

Gut Health – Kelda White

www.keldawhite.co.uk

Week 1: The role of gut bacteria

- What 'gut bacteria' are.
- The functions that they perform in maintaining our physical and emotional wellbeing.

All disease begins in the gut – Hippocrates.

The human body is an organism of 100 trillion cells

- 90 trillion are prokaryotic (bacterial) and 10 trillion are eukaryotic ('human').
- Our cells are designed to allow bacteria to 'dock'.
- 99% of them found in the gut although they are found everywhere. Mainly lower intestine.
- More than 1000 different bacteria in our gut. Very difficult to study as most do not survive outside of gut.

Sterile in the womb then:

- Vagina contains bacteria mainly consisting of lactobacillus – produces lactic acid which makes the environment inhospitable to other germs/fungi. Lactobacillus makes Vitamin K.
- Some gut bacteria passed on during birth (starts digesting milk and simple carbohydrates) and skin bacteria from hands. More bacteria (some helpful, some not) colonise as children put things into their mouths.
- Some bacteria can reproduce in less than 20 minutes.
- Breastfeeding promotes bifidobacteria which influence immune system and metabolism. Low levels associated with increased risk of obesity.
- Breastfeeding shifts balance towards beneficial bacteria. First gut bacteria remove oxygen from small intestine and allow 'typical' gut bacteria to settle there. Milk also contains antibodies.
- By week 3, we have set the scene for our health in later life. A year before gut flora stabilises.

Bacteria has to be suited to gut (cells, food, climate). Varies from person to person, even identical twins. Due to diversity in acquaintances, experiences, illnesses, food preferences etc.

- African children's bacteria break down fibrous plant food. European babies have different diet.
- Bacteria can 'borrow' the tools they need to break down food. Eg: Japanese gut population has borrowed a gene from marine bacteria which breaks down seaweed.
- Gut bacteria (altogether) contain 150 times more genes than a human which gives us different abilities (eg: breaking down food, dealing with stress, producing substances which help liver detoxify Paracetamol).
- Soya is beneficial for 50% of Asian population with regard to cardiovascular disease, bone disorders and certain cancers. Only beneficial for 25-30% of those of European heritage due to different gut bacteria.

Bacteria manifest benign or pathogenic forms depending on situation.

- B coli usually performs a useful function. Change in host changes the intestinal mucosa upsets the balance and results in a change in the habit and biochemistry of B coli which then becomes pathogenic. The original change (the disease) originated in the host – the bacillus had to modify to survive. Same with candida.

Roles of Gut Bacteria:

Digestion: mainly takes place in the small intestine where there are few bacteria.

- If gut bacteria populates the small intestine, they cause bloating, pain, joint pain, gastrointestinal infections.

Large intestine break down remainder of food and consist of three main groups.

Bacteroides: often the dominant population.

- Break down food by producing different enzymes. Favour meat and saturated fatty acids.
- Parabacteroides have ability to pass on as many calories as possible.
- Also produce biotin (B7) – maintains hair, skin, nails, neurological function and regulates cholesterol.
- Other bacteria use the waste produced and create substances that the bacteroides use again.

Prevotella: More prevalent in vegetarian but found in everyone.

- Break down proteins and release sulphur. Work with another bacteria which consumer the sulphur.
- Help supply us with B1: keeps nerves well nourished.

Ruminococcus:

- Feed on cell walls of plants and produces haem needed for red blood cells.

Immunity: Gut bacteria help in two main ways.

- Human intestine is the largest organ of the immune system and comprises of millions of bacteria in symbiotic balance with the host. 80% of immune system in the gut.

1) 'Training' our immune cells:

- Our own immune cells learn to differentiate between bacteria which are helpful and others in the gut.
- Also allows immune cells to differentiate between own cells and bacterial – can closely resemble each other. Eg: Diabetes Type 1: autoimmune destruction of cells producing insulin.
- Bacteria also change the nature of our immune system: some make it less 'aggressive' (helps them as less likely to be ejected) by affecting our cells in a similar way to cortisone.
- Small intestine has bacteria which provoke the immune system and control bacterial level. Helpful bacteria lodge in the villi to occupy space that would be taken up by harmful bacteria (colonisation resistance).

2) Specialised defences, not fully understood, are in place for the protection of the gut from infectious pathogens and maintaining the integrity of the gut mucosa.

- This immune function also extends beyond the gut.
- 'The brain and body state' is achieved as a reward for looking after our micro flora - *Evgeny Rothschild, (Science Spectra 6, 1996)*.

