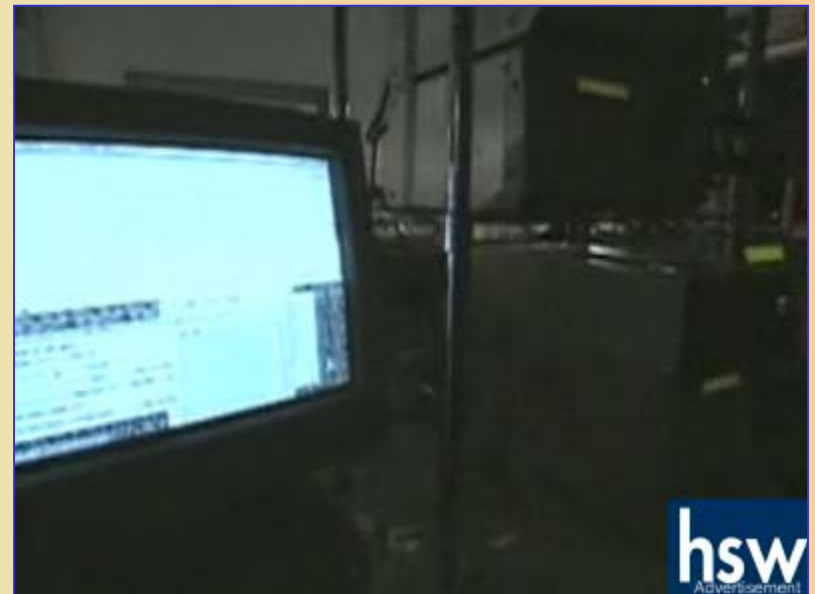


# Human Genome

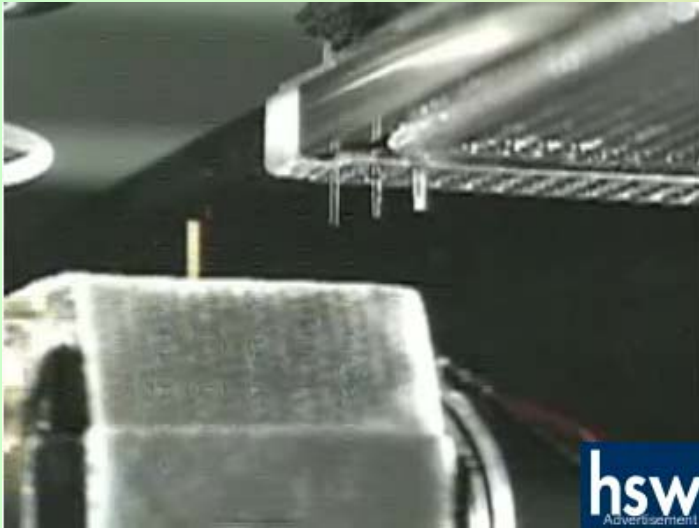


One of the most exciting aspects of human genome research is its potential to cure illnesses that we currently do not have answers for.

Until recently, it is only been possible to study one gene at a time, but now new technologies are being developed to search for thousands of traits, all at the same time, identifying genes in causing diseases and genes that make us susceptible for ill health.



# Human Genome



Scientists are developing a new technology, called "DNA chips", that can study thousands of genes at once. Here, tiny snippets of DNA are being anchored into a glass slide, so that it can be scanned simultaneously.

Researches have been hunting down disease genes one by one for the past two decades. The systematic search for human genes will vastly accelerate the process of finding genes involved in all aspects of health.



# Human Genome



Those genes [that cause diseases] can be found deep within the cell. They reside inside the cell's nucleus, on long strands of DNA.

These genes are scattered across our chromosomes...

... and as scientists explore our genes, they are finding that the common diseases have a strong genetic component. Eventually, they expect to find the genes involved in every ailment.



# Human Genome



The point of the genome project is to have the tools to find the actual causes.

That sort of understanding will transform medicine.

