**DRIVE OUT “BUGS” TO PREVENT COLON CANCERS**

There is a microscopic society living within us.  Our bodies are home to more than 100 trillion microorganisms, similar to the number of human cells in the body. Many of them reside in our gut. Most of the time, this microsociety—which includes hundreds of species of bacteria—and its human host coexist harmoniously.  The “bugs” we live with aid in digestion, metabolism and immunity.

With such an overwhelming numbers advantage, it may only take the activity of two organisms to shift this harmonious relationship in a way that can promote cancer.

The entire colon is lined with a thick protective layer of mucus, and most bacteria do not make it past this protective barrier. Our research has shown that in some colon cancers, toxin-producing strains of two kinds of common bacteria called *Bacteroides fragilis* and *Escherichia coli* invade the mucus and form a sticky biofilm in the cells that line the colon. They upend the whole biology of the system, creating a little environment all their own—complete with nutrients and everything the bacteria need to survive—causing ongoing inflammation and then DNA damage that can set cancer development in motion.

Our research focuses on understanding this process better. We undertook studies to see how bacteria contribute to the development and growth of colon cancer. This is a very important area of investigation because colon cancer is considered a nearly completely preventable cancer if it is detected early, yet the American Cancer Society reports that 50,000 people will die and more than 100,000 new cases will be diagnosed in the U.S. alone this year. Globally, colon cancer rates are rising all over the world. An even more alarming report in the *Journal of the National Cancer Institute* in February 2017 reported that colon cancer rates have increased in younger people, under age 50.

At least in some people, these bacteria appear to be picked up early in life in children less than 5-years old, sometimes without symptoms, but the bacteria can live and grow in people of all ages. We do not know precisely how they are transmitted, but person-to-person, animal-to-person, food and water are all possibilities.

To blunt the burden of colon cancer, new approaches to prevention must be developed. We think that targeting specific bacteria by administering drugs or vaccines to prevent the bacteria from living and growing in a person’s colon, and potentially even probiotics to chase the bugs from the colon could be explored to interrupt the cancer-promoting process. Our ongoing research is looking at 2,000 people to determine if colon biofilms and/or specific bacteria can be directly linked to early tumor formation. If so, we could use these drugs or vaccines to block the bacteria or their toxins in the colon or prevent exposure to the bacteria.

We found these two types of bacteria both in patients with an inherited form of colon cancer and we and others have similarly found these bacteria in people who develop colon cancer with no connection to heredity (called ‘sporadic colon cancer’). We have also uncovered a possible mechanism behind how one of these species spurs a type of immune response that promotes—rather than inhibits—cancer.

The coexistence of these two bacteria and the immune reaction creates the ‘perfect storm’ to drive colon cancer development. Both types of bugs are found to commonly live and grow in young children worldwide, potentially contributing to the rise in colon cancer rates among younger people.

The research suggests so far that only a few types of bugs of the 500 to 1,000 possibilities in the colon may be early key triggers for pushing the development of colon cancer. Our studies are still early, but we believe it may be possible to slow colon tumor development in people predisposed to colon cancer through inherited syndromes as well as those who develop it sporadically by getting rid of these bacteria in their colons.