Hormone Production:

- Correct break down and digestion foods are required to produce the vitamins needed to create the hormones including cortisol.
- Cortisol is an anti-inflammatory compound which is important for the homeostasis of the body, dealing with allergies, immunity, controlling inflammation, mood regulation, stamina levels and blood sugar regulation.
- Whole range of other hormones that influence insulin, appetite, digestive enzymes etc.

Gut and Mind

Gut acts like a second brain, producing substances which affect mood and informing the brain.

- In the foetus, gut and brain start as the same clump of tissue which divides to become central nervous system and enteric nervous system. Remains connected via the vagus nerve.
- Correctly functioning gut vital for neurological, psychological and immunological health.
- In a healthy person, 95% of serotonin - the feel-good neurotransmitter - is made in the digestive tract.
- 85% of neurotransmitters made in the gut.
- Bud Craig spent 20 years staining nerve fibres and tracking pathways through brain. Inular cortex in brain receives messages from the gut. It also receives messages from every part of our body in terms of feelings which translates into action. Also takes on perceptions from environment and experiences from the past.

Mental illness was seen as deriving only from the brain. Often underlying physical cause in the gut.

- 99% certainty of a genetic link between schizophrenia and celiac disease. Out of 82 schizophrenic patients, 50% had gastritis, 85% enteritis and 92% colitis.
- Commonly recognised among gastroenterologists that children with neurological problems often have digestive problems as well.

- Enteric nervous system (brain of the gut) is found in sheaths of tissue lining oesophagus, stomach and colon. Contains nerves with neurotransmitters, neurons, proteins and support cells, just like in the brain. When we feel emotional, the enteric nervous system responds. Eg: vomiting due to nerves.
- Gut can also affect mind: bacteria from anxious mice placed in calm mice makes them anxious and the same in reverse. Constipation causes confusion, sluggishness, aggression and violence in Alzheimers patients.

Leaky gut: repeated inflammation causes gut to become permeable and changes bowel bacteria.

- Permeability allows candida, heavy metals, undigested food and toxins into the blood stream – overloading liver and kidneys and causing sensitivities. Toxins cross blood-brain barrier – interfere with brain function.
- Bacterial changes result in reduced immune function and cause less enzymes for digestion to be released, resulting in vitamin and mineral deficiencies, particularly B6, 12 and Zinc.
- Undigested food fragments from gluten and casein act as opiates in human brain and act like morphine.
- Psychotic patients have antibodies against these undigested fragments, showing that they have accumulated over time in brain and other organs where they cause damage.
- Frontal lobe does not complete development until age of 25 so damage is particularly significant.

Parkinsons

- In WDDDTY end of June 2015. Prolonged constipation often a precursor to Parkinsons.
- Study of 15000 patients: severing vagus nerve halves risk of developing Parkinsons (other effects not cited).

Autism

- Enterocolitis in majority of children with autism spectrum disorders. Andrew Wakefield a gastroenterologist.
- Children with autism have a different bacteria (Sutterella) than those without. Not clear whether it's cause or effect. Also less protective bacteria and higher levels of antibodies for wheat and gluten.
- Some children who had MMR vaccine may have developed a persistent gastrointestinal infection with the measles virus (not the wild virus, the one in the vaccine). Poor bowel health caused these children to deteriorate neurologically. Also migrates to brain (found in spinal cord).
- Autism Research Unit at University of Sunderland says that autism is a metabolic disorder that starts in the gut, often when peptides from gluten and dairy are not broken down properly. These then get into bloodstream, into brain and central nervous system due to permeable gut lining.
- Women treated with antibiotics during pregnancy 3x more likely to have autistic child.

Weight

- Different gut bacteria in thin and fat mice. 2006: scientists isolated Firmicutes bacteria from fatter mice – put into thin mice and they fattened up in 10-14 days. Thrifty bacteria – experts in extracting calories even from usually undigestible things like fibrous vegetation.
- People carry these bacteria. Woman who had faecal transplant from overweight daughter became fatter.
- Different gut bacteria affects calorie extraction rates but also feelings of hunger, satiety, fullness, hormones.
- Not known whether it is cause or effect but when prebiotics introduced into the diet of mice, weight loss occurs naturally due to growth of other bacteria. Also insulin resistance disappears.
- Average child in US has 10 courses of antibiotics but age 10. Tests on mice show tylosin and amoxicillin reprogramme metabolism, interfere with bone grown and change gut microbiome.
- Those with metabolism problems have more infection markers. This is signalled by certain bacteria which can find their way into the bloodstream if the diet is overly fatty. Then attach to other organs and encourage fat deposition as well as reducing thyroid functions.
- Bacteria reward us with 'feel good' chemicals when we give them food they like and also produce feelings of satiety. If they are not properly nourished, we will still feel hungry. Can also lead to cravings for unhealthy food if that is what our gut bacteria have become accustomed to consuming.