Press Release

EMBL

Havoc in biology's most-used human cell line

Genome of HeLa cells sequenced for the first time

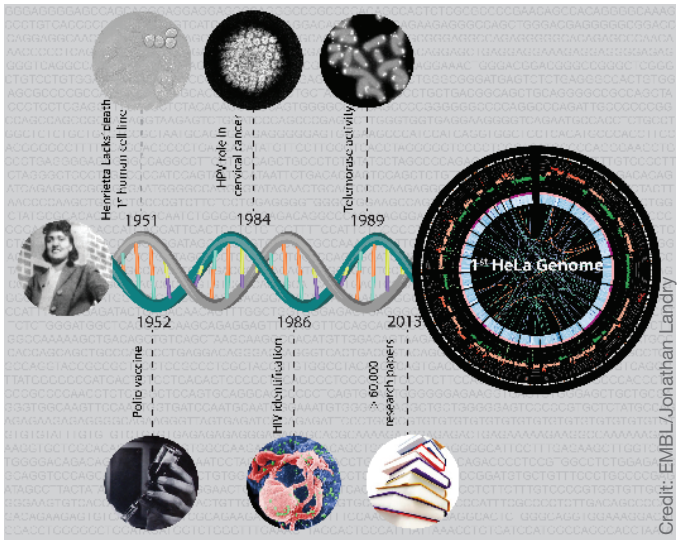
Heidelberg, 11 March 2013 – HeLa cells are the world's most commonly used human cell lines, and have served as a standard for understanding many fundamental biological processes. In a study published today in *G3: Genes, Genomes and Genetics* online, scientists at the European Molecular Biology Laboratory in Heidelberg, announce they have successfully sequenced the genome of a HeLa cell line. It provides a high-resolution genomic reference that reveals the striking differences between the HeLa genome and that of normal human cells. The study could improve the way HeLa cells are used to model human biology.

The scientists' analysis of the HeLa genome revealed widespread abnormalities in both the number and structure of chromosomes, as well as factors commonly associated with cancer cells like losing healthy copies of genes. In particular, the researchers found that countless regions of the chromosomes in each cell were arranged in the wrong order and had extra or fewer copies of genes. This is a telltale sign of chromosome shattering, a recently discovered phenomenon associated with 2-3% of all cancers. Knowledge of the genetic landscape of these cells can inform the design of future studies using HeLa cells, and strengthen the biological conclusions that can be made from them.

"The results provide the first detailed sequence of a HeLa genome," explain Jonathan Landry and Paul Pyl from EMBL, who carried out the research. "It demonstrates how genetically complex HeLa is compared to normal human tissue. Yet, possibly because of this complexity, no one had systematically sequenced the genome, until now."

"Our study underscores the importance of accounting for the abnormal characteristics of HeLa cells in experimental design and analysis, and has the potential to refine the use of HeLa cells as a model of human biology," adds Lars Steinmetz from EMBL, who led the project.

For decades HeLa cells have provided effective and easily usable biological models for researching human biology and disease. They are widely regarded as the 'industry standard' tool for studying human biology. Studies using them have led to two Nobel prizes and a host of advancements in many areas, including cancer, HIV/AIDS and the development of the polio vaccine. The HeLa genome had never been sequenced before, and modern molecular genetic studies using HeLa cells are typically designed and analysed using the Human Genome Project reference. This, however, misrepresents the sequence chaos that characterises HeLa cells, since they were derived from a cervical tumour and have since been adapting in laboratories for decades.



Since 1951, HeLa cells have made a significant impact in many areas of science and research.

The study provides a high-resolution genetic picture of a key research tool for human biology. It highlights the extensive differences that cell lines can have from the human reference, indicating that such characterisation is important for all research involving cell lines and could improve the insights they deliver into human biology. ●

Source Article
The genomic and transcriptomic landscape of a HeLa cell line – Jonathan Landry, Paul Theodor Pyl, Tobias Rausch, Thomas Zichner, Manu M. Tekkedil, Adrian M. Stütz, Anna Jauch, Raeka S. Aiyar, Gregoire Pau, Nicolas Delhomme, Julien Gagneur, Jan O. Korbel, Wolfgang Huber, & Lars M. Steinmetz. Advanced online publication in *G3: Genes, Genomes and Genetics* on 11th March 2013 - DOI: 10.1534/g3.113.005777

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About EMBL

The European Molecular Biology Laboratory is a basic research institute funded by public research monies from 20 member states (Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom) and associate member state Australia. Research at EMBL is conducted by approximately 85 independent groups covering the spectrum of molecular biology. The Laboratory has five units: the main Laboratory in Heidelberg, and Outstations in Hinxton (the European Bioinformatics Institute), Grenoble, Hamburg, and Monterotondo near Rome. The cornerstones of EMBL's mission are: to perform basic research in molecular biology; to train scientists, students and visitors at all levels; to offer vital services to scientists in the member states; to develop new instruments and methods in the life sciences and to actively engage in technology transfer activities. Around 190 students are enrolled in EMBL's International PhD programme. Additionally, the Laboratory offers a platform for dialogue with the general public through various science communication activities such as lecture series, visitor programmes and the dissemination of scientific achievements.