CONNECTING THE DOTS

AIR POLLUTION

GUT

BRAIN
Chewing: Saliva

- Moistening
- Antibacterial
- Amylase breaks down starch into sugars
- Food bolus
THE GUT

Saliva

Gastric Acid (HCL)

- Anti-infective
- Breaks down protein
- Releases B12 and minerals from protein
- Regulates lower esophageal sphincter
THE GUT

Saliva
Gastric Acid (HCL)

● 90% of digestion, absorption of nutrients and minerals, water and salt
● 6-8 hours

Digestive enzymes (pancreas) & bile
THE GUT

Saliva
Gastric Acid (HCL)
Digestive enzymes (pancreas) and bile

Microbiota
- Bacteria, fungi, viruses, protozoans
- Trillions of bacteria
- 1000 (+2000) species, each with different strains
- 150-170 predominate
- ⅓ similar
- Total mass of bacteria 0.2kg
MICROBIOTA

- Digest leftovers (fermentation)
MICROBIOTA

- Digest leftovers
- Defend against pathogens
- Digest leftovers (fermentation)
- Defend against pathogens
- Produce some vitamins (B,K)
MICROBIOTA

- Digest leftovers
- Defend against pathogens
- Produce some vitamins

- Produce neurotransmitters (Serotonin)
MICROBIOTA

- Digest leftovers
- Defend against pathogens
- Produce some vitamins
- Produce neurotransmitters

- Excrete/Detoxification
Microbiota

- Digest leftovers
- Defend against pathogens
- Produce some vitamins
- Produce neurotransmitters
- Excrete/Detoxification

- Produce short chain fatty acids:
  1. Acetate:
     - appetite regulation
     - cholesterol metabolism
MICROBIOTA

- Digest leftovers
- Defend against pathogens
- Produce some vitamins
- Produce neurotransmitters
- Excrete/Detoxification

- Produce short chain fatty acids:
  1. Acetate (appetite)
  2. Propionate
     - Gut-Liver
     - Satiety
MICROBIOTA

- Digest leftovers
- Defend against pathogens
- Produce some vitamins
- Produce neurotransmitters
- Excrete/Detoxification

- Produce short chain fatty acids:
  1. Acetate (Appetite)
  2. Propionate (Satiety)
  3. Butyrate:
     - Energy for gut lining
     - Inhibits cancer
Adult brain has approx. 100 billions of brain cells

1000 synaptic connections per cell
THE BRAIN

100 billions of brain cells
1000 synaptic connections per cell

Communication through neurotransmitters
Resulting in action and emotion
THE BRAIN

- 100 billions of brain cells
- 1000 synaptic connections per cell
- Communication through neurotransmitters

>100 neurotransmitters
- Important: Serotonin, GABA, Dopamine, Norepinephrine

😊 | 😞
THE BRAIN

100 billions of brain cells
1000 synaptic connections per cell
Communication through neurotransmitters
>100 neurotransmitters: Serotonin

Primary raw materials are nutrients (amino acids, vitamins and minerals)
SHORT CHAIN FATTY ACIDS
NEUROTRANSMITTER
NUTRIENTS

ALL OTHER ORGANS

VAGUS NERVE
LACK OF SLEEP

CHRONIC STRESS

LACK OF EXERCISE
TOO MUCH FAST FOOD

TOO MUCH WEIGHT

GENETIC PREDISPOSITION
DYSBIOSIS

- Loss of balance in gut microbiota
- Loss of diversity
- Not enough good bacteria
- Unhealthy species can overgrow and dominate
- SIBO: Small intestinal overgrowth
LEAKY GUT

“Increased intestinal permeability”

Toxins and pathogens are able to leak through the gut wall causing inflammation and immunological activation.
**LEAKY GUT**

“Increased intestinal permeability”

---

**Obesity and Diabetes**

Healthy microbiota producing short chain fatty acids

Regulating feeling of fullness and appetite through communication with the brain

Inflammation causes insulin resistance
LEAKY GUT

“Increased intestinal permeability”

- Obesity and Diabetes

Food allergies and other sensitivities

Particles which normally would stay inside the gut enter the bloodstream and causing stimulation of immune system

Over time the immune system starts to attack similar looking food
LEAKY GUT

“Increased intestinal permeability”

- Obesity and Diabetes
- Food allergies and other sensitivities

Autoimmune disease

The immune system mistakes cells of organs as foreign bodies and starts attacking

- Hashimoto Thyroiditis
- Asthma
- IgA Nephropathy
- Ankylosing Spondylitis
- Rheumatoid Arthritis
- Multiple Sclerosis
- Type 1 Diabetes
- Coeliac Disease
LEAKY GUT

