactive Effects on Nutrition and Health. Dr Edward Ishiguro et al, Academic Press, 2018

How early is early? We will find out

How we plan to test the canine healthy soil hypothesis

- Together, we get > 500 dogs, through their vets, to sign up
- We find sponsors to pay for preparatory work, breeder testing
- We start with the oral cavity
- Testing and Analysis
- Publish results
- Results available to all

Why we're starting with the oral cavity

Good health starts in the mouth

“The worst culprits, which seem to play a role in the widest range of ailments, are the bacteria that cause gum disease.”

New Scientist, August 2019

“Results show the blood-pressure-lowering effects of exercise were diminished by more than 60% over the first hour of recovery, and completely absent two hours post-exercise in those who used antibacterial mouthwash.”

Post-exercise hypotension and skeletal muscle oxygenation is regulated by nitrate-reducing activity of oral bacteria”. Raul Bescos et al. Free Radical Biology and Medicine. doi:10.1016/j.freeradbiomed.2019.07.035

Why we're starting with the oral cavity

- Physical examinations of the oral cavity by veterinarians
- The human oral microbiota is well studied, and includes the comprehensive Human Oral Microbiome Database, <http://www.homd.org/>.
- The eruption of puppy and adult teeth may be ideal times for soil exposure.
- We may be able to get sufficient data combined with physical examinations to publish reports within 2 years.
- Concern: stress can affect microbial populations

How we can test enough dogs to answer our questions

- You
 - Encourage your clients to sign up, tell everyone to participate, use social media
 - Go to our website and sign up, tell us how many clients
 - Tell us what you want to know.
- Us
 - We tell everyone we know to tell everyone they know to sign up
 - We send out press releases, stories
 - We work with regenerative ag specialists to develop local sources of healthy soil.

The first set of tests by the Canine Healthy Soil Team

- Dosage, frequency of exposure and timing of tests
- Finding the marker microbes
 - Metagenomic tests, looking for marker microbes within a wide spectrum of extremes between healthy and unhealthy dogs
 - Follow-up testing with 16S and 18S rRNA for concept proof
- Starting November 2019

Second set of tests by veterinarians

- Species composition testing with 16S/18S rRNA gene sequencing
- Test adult dogs and puppies, \$150-\$200 / dog
 - Before and after exposure to healthy soil
 - Before and after change of foods
- Test 10 litters working with breeders
 - \$ from sponsors, donations
 - 5 breeders, one litter exposed to healthy soil, one raised conventionally
 - Same genetics
 - Test when puppy teeth emerge, when sent to new home, when adult teeth emerge, after 2 years.
 - Yearly veterinary examinations

The veterinarian's work:

- Sign up now!
- Testing starts February 2020
- Order testing kits
- Fill out questionnaire
- Examine teeth
- Take samples or instruct clients on how to take samples
 - Same side of the same tooth, same time of day, same time after eating
- Follow up yearly
- Tell everyone!

Everyone who tests is part of the revolution in biology

Your clients will have helped their own dogs, future generations of dogs, and perhaps much more.

If we prove the canine healthy soil hypothesis

"Thus, dog studies provide a double benefit: for dogs directly and for their potential to generalize to humans"

✓ Healthy Soil for healthy plants.

Healthy Soil for healthy dogs.

Healthy Soils for healthy humans, and a healthy planet.

The next step is yours

www.caninehealthysoil.com

