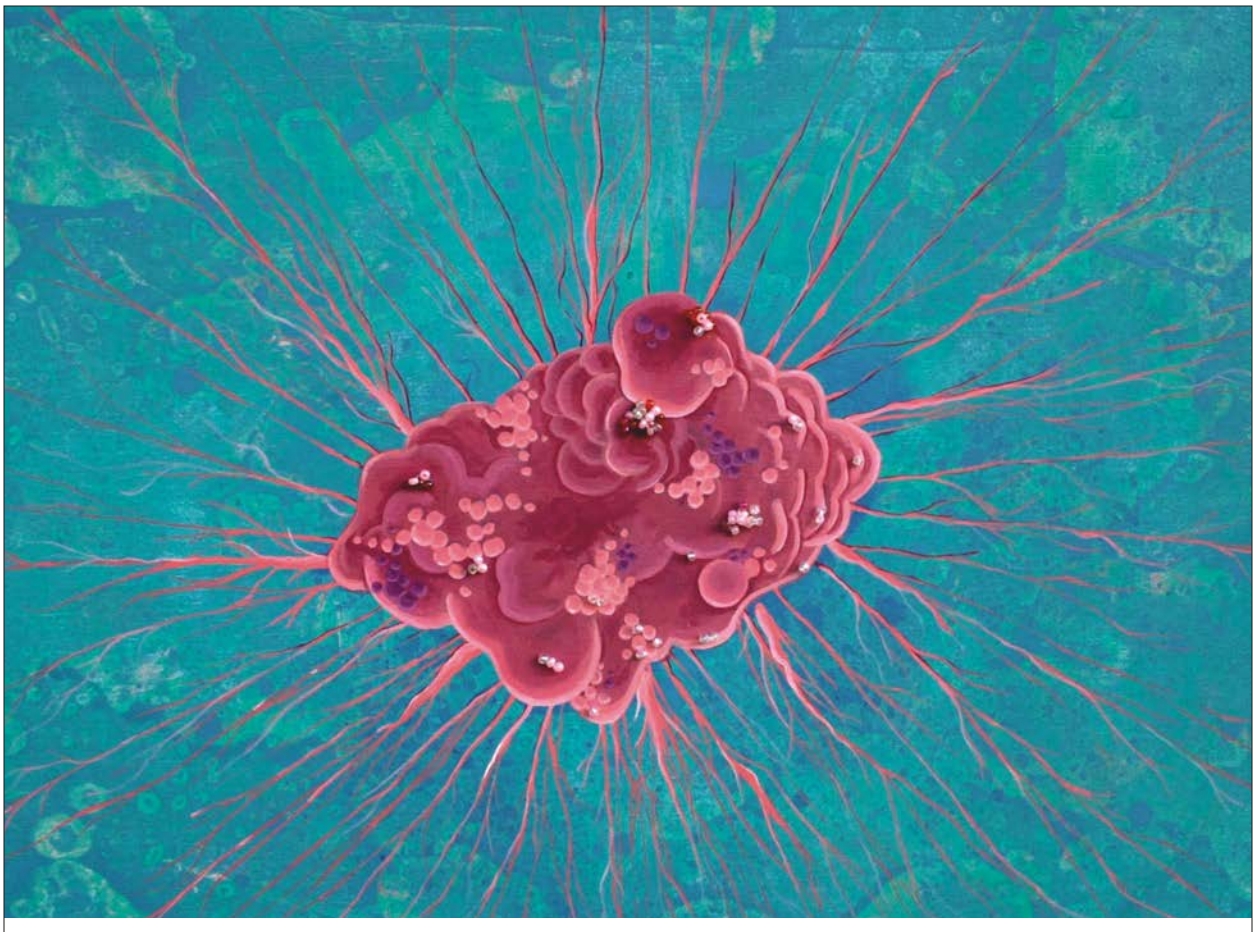

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Epstein-Barr: Scientists Decode Secrets of a Very Common Virus That Can Cause Cancer

About 90 percent of people are infected at some time in their lives with Epstein-Barr virus (EBV), usually with no ill effects. But individuals with compromised immune systems, such as people with organ transplants or HIV infection, have a greater risk of cancer occurring because of this virus.

Scientists at the Duke Cancer Institute have discovered a pathway that infected cells use to root out EBV infections, a finding that has implications for understanding the human response to cancer-causing viruses in general.

"Using cell culture studies, we have uncovered a major pathway that the infected host cell activates to prevent an oncogenic virus from causing cancer," said senior author Micah Luftig, Ph.D., Assistant Professor of Molecular Genetics and Microbiology. "We proposed that the cell was sensing that the virus is trying to take over. When this oncogenic stress response is activated, it keeps the virus in check, and now we know why."

The Luftig group also learned how the Epstein-Barr virus overcomes the cell's response. "The findings may eventually yield therapies to benefit people who don't have good immune systems and who need protection from a threatening EBV infection," Luftig said.

This work appears in the Dec. 15 online issue of Cell Host and Microbe.

Very early in many people's lives, there is a huge expansion of immune system B cells infected with EBV. But thanks to the oncogenic stress response and a strong immune system, the majority of these infected cells are killed off and the person remains healthy. Luftig and his group, including lead authors Pavel Nikitin and Chris Yan, found two enzymes, called kinases, which were critical in mediating this oncogenic stress response and preventing unchecked B-cell cell growth, called immortalization.

When the scientists blocked the ATM and Chk2 kinases, unchecked growth resulted in 10 times more infected cells. This burgeoning cell growth is related to several types of cancer, including post-transplant lymphoproliferative disorder, in which a transplant patient gets a form of lymphoma because of B-cell proliferation, and HIV-associated B-cell lymphomas among others.

"This finding can be extended to the general case of any oncogene being activated that might start the process of tumor formation," Luftig said. "About 20 percent of all human cancers are caused by infectious agents, where about 80 percent of these infections are viral." Another example of a viral infection leading to cancer is the human papillomavirus, implicated in cervical cancer.

Epstein-Barr virus infection can mean different courses for different people. In children 4-5 years old, a first infection with the virus may cause a mild illness, but if this primary infection happens during adolescence, the person may suffer a case of mononucleosis with heavy fatigue and other symptoms. In immune-compromised people, the virus can do much worse damage and cause forms of lymphoma.

Other authors include Eleonora Forte, Alessio Bocedi, Jay Tourigny, Katherine Hu, Jing Guo, David Tainter and Elena Rusyn of the Duke Department of Molecular Genetics and Microbiology, and Amee Patel, Sandeep Dave and William Kim of the Duke Institute for Genome Sciences and Policy as well as Rob White and Martin Allday of the Imperial College London.

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Pavel A. Nikitin, Christopher M. Yan, Eleonora Forte, Alessio Bocedi, Jason P. Tourigny, Robert E. White, Martin J. Allday, Amee Patel, Sandeep S. Dave, William Kim, Katherine Hu, Jing Guo, David Tainter, Elena Rusyn, Micah A. Luftig. An ATM/Chk2-Mediated DNA Damage-Responsive Signaling Pathway Suppresses Epstein-Barr Virus Transformation of Primary Human B Cells. Cell Host and Microbe, 2010; 8 (6): 510-522 DOI: 10.1016/j.chom.2010.11.004