“Increased intestinal permeability”

- Obesity and Diabetes
- Food allergies and other sensitivities
- Autoimmune disease

Development of Cancers

The body is simply distracted and overwhelmed
LEAKY GUT

“Increased intestinal permeability”

- Obesity and Diabetes
- Food allergies and other sensitivities
- Autoimmune disease
- Development of cancers

Nutrient Deficiencies

Unable to adequately absorb minerals and nutrients needed to produce
- enzymes
- hormones
- neurotransmitters

Unable to facilitate healthy cell function
LEAKY GUT

“Increased intestinal permeability”

Mental Health Disorders: Depression

Neurotransmitter and synaptic activity depends on amino acids and minerals.

90-95% of Serotonin is found in the GI tract

Tryptophan → Serotonin → Melatonin

The brain also needs magnesium, zinc, B6, unsaturated fatty acids
LEAKY GUT

"Increased intestinal permeability"

- Obesity and Diabetes
- Food allergies and other sensitivities
- Autoimmune disease
- Development of cancers
- Nutrient Deficiencies
- Mental Health Disorders: Depression

Autism

Of autistic people 90% have malabsorption

- Stomach: \(\uparrow\downarrow\) hydrochloric acid
- Small intestine: incomplete digestion
- Problems at the brush-border of the intestine where most nutrients get absorbed into the bloodstream
  - Low nutrients in blood
  - Inflammation in gut
  - Candida and other pathogens overgrow
  - Toxic metals absorption\(\uparrow\)
  - Low digestive enzymes
LEAKY GUT

"Increased intestinal permeability"

- Obesity and Diabetes
- Food allergies and other sensitivities
- Autoimmune disease
- Development of cancers
- Nutrient Deficiencies
- Mental Health Disorders: Depression
- Autism

Parkinson’s Disease

Mitochondrial Disease
Low dopamine
High copper/low zinc depletes dopamine
Linked to gut infection (Clostridium diff?)
Heavy metals?
LEAKY GUT

- Obesity and Diabetes
- Food allergies and other sensitivities
- Autoimmune disease
- Development of cancers
- Nutrient Deficiencies
- Mental Health Disorders: Depression
- Autism
- Parkinson's Disease

"Increased intestinal permeability"

Inflammatory Skin Conditions

- Acne
- Psoriasis
- Rosacea
- Eczema
LEAKY GUT

“Increased intestinal permeability”

- Obesity and Diabetes
- Food allergies and other sensitivities
- Autoimmune disease
- Development of cancers
- Nutrient Deficiencies
- Mental Health Disorders: Depression
- Autism
- Parkinson’s Disease
- Inflammatory Skin Conditions

Inflammatory Arthritis, Sepsis

Through activation of cytokines
LEAKY GUT

- Obesity and Diabetes
- Food allergies and other sensitivities
- Autoimmune disease
- Development of cancers
- Nutrient Deficiencies
- Mental Health Disorders: Depression
- Autism
- Parkinson's Disease
- Inflammatory Skin Conditions
- Inflammatory Arthritis, Sepsis

"Increased intestinal permeability"

Inflammmatory Bowel Disease

Crohn's Disease
Ulcerative Colitis
INFLAMMATION

ACUTE INFLAMMATION

Part of the body's defense mechanism

The immune system recognizes and removes harmful stimuli and begins the healing process.
INFLAMMATION

ACUTE INFLAMMATION

CHRONIC INFLAMMATION:

1. Failure of eliminating the agent such as bacterial infection
INFLAMMATION

ACUTE INFLAMMATION

CHRONIC INFLAMMATION:

1. Failure of eliminating the agent such as bacterial infection
2. Exposure to a low level of a foreign material that cannot be eliminated - substances or industrial chemical that can be inhaled over a long period, for example, silica dust.
INFLAMMATION

ACUTE INFLAMMATION

1. Failure of eliminating the agent such as bacterial infection
2. Exposure to a low level of a particular irritant or foreign materials that cannot be eliminated by enzymatic breakdown or phagocytosis in the body including substances or industrial chemical that can be inhaled over a long period, for example, silica dust.
3. If the immune system is sensitized to the normal component of the body and attacks healthy tissue - autoimmune disorder

CHRONIC INFLAMMATION:
INFLAMMATION

ACUTE INFLAMMATION

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3. If the immune system is sensitized to the normal component of the body and attacks healthy tissue - autoimmune disorder
4. Causing oxidative stress and mitochondrial dysfunction, increased production of free radical molecules, uric acid (urate) crystals, homocysteine, etc.
INFLAMMATION

ACUTE INFLAMMATION

CHRONIC INFLAMMATION:

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3. If the immune system is sensitized to the normal component of the body and attacks healthy tissue - autoimmune disorder
4. Causing oxidative stress and mitochondrial dysfunction, increased production of free radical molecules, uric acid (urate) crystals, homocysteine, etc.
AIR POLLUTION
Ambient (outdoor) air pollution was estimated to cause **4.2 million** premature deaths worldwide in 2016.

