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Baby's first microbes sized up

The bugs picked up by newborns guts could bear on later life.

Helen Pearson

Scientists have logged a year in the life of 14 babies' intestines, and found that our early gut microbes bear a legacy from our very first exposure to bugs. And this early bacterial colony could have a lasting impact on our guts.

Early days: researchers are starting to study how our first colony of gut bacteria is set up.

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The study is part of intensifying interest in the microscopic organisms crawling around our intestines. It is becoming increasingly clear that we rely on them to help us dredge nutrients from food, fight off invading bacteria, absorb drugs and promote healthy growth of the immune system. Researchers who this week publish a genetic survey of the bugs in adult digestive systems[1] even go so far as to say we should think of ourselves as 'super-organisms' made of a human-bacterial meld.

To find out how these microbial communities are first established, David Relman at Stanford University and his colleagues collected feces from babies on their day of birth and then regularly throughout their first year. They also gathered samples from each mother's feces and vagina, and her breast milk, which contains bacteria from the skin.

They extracted microbial DNA from each sample and then identified the types of organisms present using a specially designed gene chip that picks out hallmark genetic sequences.

The results, presented by Relman at the American Society for Microbiology meeting in Orlando last week, indicate that babies pick up the first microbes they meet as they enter the world. One baby's microbes, for example, most resembled those in the mother's feces on the day of birth; others were most similar to their mother's vaginal sample or breast milk.

Tummy trouble

These microbe communities changed as the babies grew: as each approached one year of age, their intestinal populations became more alike and more like those of adults. But each baby still retained individual microbial signatures, which were probably set up by their unique first exposure to bugs, along with their diet and their genes.

These early events could help to mould each individual's adult microbial population, Relman says. So anything that interferes with this could be crucially important.

Two children in the study were given antibiotics, for example, and this dramatically changed the natural population of microbes in their guts. "They never returned to the picture they had before," Relman told the meeting.

Relman says he would like to find out what factors influence a baby's intestinal occupants. Perhaps it depends upon whether they are born by Caesarean section or vaginally (see 'Natural birth teaches newborn gut a lesson'), whether a child is breast fed or formula fed, and at what stage solid food is introduced. At the moment, the number of children in the study is too small to answer these questions, he says.

Digestion aid

Proof of the importance of all these bugs come from a survey of adult intestinal microbes done by Relman and others, led by Steven Gill at the State University of New York at Buffalo. Their work, published in Science, looks at a mass of microbial DNA extracted from the feces of two healthy adults, and finds a disproportionate abundance of genes involved in food digestion and processing.

The study backs the idea that microbes are important for breaking down plant sugars that are otherwise indigestible, and making essential amino acids and vitamins (see 'Stomach bug makes food yield more calories'). "They co-evolved with us to provide functions we can't provide for ourselves," Gill says.

Researchers next want to find out how our diet and genetics influence which microbes live within in us, and whether particular bacteria are linked with good or ill health. They are also sampling the microbial contents of other body cavities, including the mouth, ears and vagina.

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References

1. Gill S. R., *et al*. *Science*, **312**. 1355 - 1359 (2006).

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