

Gut Health – Kelda White

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Week 3: Threats to a healthy microbiome and how to identify that there are problems.

- How diet, medications and other factors affect our gut bacteria.
- Comparing our microbiome to those in people who live a more traditional lifestyle.
- Some indicators that your microbiome may be out of balance.

What damages the gut?

Antibiotics: have an effect on all bacteria.

- Around since 1940. Use increasing. Also found in meats and animal products which are not organic.
- Made from bacteria in tanks of up to 100,000 capacity.
- Germany: one person in four takes antibiotics once a year on average. Main reason is 'colds' – virus!
- Work by filling bacteria with holes, poisoning them or stopping them reproducing.
- Diarrhoea from dead bacteria and change in gut flora.
- Microbiome becomes less diverse and abilities of bacteria in it changes (less able to produce vitamins, how much cholesterol they absorb, less able to digest certain foodstuffs). Particularly metronidazole/gentamycin.
- Most problematic for children and old people as gut bacteria less stable anyway. Studies showed children's gut bacteria profile still considerably altered two months after taking antibiotics.
- Some people have resilience: some bacteria are able to combat the antibiotics by pumping the antibiotics out, disguising themselves or developing tools that damage the antibiotics.
- Some bacteria will always survive and become 'experienced' in combatting them. This might be beneficial for 'good' bacteria but if harmful bacteria survive they are less easy to tackle with antibiotics. Resistance.
- Few new antibiotics developed as they are not profitable to invest in.
 - Take as few as possible and take for the 'correct' amount of time. May be hard to judge.
 - Avoid antibiotics in intensively farmed meat. Direct correlation between amount of antibiotics used in farming and infections in humans of multidrug resistant strains of bacteria. Bacteria in the animals guts become antibiotic resistant and transfer to humans (Spain and India unregulated).
 - Wash fruit and veg thoroughly – animal manure used as fertiliser.

Poor diet:

- Processed foods, sugar, alcohol, wheat, caffeine...acidic diets.
- High fat diet in rats caused leaky gut syndrome. Less effect if combined with prebiotics.
- Also eating on the run, not chewing properly, being stressed, eating late at night.
- Microwaved foods: changes cell structure.

Stress

- Stress response leads to decreased , changes to peristalsis, reduced gastrointestinal secretions, mucosal blood flow, nutrient absorption, decreased oxygenation, 4x less blood flow (body in fight or flight mode) so metabolism slows, decreased enzymic output (20,000fold).
- Strongly connected to inflammatory bowel disorder, IBS, food allergies, peptic ulcer, gastroesophageal reflux disease and other digestive problems.
- Change in bacteria balance – those that can survive stressful situations will thrive. These in turn are unlikely to be the bacteria that foster happiness.

Vaccinations:

- 1940s: smallpox, diphtheria, pertussis, tetanus. Now, 19 before the age of 1 in UK. Plus travel vaccines, HPV, occupation related (flu and meningitis for nurses, students).
- Virus from vaccines found in gut environment. Heavy metals accumulate in and damage gut.
- Best to take probiotics before and during.

Heavy metals

- From vaccines, pollution, fillings, fish, skin creams, drugs, incandescent lights, linings of nappies, fungicides used in farming. 95% mercury absorbed in digestive tract through epithelial cells.

- Inhibits production of digestive enzymes and interferes with normal function of others. Destroys beneficial bacteria: undigested food crosses gut membrane.
- Also lowers resistance to infection from many pathogens including parasites, yeast and fungi.
- Exposure to mercury produces antibiotic resistance too as resistance to both in adjacent DNA molecules – when one activated, other is too. So, linked to superbugs.

Being too clean

- Increase in sterilisation, irradiation, anti-bacterial handwashes, sprays etc.
- We don't pick up bacteria from soil etc.
- Eating food which is not ripe. Before refrigeration (most of our evolution), we would have eaten semi fermented and ripe foods which would have been easier to digest and added to our internal diversity.

Change in birth and breastfeeding

- C-section: don't pick up bacteria from vaginal tract. Pick up bacteria that is less desirable from all sources. Three quarters of babies who pick up hospital germs are born by caesarean section. Increased risk of developing allergies or asthma. American study showed that giving lactobacillus to those babies can reduce their risk of developing allergies. No difference in babies born naturally (already had probiotics). By age of 7, no difference in gut bacteria population.
- Antibiotics intravenously due to Group B strep (campaign to get everyone tested....)
- Less people breastfeeding so children not getting probiotics from that.

Gut problems:

How do we know there are problems? Most people have disordered digestion. But have come to believe that bloating, gas, constipation or diarrhoea is usual.

Stool:

- Should be at least once a day, better 2 or 3. No mucus (shows inflammation).
- Bristol stool chart – 6 types. Sausage shaped with/without cracks fine.
- Hard balls/lumpy or bits or liquid not good. Offensive smell and excess gas indicates something not right.

