

Commensalism the new Scientific Revolution?

Theodor Rosebury reminded us 35 years ago that all life, including microbes, is a single community and that it would be a good idea to stop thinking indiscriminately of our unicellular companions as repulsive, contemptible, or even ferocious. Quite appropriately, human medicine demands that we focus on disease and its cure or amelioration. Does this focus sometimes distract us from understanding the biology of the pathogen and the evolution of the host-parasite relationship? One continuing problem facing those of us who study microorganisms that cause human disease is defining exactly what is a pathogen. Humans live with hundreds of commensal species, along with transient microbes that are “just passing through.” Commensals inhabit every mucosal nook and cranny, and most are present for our entire lives but do no harm. Meanwhile, pathogens are traditionally defined as organisms that cause disease.

The problem is that the distinction between the commensal and the pathogen can be blurred at times because some commensals cause disease, albeit usually in immunocompromised hosts, whereas some pathogens can persist without causing disease symptoms.

However, recent breakthrough by a scientist of the UK has really put forth the question? Commensalism the new Scientific Revolution.

Clean modern homes, antiseptic wipes, and the reasonable craving to protect small babies against any infection are the factors claim to be the reasons for childhood malignancy; a leading expert has concluded after >30 years of research.

Childhood acute leukemia is nothing to do with power lines or nuclear fuel reprocessing stations. Mel Greaves’ extensive research carried out for the last thirty years offers a credible enlightenment for the role played by early childhood infection in controlling/preventing the major type of childhood leukaemia.

The best news, says Greaves, is that the cancer is likely to be preventable. And part of the answer could be to ensure children under the age of one to have social contact with others, possibly at day-care centers.

Greaves, of the Institute of Cancer Research in London, has compiled evidence from decades of work on acute lymphoblastic leukemia (ALL), which affects one in 2000 children. He describes a “triple whammy” that he trusts is the reason of all. One in 20 children is born with a genetic mutation that puts them potentially at risk. However, they will be fine if their immune system is properly set up. For that to happen, they must encounter benign bacteria or viruses in their 1st year of life. Claims Greaves.



Those whose immune systems are not fully functioning because they have not had an early challenge to deal with – and who then later encounter an infection such as a cold or flu – may develop a second genetic mutation that will make them susceptible to the cancer.

ALL, he says, is increasing globally at the rate of about 1% a year. Unlike most diseases, it is increasing in more affluent populations. Something about our modern lifestyles has to be involved, Greaves reasoned. “Infectious disease tracks with poverty,” he said. “The problem is not infection. The problem is lack of infection.”

ALL rates are low or nonexistent in the deprived or developing countries, where families have lots of children and cross-infection is common. One exception is Costa Rica, which has invested heavily in medical schools and its health system and brought down family sizes from 7.2 children on average to 2.3. However, they now have significant levels of Hodgkin’s lymphoma, type 1 diabetes, and ALL.

In a paper in the journal *Nature Reviews Cancer*, Greaves has assembled the evidence from his own work and that of colleagues around the world into the genetics, cell biology, immunology, epidemiology, and animal modeling of childhood leukemia, which includes experiments in mice that have been modified to have the first gene mutation. Those that were kept in clean and sterile conditions and then later transferred into a dirty environment developed the cancer.

Greaves *et al.* and scientists are anxious that no parents should feel in any way responsible for their child’s cancer, pointing out that keeping babies away from any source of infection is very normal behavior, and that there is still an element of chance in developing the two genetic mutations. The factors that may decrease a baby’s risk are going to a day-care center as a small baby, having older siblings who are likely to bring infections into the home, breastfeeding and probably being born through a vaginal

delivery rather than a more sterile cesarean. Chris Bunce, professor of Translational Cancer Biology at the University of Birmingham, called Greaves “one of the superstars among modern cancer biologists” who had demonstrated that the early mutation putting a child at risk occurred in a cell before birth and now presented “a compelling model” of the way the cancer arises. Prof. Charles Swanton, Cancer Research UK’s chief clinician, said: “This research sheds light on how a form of childhood blood cancer might develop, implicating a complex combination of genetics and early exposure to germs, dirt, and illness.”

But he added: “We want to assure any parents of a child who has or has had leukemia that there’s nothing that we know of that could have been done to prevent their illness.” The research document published recently in the journal Nature Reviews Cancer finds that ALL, the most common type of childhood cancer, is caused by a two-step process. The first step is a genetic mutation before birth that predisposes a child to the risk of developing this form of leukemia. The second step is exposure to certain infections later in childhood, after clean early childhoods that limited exposure to infections. More specifically, children who grew up in cleaner households during their 1st year and interacted less with other children are more likely to develop.

Greaves research is a culmination of decades of work and at last provides a credible explanation for how the major type of childhood leukemia develops, “he said in a statement.” The research strongly suggests that cancer has a clear biological cause and is triggered by a variety of infections in predisposed children whose immune systems have not been properly primed.

However, other experts warn that more specifics need to be confirmed and emphasize that hygiene and safety are still crucial.

“Preventing childhood leukemia would have a huge impact on the lives of children and their families across the globe,” said Paul Workman, chief executive of the Institute of Cancer Research, London. However, other experts are more

cautiously hopeful, emphasizing that genetics and pure chance are still significant factors for developing ALL.

If we could stop this type of leukemia from happening in the first place, it would be enormously exciting, but many more questions still need to be answered in the research laboratory before we will know for sure whether that could become a reality?



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