



Microbiomes: To See the Unseen

A SPRING CREEK PROJECT CHAPBOOK



A Mother's Gift

Diana J. Bigelow

In Greek mythology, the nymph Thetis attempted to confer immortality on her infant son, Achilles, by dipping him in the River Styx. As the story goes, she missed a spot on his heel, leaving him vulnerable to an enemy's arrow. In real life, human mothers bestow their own special protection on their newborns in the form of an invisible coating of microbes. As the infant passes through her birth canal, her own microbes immediately begin to colonize every inch of the baby's skin and inhabit every orifice, all the way to the innermost reaches of the intestinal tract. Mother's first embrace and her first kiss confer new sets of microbes; with mother's milk comes additional bacteria matched with nutrient sugars to enable efficient digestion of milk; solid food activates yet other specialized bacteria. As the infant grows, so grows this microbial ecosystem in size and diversity; by the age of three, the toddler is fully equipped with an adult complement of some 2000 microbial species. The adult human will carry up to 5 pounds of microbial cells, ten times the number of human cells.

If well-cared for, this second skin of microbes confers, if not immortality, then a set of special capabilities not present in purely human cells. The human host of this microbial ecosystem is endowed with enhanced survival skills that include: (i.) protection against pathogens, (ii.) detoxification of environmental chemicals, (iii.) training of the developing immune system, (iv.) more efficient digestion and (v.) synthesis of essential vitamins. Without our marvelous microbiome, the human part of us would only exist as a thin and sickly version of ourselves. But with these invisible partners, we humans possess a robust and resilient microbial armament that is highly adaptable to our changing environment and the choices we make throughout our lifespan. Notably, dietary choices play a crucial role in the unique capabilities of the intestinal microbiome, where, for example, a vegetarian diet produces a profoundly different microbiome than that of a meat eater, the latter harboring bacterial species that promote atherosclerotic plaques.

As with Thetis's gift, the human infant can be left vulnerable if the initial maternal transfer of microbes is disrupted. Perinatal antibiotics, non-vaginal (C-section) birth, or formula feeding are Achilles' heels that leave infants susceptible to conditions like celiac disease, asthma, diabetes, and obesity. If we have learned anything from recent investigations into this invisible microbial part of us, it is the importance of nurturing this first gift from our mothers.



Social Theory

Jenna Noska

on each
square inch
of skin

32 million bacteria / surviving /

the body inhabited by

/ writhing / organized cooperative systems

secreting growth-

promoting enzymes

engaging

in mutual destruction / writhing /

they outnumber the body's own cells 10
to 1

/ alive / ecosystem

coiled in ecosystem / writhing / my body

a healthy percentage my body

exploiting

the common good / alive /

engaging in mutual
destruction

soft malleable skin easily imprinted upon

by microbial affairs my skin

this boundary lies

opened / writhing /

unzipped

exposed to moral confusion / where /

do i end and you

begin

/ exposed /

to ten million viruses in a drop of seawater



Beautiful or Not, Small Can Be a Way of Getting By Eleanor Berry

A sac & a stinger
may not seem like much but they're enough to make
a successful predator
and the combination is capable

of practically infinite
variations in form
polyp medusa one-after-the-other in successive life stages
ranging in size from gigantic to microscopic

No need to be big
to survive
One can thrive
by living off others

Ditch tentacles gut mouth
scores of unneeded genes
Dwindle to no more
than a few cells

The worm
won't know what it's eaten
won't know other animals

are using its body
as a changing-room

won't know it's excreted
new incarnations
of creatures it ate

ephemeral embodiments
with inflatable appendages

The fish
won't know what hit it
so minuscule a dart

won't know what's set it
whirling whirling whirling

filopodia fine wires
probing between
its cells
toxin infecting
tissue of its brain



Eastern Emerald Elysia

Joyce Schmid

These little sea slugs
are not born with chloroplasts.
They start off swaddled
red-brown in their shells,
exposed
against the greenery of sea.
They start off hungry,
desperate to sip the sap
of luscious algae
swaying in the swells.

They suckle on the algae
and they change:
the chloroplasts they swallow
take up residence inside their cells
and dye their bodies safely green.
Their baby shells dissolve,
their bodies morph—
and they are ambulating leaves!
They feed on sunlight
and they need no other food.

Delivered from their hunger, they are free
to live their independent lives
of indistinct identity,
their dim capacity for green fulfilled
by something from outside themselves.
Both animal and plant
but only animal at birth,
they blur the boundaries
that can't quite separate
the kingdoms of the earth.



And So I Am Never Alone

Robin Cedar

When I open my mouth you can hear
the long string of the concealed growing.
They push against my throat, trying
to flower outward like a string

of forget-me-not. They can't live
without me so they spindle up,
a network of roots, shifting and curling
around my tonsils, through the slits

of my teeth. I have never
held a cluster of ground elder
in my hands, but an unseen garden
grows deep in my gut.

My stomach is rich with mushrooms,
wasting away for want of sustenance.
My liver is thick with heirloom tomatoes,
bruised and such a deep red-brown.

If I try to have a conversation with my body,
the unseeable coating my lungs seep out
through my breath. My head is full
of yarrow, blooming from the folds

of my grey matter. I can't live without them.
If you look closely you can see them
through my skin – a constellation of star-drops
blooming in the dark. A moment of dual-belonging.



Airborne: An Elegy

Jennifer Richter

New research shows that all humans have a microbial cloud that emanates from their bodies. Though it's invisible to the eye, scientists can sample and sequence the cloud to identify your unique airborne microbial signature. —Newsweek.com, 9/22/15

*

To capture the clouds, scientists caught filtered air in cups;
subjects sat in a climate-controlled, sanitized room. In yours,

the hospice nurse maxxed the AC; the orderly apologetically
swept between our feet. Horseshoed around you, we

formulated questions/ compiled data/ drew conclusions.
At the end, we shared results. Shared, too—I think

the scientists would say—our microbiomes. They proved,
I think, you're still with us.