Constipation:

- Poor gut motility plus poor diet, stress, dehydration, lack of exercise. Also excessive calcium (calcium is the muscle contractor), painkillers (opiates), iron supplementation if ferrous sulphate, stress.
- Results in feeling heavy, fatigued, moody.
- Bacteria in lower gut ferment blocked matter releasing gas which is then trapped.

Bloating

- Because of trapped gas and poor bacterial population.
- Also lack of stomach acid: proteins do not digest properly and pass into the large intestine before being properly broken down. Causes localized inflammation. Fermentation causes gas and discomfort.
- Low digestive enzymes: due to inflammation of small intestine (damage to villi which means they cannot secrete the correct enzymes). Food reaches lower intestine not fully digested and ferments.

IBS:

- Affects 1 in 5 but diagnosis difficult. Alternating constipation and diarrhea with bloating and pain.
- Can have pain in different parts of abdomen and long periods with no problem or constant.
- Cause: STRESS, food sensitivity, overactivity of the gut, infection which causes gut to overreact.

Coeliac: inability to deal with gluten.

- Autoimmune condition linked to leaky gut. Damage to cell wall results in malnutrition.
- Diarrhoea (smelly), weight loss, failure to grow in children, tiredness, pain, flatulence.

Diverticulitis:

- Large intestine walls become weakened, particularly with age and/or prolonged constipation (straining).
- Loops form in walls which then trap waste and can become infected.
- Causes pain and bloating. In severe cases, pain, fever and diarrhoea

Worms:

- Round worms (ascariasis or ascaris), pinhead or thread worms, tapeworms, toxocara, also flukes and amoebas which tend to travel to other organs.
- General symptoms: loss of appetite, nausea, tiredness, dark rings around eyes diarrhea, painful or distended tummy, fever, coughing, itching around anus or vagina at night (vaginal discharge). Children who pick nose (excess mucus). Can sometimes see in stool.
- May not have symptoms if infection level low. May cause damage to gut lining in large numbers.
- From other people, soil (human sewage used on fields), children chewing their fingers after biting their nails, breathing eggs in, rare meat, sushi, pets, travel (round worms in tropical or subtropical areas from soil or contaminated water)
- Not to do with cleanliness! Half of all under 10s have threadworms at some point (and those are the ones which are seen). Eggs can live 2 weeks out of the body and can be breathed in.
- May be complications: pork tapeworm cysts (sacs with larvae in) get into lungs, liver, eye or brain causing inflammation and affecting normal function. If they burst they can release bacteria and cause anaphylaxis. Can also affect brain and central nervous system leading to meningitis, epilepsy, dementia. Can be fatal.
- Dog tapeworm can affect liver, lungs, brain or bones due to cysts. Infection can begin in childhood but won't show for many years. Very rarely tapeworms can block intestines, pancreatic ducts, bile ducts, appendix if numerous or large (can grow up to 30ft).
- NB: most people will have a worm infection at some point and may not even be aware of it. They are often passing through and our immune systems deal with them.
- Interesting link between worms and immunity. As worm infection decreased, allergies such as hayfever and autoimmune conditions have increased. Possibly to do with worms keeping immune system attacking the right things. Possibly a symbiotic relationship we don't yet understand, same as bacteria.
- Man with severe celiac disease infected self with hookworms (through skin) and was able to eat gluten. Worms suppress the immune response of the gut and therefore allow it to tolerate gluten.

Behavior issues/changes/emotional issues

- Stress, anxiety.
- Also link between toxoplasma and risk taking behaviour.
 - More complex than bacteria although only one cell. Live in cats' guts and transfer to humans. Probability in % of having it is about same as age in years. Parasitic in that they have no useful function to the host.
 - Most people do not know they have them – mild flu symptoms or nothing. Hibernate and usually not dangerous unless woman is pregnant – can cause damage or miscarriage.
 - 1990's Joanne Webster at Oxford University put rats with different liquids – water, rat urine, rabbit urine, cat urine. Usually of course rats would avoid cat urine but when infected with toxoplasma they seemed to prefer it. Offering self as food.
 - Started to study people involved in traffic accidents: higher risk in early stages of infection. Nearly 4000 Czech army recruits studied: more accidents when infected, particularly when combined with rhesus negative blood groups.
 - Why? Our immune system activates IDO enzyme to protect us from the parasite. Breaks down substances they like to eat, forcing them to become dormant. This substance is also one of the ingredients used to make serotonin so we are less able to make this 'feel good' hormone. Less happy and also contributes to lethargy.
 - Parasites also lodge in amygdala which is associated with fear, the olfactory centre (smell) and influences production of dopamine: neurotransmitter associated with pleasure and reward – twice as many carriers among schizophrenics.