Your Immune System And The Bugs That Live Inside You

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Last month I discussed how alterations in the intestinal bacteria are associated with obesity. Actually, we are learning that the "gut flora," as they are called, have a major influence on many aspects of our health. In a Scientific American article on intestinal bacteria published in 2008, a well known researcher wrote that almost every sort of disease has a "gut bug" connection somewhere. It should. Weighing in at between 3 and 6 pounds, this is one of the body's largest "organs." Despite the many functions it plays in human physiology though, it is not actually a body organ. It is a collection of bacteria (over 400 species have been identified so far) that have a symbiotic relationship to their host – humans. Basically, we give them food and a place to live – and they provide a "barrier" of protection from harmful microbes, produce vitamins (like some B vitamins and Vitamin K) and greatly influence our immune system both locally in the gut and systemically. The interaction between healthy intestinal microflora and our immune function is complex and has far reaching implications in our understanding of chronic disease and its treatments.

Since the gastrointestinal tract is only a tube letting the outside world (food, water, bacteria...) enter our body, then the walls lining the intestinal tract must be very selective in letting nutrients in and keeping potential toxins out. This is tricky business and the intestinal bacteria play a crucial role. There are various mechanisms by which the bacteria help protect against possible pathogens and, at the same time, tolerate the continuous flow of food and "friendly" bacteria by suppressing attacks against these more benign "foreigners."

These bacteria that interact with our intestinal lining cells are acquired. The intestines are sterile prior to birth. During birth, the baby's bacterial environment will be derived from the mother's vaginal, intestinal (fecal) and skin microflora. The baby acquires his/her intestinal microflora from the first day of life throughout the first 2 years. At 2 years of age, the baby's intestinal bacterial communities will be similar to what it will be in their adult life. This microflora is responsible for a major part of the development of the entire infant immune system. The various immune regulatory mechanisms being developed will subsequently be operational throughout life. It turns out that there are many factors that can affect the fragile microbial balance and maturation of this immune system. These include: the delivery method (vaginal or C-section), gestational age at birth, mother's use of antibiotics, and diet (breast or bottle), among others. For example, breast fed babies are colonized with strictly anaerobic microflora (the very beneficial bifidobacter species). In formula fed babies these are absent or present in random fashion. The strict hygiene of delivery in industrialized countries and other environmental conditions (e.g, antibiotic use) has produced changes that have recently been observed in the intestinal colonization profiles in babies. Delayed colonization by bacteria from the mother, leading to establishment of bacteria from the environment, appears to have altered the balance and maturation of the immune system. A confused immune system may be over or under active. These new bacterial colonization profiles have been implicated as a major cause of the very high incidence of allergic diseases seen in developed countries. Likewise, an underactive "barrier effect" can increase susceptibility to infectious disease.

Each adult's unique bacterial milieu remains stable over time with different species of bacteria providing different functions for itself and the host. These bacteria eat resistant starches (complex carbohydrates that human bodies are not able to digest). In turn, they generate short chain fatty acids and other products including something we are quite aware of – gas. The short chain fatty acids provide food for our intestinal cells and are also capable of turning on and off the expression of various genes.

Our 3 - 6 pounds of symbiotic hitchhikers doesn't vary much under "normal" conditions. But this awesome and complex ecosystem, that has evolved over the millennia for the advantage of both, is now easily and frequently disturbed and disrupted by antibiotic use, stress, an unbalanced diet, changes in gastrointestinal transit time, and intestinal infections. And through its connection to the immune system, the changed composition of this microflora may be having effects on our health that we would never have imagined! Next time: *The bugs you PUT inside you – all about probiotics…*

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