*

The mass on your scan was a stormy cumulonimbus,
your spine a bright contrail aimed straight into sky.

*

Seats line up like base pairs on this narrow plane
A-B, D-E who we are is shifting without you
three rows up my son's shoulder in the aisle
his first suit jacket could be my husband/your son
my daughter coos my voice to the toddler
peeking between seats now reaching stretching
tilting his cup to catch the vent's loud breath
your son sleeps on me and I'm doubled in size
you're fading from photos he's saved to carry on



In the Microbiome Lab (or the Day After the Biopsy)

Marilyn Johnston

The microscope hides nothing from the naked eye.
Left alone, the view on the slide, brilliant, artful—
bacteria from someone's dog's mouth,
a few drops of pond water, a sample of mud tracked in
on the sole of a shoe—bacterial cells proliferated on an agar plate.
I learn there are 10 million viruses in a drop of seawater,
that microbes are a collection of organisms in our bodies,
outnumbering our cells by a ratio of 10 to 1.
And I wish I had thought to ask for the cells culled yesterday,
as the needle probed my kidney where the tumor lay.
I wish I could have looked over the technician's shoulder
as they sliced and prepared the microscope's slide.
Here, I learn that microbiomes are the totality of micro organisms
and their collective genetic material present in the environment,
and I feel that may be true for humans, too—
still grappling with who we are, our old hidden stories.
I've spent decades searching my own roots, trying
to use my own research to find the right salve to heal—
like these microbiomes now groomed to treat failing concrete
or protect damaged reefs in warming seas.
A chart shows a tree of diverse microbes—
the parasitic cell on a salmon, the cellular growth from spores.
I watch with rapt attention the video on microbial interactions
between the healthy cells and infect them, guilelessly.
Tomorrow, I will call the Lab where my tumor cells grow
on their own agar plate. Perhaps, they will call me foolish,
but that night, I will dream I am in a laboratory painting my
own proliferated renal cells, crafting a piece of personal art.
But not today. The microbiome workshop over,
I walk out onto Campus into shy light and I cry
when the rain refuses to start or stop when I beg it to.



Autoimmunity

Alex Borgen

HONORABLE MENTION

1.

all disease begins in the gut
presently, (chronic illness)
waging guerrilla war
\imbalance of biodiversity, extinct micro-species
can trigger the body to attack itself (autoimmunity)
\host down

a micro biome war will have no clear winners or losers
\(constant) battle of balance,

we don't yet, understand

true complexity / ecosystems
interconnectedness / nodes

(the body is a complex and dynamic symbiote)

2.

\micro biome not seeding? (might be due to)
fungal biome gummed to cell walls
(take one round) fluconazole
\eradicate pathogenic yeasts,

meanwhile,
\introduce
Saccharomyces Boulardii, a janitorial yeast,
sweeping,
crowd out pathogenic bacteria/ pathogenic yeasts
a strategy, operational, at least for now
\maintain pathogenic numbers low(er)

then, seed gut with probiotics
(living food, sauerkraut, lacto-ferments, yogurt, kefir, et al)
(high potency probiotics, soil based organisms, et al.)
(diverse, healthy micro biome transplant, a.k.a. fecal transplant)

\(re)seeded (verging towards remission)



Necrotizing Fasciitis

Zoë Bossiere

HONORABLE MENTION

A human face, half flesh, half skull, its contours exposed, bone draped in a thin layer of pink, delicate tissue. A woman, you will later learn. She sits naked on a purple lawn chair, foregrounding a shelter of tree branches, a roof of thatched palm fronds. Her remaining eye is watery, fixed on some unknown point in the distance. She turns and flashes the cameraman what might be a half-lipped smile, or maybe a grimace. You think of how she could easily hook a finger around that bone supporting her empty eye socket. You watch as a young man inserts a wad of gauze under where her left temporal bone used to be. The internet advertises her, freak show style, as the “living zombie.”

The bacterium that plagues this woman, *Streptococcus*, resembles a broken string of Mardi Gras beads scattered about the floor. Its stuffed likeness I once gave my father as a gag gift (“1,000,000x+ actual size!”) is cute – huggable, even. All except for those big, baleful eyes. The cutlery stitched to its bristling, angry body.

Before, when I heard the words “flesh-eating bacteria,” I didn’t think of long-suffering women, or stuffed microbes – I thought of the birth in *Alien*. The long, scaly, vaguely phallic creature bursting through the stomach, tongue flicking between its bared teeth like a canine on the attack before whipping off into the dark, awaiting its unwitting next meal. The monsters of legend stem from those which live among us. Our sexy vampires are actually victims of porphyria, our handsome werewolves of hypertrichosis – monsters birthed from social stigma, like the zombies of our video gaming conquests who prey on our fears of contagion, encouraging us to kill the carriers rather than nurse the sick.

But unlike the living corpses populating our fantasies, the flesh eating bacteria doesn’t eat the flesh at all. Healthy flesh exposed to bacterial toxins begins to wither like a burning tree, skin falling away in blackened flakes. A survivor of the bacteria described the pain as “a naked flame running up and down my leg.” Some sufferers report a crackling sensation under the skin, like wood at a campfire. It’s no accident that the only way to kill a zombie in a video game is to engulf it in flames. That, or a bullet to the brain.

This crackling is the sound of the toxins running along the fascia between muscle and skin, eroding the flesh from the inside on out. Even if all the bacteria succumb to antibiotics, the toxins press on. Limbs must be amputated. Decaying skin removed, wounds grafted. Zombies born.