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# Computer Model for Predicting Hereditary Colorectal Cancer

By Tamara Halkina

One of the most important factors for surviving cancer may come from an unexpected direction: early detection. While exciting new cancer treatments are still under development, recent advances in prediction and screening are already allowing doctors to catch cancer in its earliest stages. In particular, genetic screening for Lynch syndrome, the most common hereditary colorectal cancer (CRC) syndrome (1), has improved tremendously since its early days.

A genetic basis for Lynch syndrome was uncovered in the early 1990s, when studies associated the syndrome with genetic dysfunction in the mismatch repair (MMR) system, which corrects mutations in the genetic code (2). The results showed that when the MMR system failed to correct mutations, the errors in the genetic code began to accumulate, often leading to the uncontrolled division of cells that characterizes colorectal cancer. This work is of particular interest because of the disease's prevalence: colorectal cancer is one of the most common malignancies in the United States and affects almost 150,000 individuals per year (2). A team of researchers at Johns Hopkins Kimmel Cancer Center in Baltimore recently set the stage for further advances in the field, when the scientist cracked the genome code for colon cancer. The team's findings were striking: instead of a handful of mutant genes, they found about 100 (3). Their findings laid a strong foundation for further studies of CRC genetics at Johns Hopkins Bloomberg School of Public Health, where researchers developed a new computer-based prediction model for genetic defects of Lynch syndrome.

This computer model, called MMRpro, estimates the probability that an individual carries a mutation in the MMR gene by looking at a detailed family history of CRC. It even predicts a risk of developing colorectal cancer when conventional laboratory tests are unable to find a genetic mutation, and tumor samples

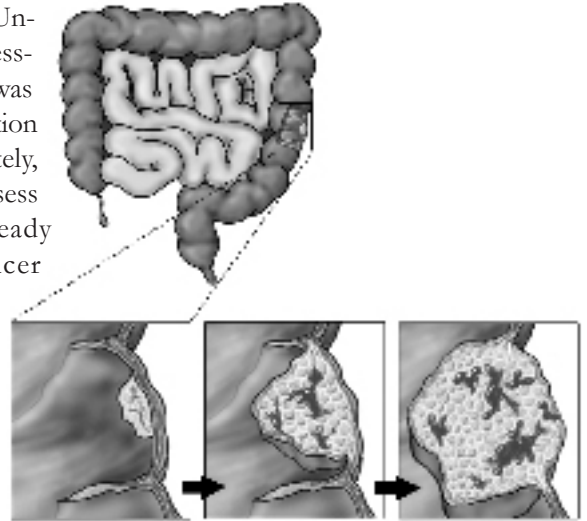
are not available (4). Unlike existing CRC assessment tools, MMRpro was found to predict mutation carriers more accurately, and can be used to assess both those who already have colorectal cancer and those who do not (4).

Hailed as groundbreaking, the development of MMRpro promises greatly improved genetic counseling and early detection for families identified to be at risk for CRC. The technology is especially important since CRC is one of the most treatable forms of cancer when caught early. The Johns Hopkins researchers' findings will also contribute to future genetic studies of cancer, including the Cancer Genome Atlas project, which utilizes large-scale genome sequencing to understand different types of cancers (6).

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▲ Uncontrolled cell growth in colon often results from genetic dysfunction in the mismatch repair system.