Mortality is due to exposure to small **particulate matter of 2.5 microns** or less in diameter which cause cardiovascular and respiratory disease, and cancers.

**Children** are particularly sensitive to air pollution.
AIR POLLUTION
...in urban areas

Traffic in big cities

Urban industrial plants
AIR POLLUTION
...in rural areas

Use of pesticides and aerial spraying

Sugar Mill Smoke
What is air pollution?

Particulate Matter: PM 10 (less than 10 microns)
PM 2.5 (less than 2.5 microns)

Ozone (O3)

Nitrogen Oxides (NOx)

Sulphur Dioxide (SO2)

Others
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<th>Substance</th>
<th>Air Total (kg)(^{[1][2]})</th>
<th>Air Fugitive (kg)(^{[1]})</th>
<th>Air Point (kg)(^{[1]})</th>
<th>Land (kg)(^{[1]})</th>
<th>Water (kg)(^{[1]})</th>
<th>Total (kg)(^{[1]})</th>
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[1] All emission/transfer quantities are displayed to two significant figures. Displayed emission totals may not exactly equal the sum of their individual emissions.

[2] Air Total = Air Point + Air Fugitive
Particulate matter (PM10 and PM2.5)

Description

Recent epidemiological research suggests that there is no threshold at which health effects do not occur. The health effects include:

- Toxic effects by absorption of the toxic material into the blood (e.g. lead, cadmium, zinc)
- Allergic or hypersensitivity effects (e.g. some woods, flour grains, chemicals)
- Bacterial and fungal infections (from live organisms)
- Fibrosis (e.g. asbestos, quartz)
- Cancer (e.g. asbestos, chromates)
- Irritation of mucous membranes (e.g. acid and alkalis)
- Increased respiratory symptoms, aggravation of asthma and premature death. The risks are highest for sensitive groups such as the elderly and children.

The factors that may influence the health effects related to exposure to particles include:

- The chemical composition and physical properties of the particles
- The mass concentration of the airborne particles
- The size of the particles (smaller particles may be associated with more adverse effects because they can be inhaled more deeply into the lungs)
- The duration of exposure (short and long term, possibly in years).
PARTICULATE MATTER

- Sulphate
- Nitrates
- Ammonia
- Sodium Chloride
- Carbone
- Water
- Mineral Dust
Air pollution causes inflammation, incl. inflammation of the brain
The impact of air pollution on children’s brain developments and health.

https://vimeo.com/308051460
PESTICIDES IN AGRICULTURE AND HEALTH IMPACTS

- Pesticides are specifically manufactured to kill life.
- Pesticides can enter the body through the air, the skin or the digestive system.
- The antibacterial properties can adversely affect the gut microbiota by reducing good bacteria and allowing pathogenic bacteria and their metabolites to proliferate.
PESTICIDES IN AGRICULTURE

Pesticides also contain heavy metals such as

**ARSENIC** - found e.g. in “RoundUp”

**MERCURY** - found in “Shirtan”
PESTICIDES IN AGRICULTURE AND CHILDREN

Children are uniquely vulnerable to uptake and adverse effects of pesticides due to:

- a higher breathing rate in the first 12 years of life, therefore inhaling double the amount of aerial pesticides
- frequent hand-to-mouth activity and being closer to the ground in general
- immature detoxification pathways, making a chemical likely 10 times more toxic to a child than to an adult

Chronic exposure has been linked to childhood cancers (leukaemia, brain tumours); poor motor skills, delayed reflexes, poor memory and other neurodevelopmental issues; asthma, obesity and early puberty.

