What does your poo microbiome do?

February 5 2018, by Kirsten Flint

Even if you've been enjoying the solitary confinement of life under a rock, you'll probably still have heard the phrase 'gut microbiome'. You might even be aware that we all have one.

If you actually have been living in the dirt, your microbiome is likely to be especially prolific.

And that's generally agreed to be a good thing.

Scientists estimate we have anywhere between 500 and 1000 different species of bacteria in our guts—and the more there are, the merrier you might be.

Some researchers have begun to investigate possible links between an unhealthy gut and a range of diseases. Conditions including depression, anxiety, obesity—even autoimmune diseases—have all been investigated.

Accordingly, doctors, pharmacists and even celebrities are now peddling probiotic supplements to help 'fix' our unhealthy guts. People are eating it up—the global market exceeded $35 billion in 2015. Each supplement contains anywhere between 1 and 16 different bacterium species.

The thing is, no one can tell you exactly what each of these gut bugs do.

IT'S JUST AN EXPRESSION

Recently, we've developed technology that has revealed the microscopic diversity lurking in our guts. Next-generation DNA sequencing technology has allowed us to see the genomes of all species present. But seeing what's there is different to knowing what they do—if they do anything at all.

Just because organisms seem to be present, it doesn't mean they're being productive in any way that is helpful. It all comes down to how they actually express their genes.

As humans, we all have the gene that produces the enzyme lactase, useful for digesting dairy products. In spite of this genetic uniformity, a hot summer's day will see some people indulging in gelato, froyo and choccy milk, while others must be satisfied with sorbet. Despite us all having the lactase gene, not everyone's body actually expresses the lactase protein.

In the same way, a bacterium may be the proud owner of an extensive genome, but it could simply be chilling in our guts and not actually producing anything.

This knowledge might prompt us to ask some big important questions. What, if anything, are all those bacteria doing in our gut? Can putting more there provide some sort of health benefit? And if so, will we ever be able to progress from a generic dose to designing targeted treatments?

New research is edging ever closer to finding answers for these questions.

A PHOTOCOPY OF YOUR GUTS

An international team of researchers (including an Aussie representative) have conducted the world's first large metatranscriptomic studies of

human faeces.

Now, seven syllables is an awful lot for anyone to handle, but metatranscriptomic simply means that researchers looked not only at the identity of the bacterial species present in the gut but also what they might be doing there.

To express a protein, bacteria must first copy out a section of their DNA, which contains the instructions to build said molecule.

These copies they make are made out of something called RNA, and the transcripts are the half-way point in the gene expression process.

Let's take this back to your house

Say, for instance, you felt the time was right for you to renovate your bathroom. Step one might be to go to the library and locate the book *Self-Build and Renovation for Dummies.* Step two might be to photocopy the chapters on plumbing and laying tiles, but the chapters on soft furnishings and landscape architecture would be less useful so you can go ahead and ignore those. Then you simply take the necessary photocopies away, follow the step-by-step instructions and whip up the water closet of your dreams.

All those photocopies you created at the half-way point between finding the instructions and creating the finished product—that's the metatranscriptome. By analysing the metatranscriptome present in human faeces, researchers could begin to figure out what the bacteria in participants' guts were making.

Speaking of bathrooms, that's where the essential stages of data collection would have taken place.

WHAT'S NORMAL FOR YOU ISN'T NORMAL FOR ME

In 2012, 300 or so old men pooped and shipped off a sample to scientists.

And 6 months later, they once more contributed some excrement to the experiment—a fresh sample, of course.

When scientists analysed these samples, they found some interesting results.

There seemed to be a fair bit of variation between participants. Bob Smith pooped out different bacteria than John Doe, and John Doe's gut bugs were different to those of Joe Average.

Over time (the 6 months between samples), the bugs in each individual's poop zoo seemed to stay largely the same.

However, there did seem to be variation in the genes that each bacteria copied out at different time points. There was a stable core of transcriptomes that appeared consistently, but there was also a dynamic set that seemed to be variably expressed—perhaps in response to different external factors such as diet.

Researchers suggested that bacteria switched genes on and off because the bacteria had to perform different functions in response to a changing environment.

DON'T POO-POO THE SCIENCE

This latest study provides some insight into how we might expect a

microbiome to change over time.

While we can't answer any of the big important questions, we do now know that a single measurement of an individual's microbiome can be useful in providing information about what bacteria are present. However, if we ever wanted to know what they were actually doing (perhaps in the event of one day administering a targeted treatment), it would be necessary to conduct repeated or short-term samples.

We are still many steps and many poop samples away from developing any sort of specific probiotic treatments. First, we'll need to know the exact output of each species of bacteria and whether it impacts on the rest of the body or not.

In the meantime, perhaps try looking after the gut bugs you do have, rather than stuffing more down your throat. It can be tasty and easy and doesn't have to include blowing your budget on a bottle of bacteria. What's more, there's a good bit of evidence to suggest that it works.

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