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We are not alone

by Freddie Theodoulou, Science Editor



I'm not talking about aliens: the title of this editorial refers to the microscopic organisms whose ancestors inhabited our planet long before humans walked the earth. With the exception of plants and animals deliberately raised in sterile laboratory conditions, all of us are colonized- within and without- by trillions of microorganisms. This community of bacteria, fungi and archaea, collectively called the microbiota or microbiome is arguably as important as any of the cells that make up our tissues and organs. Bacteria have traditionally suffered a bad press as disease-causing baddies, but the explosion of studies reporting pervasive beneficial effects of the microbiome represents an image change that would make any self-respecting PR agency green with envy. Long recognized for assisting digestion, we now know that gut bacteria influence our metabolism, impact our immune system and can even reset our circadian clocks. As associations between disease and gut dysbiosis are increasingly reported, altered microbial signatures have become warning beacons for serious underlying conditions and whilst there is still some work to do to separate cause from effect, manipulation of microbiotas is an emerging target for therapy.

The vast majority of microbes are unculturable but the advent of next-generation sequencing has opened up the world of the microbiome and spawned a metagenomics frenzy. Pretty much everything from aardvarks to zebras has been swabbed and sequenced, leading to gleeful popular science articles ("Some beards as dirty as toilets", "Bearded men have poop on their faces", "Your mobile phone carries your microbiome"). Microbiome studies are not just limited to the here and now: in a recent report, the scrapings from a handful of Neanderthal teeth proved sufficient to suggest that our closest hominin relatives dined on woolly rhino and pine nuts, dabbled with herbal medicines and probably enjoyed the odd snog. Racy headlines notwithstanding, the DNA analysis was truly impressive, with 10 x coverage of a 48,000-year old archaeal genome.

This month, *The Biochemist* features have a focus on the human microbiome, but the microbes that live in and alongside other organisms are just as fascinating and just as important. Plants have intimate, complex and dynamic relationships with soil microbes that underpin the health of the ecosystem and the production of our food. Lurking below the surface, plant roots tailor their local soil microbiome by secreting attractants and key nutrients, allowing them to recruit microorganisms that facilitate nutrient uptake and combat soil-borne diseases. In a neat parallel with human medicine, manipulating the soil microbiome for agricultural and environmental benefit is an inexact but promising science. Soil, with its kaleidoscopic community of microorganisms is no longer dismissed as dirt, but valued as a potential source of much-needed new antibiotics. A topic that has the potential to bring together clinicians, soil scientists, drug developers and more, the microbiome continues to intrigue, inform and offer routes to improve our quality of life. ■