Acute pesticide poisoning can result in death for young children. Symptoms include memory loss, uncontrolled urination, headaches, vomiting and blurred vision.
Any questions so far
1. Tip for a happy gut: AVOID TOXINS

- Buy single ingredients
- Buy food that is not packaged
- If it is packaged - read the label
- If you are unsure what it says - don’t buy it
- Buy small amounts of a variety of food - helps to minimise risk of hidden toxins
- Fish: small is better

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Low food additive diet for calmer, happier children

Avoid artificial colours:

Safe colour alternatives:
- Curcumin (turmeric) yellow 100
- Cothins sol red 120
- Copper chlorophyll green 141
- Betacarotene yellow 160a
- Beet red 62
- Saffron, crocetin or crocin 164
- Titanium dioxide white 171
- Riboflavin yellow 101
- Chlorophyll green 140
- Caramel brown 150a
- Yellow 160g
- Antho cyanin red, blue, violet 183
- Iron oxides yellowish/white 172

Avoid artificial preservatives:
- Benzosee E210-213 mainly in drinks, sauces, processed foods (E211)
- Sulphites E220-228 mainly in sausages, soft drinks, dried fruit
- Nitrates, E 249-252 mainly processed meat esp bacon ham (understand all are not in banned list and carry warnings in UK)

Safe alternatives to many preservatives include refrigeration, freezing, ascorbates 300-304, Calcium sulphate 516

Avoid flavour enhancers:
- Glutamates E621-626,627,631,855, MSG is E621 - in most processed savoury foods incl potato chips
- Hydrolysed vegetable protein (HVP) - added to savoury processed meats

Avoid known stimulatory chemicals:
- eg. Caffeine, Nutrasweet (aspartame E951), saccharin (E 954), chocolate

Good resource: www.fedupwithfoodadditives.info
2. Tip for a happy gut: CHOOSE NUTRIENT DENSE

- Wholefood, lots of FIBRE
- Buy fresh/local - eat fresh
- No added or processed sugar
- Don’t overcook, eat some things raw
- If available, buy (some) organic or biodynamic or grow yourself
3. Tip for a happy gut: VARIETY

- Don’t avoid food if no compelling reason
- Try new things (if it is a whole food)
- Don’t forget herbs and spices
- No fad diets!
4. Tip for a happy gut: PROBIOTIC FOOD

Eat a small amount of fermented food regularly:

- Plain good yoghurt
- Sauerkraut
- Kimchi
- Kombucha
- Sourdough bread (if not factory made)
5. Tip for a happy gut: PREBIOTIC FOOD

Vegetable, salads and legumes contain fibre which feeds the healthy gut bacteria.

At least 5 serves per day - half your dinner plate.
Caring for your brain: 1. UNSATURATED FATTY ACIDS

The brain has a high fat content -65%.

Low levels of Omega 3 fats are associated with

- Depression
- ADHD
- Bipolar Disorder
- Dementia and Schizophrenia
Caring for your brain: 2. ZINC

Zinc is a component of > 200 enzymes and proteins with key roles in cell division and genetic expression.

Zinc combats free radicals in the brain

Zinc stabilises the **blood-brain-barrier**

Zinc is involved in the Serotonin pathway

>90% of people with depression, ADHD, autism, schizophrenia have low to severely depleted levels of zinc.

Zinc deficiency: delayed growth, **temper control problems**, poor immunity, poor wound healing, epilepsy, anxiety, learning problems, neurodegenerative disorders.

Seeds, nuts, eggs, legumes, meat, shellfish, wholegrain
Caring for your brain: 3. AMINO ACIDS→Protein

Tryptophan → Serotonin
Food rich in tryptophan: Poultry, eggs, spinach, seeds, nuts, dairy

Tyrosine → Dopamine
Food rich in tyrosine: almonds, bananas, avocados, eggs, beans, fish, chicken

Glutamine → GABA
Food rich in glutamine: chicken, fish, cabbage, spinach, dairy, tofu, lentils, beans

Methionine → SAMe (helps to produce and regulate hormones)
Food rich in methionine: nuts, beef, lamb, cheese, turkey, pork, fish, shellfish, soy, eggs, dairy, and beans
Caring for your brain: 4. BLOOD SUGAR

↓ Low blood sugar levels can trigger acute episodes of mental health deterioration

Symptoms: irritability, craving for sweets, trembling, anxiety, intermittent poor concentration and focus

Try: >6 small meals of protein and complex carbs, AVOID SIMPLE SUGARS

↑ High blood sugar levels cause INFLAMMATION
Caring for your brain: 5. EVERYTHING ELSE

VITAMIN B6

GLUTATHIONE

MAGNESIUM

 METHYL/FOLATE BALANCE

VITAMIN C

VITAMIN D

VITAMIN E

POLYPHENOL RICH FOOD (cocoa, green tea, olive oil, coffee, berries)
WHAT CAN WE DO TO REDUCE (AIR) POLLUTION?
Awareness & Acknowledgment
Information & Transparency

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Communication & Cooperation

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