Scientists have found dozens of genes related to cancer. The challenge now is to understand how damaged DNA causes disease and death.

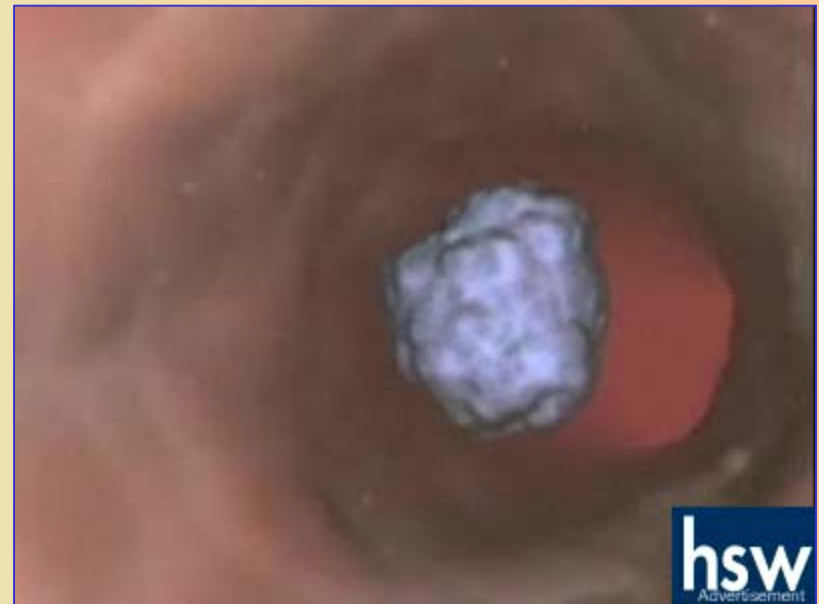


# Human Genome



Most cells in our bodies are supposed to grow and divide. But occasionally that growth will get out of hand; the cell will keep dividing endlessly. That runaway growth becomes a tumor: that is cancer.

A cancer cell can also break off and get swept away through the bloodstream. If that malignant cell settles somewhere else in the body, a new tumor can start growing: that is called the methastasis.



# Human Genome



The key is having an understanding of what is wrong. That way, we can be systematic and we will not depend on luck.

P53 is a protein that avoids the cell's division at the wrong time  
(intercepts incorrect signals sent by RAS that induce the cells to divide at the wrong time).

It activates some defense enzymes and runaway growth is halted.



# Human Genome



If one pair of bases is missing and the P53 protein is incorrectly built up, the enzymes can not do their job, and the risk of cancer is very high.

It has been discovered that if you take normal P53 gene and put it back into a cancer cell that has a mutated P53 gene, that cancer cell would undergo apoptosis or will kill itself, basically.



# Human Genome



Researches are trying to figure out how to transplant a healthy P53 back into people with cancer. This laboratory has genetically engineered a virus that causes the common cold.

This now carries a healthy P53 gene. The idea is to use this virus as a form of therapy, gene therapy.

When this virus infects cancer cells in the laboratory, it delivers P53 genes, and the P53 stops the abnormal growth and the cancer cell die off.



# Human Genome



Gene therapy refers to an approach to trying to treat disease where the gene is the drug. Basically, you are trying to deliver a gene to a particular place in the body and get it to work (that is, to make a protein).

Every breath we take brings us life-giving oxygen; blood rushes oxygen to all of our cells. But oxygen can also be present in a harmful form. This oxygen is called free radical. These free radicals are very unstable, they are likely to react violently with whatever they encounter.



# Human Genome



Some of these free radicals drift into the cell's nucleus. When free radicals collide with DNA, they can damage our genes, they can alter our genetic code, and create mutations.

Living creatures have developed defenses against free radicals; human defenses are quite elaborate and include enzymes that are constantly patrolling, looking for mutations caused by free radicals.

But it is a never ending process and sometimes the accumulated damages are simply too much.

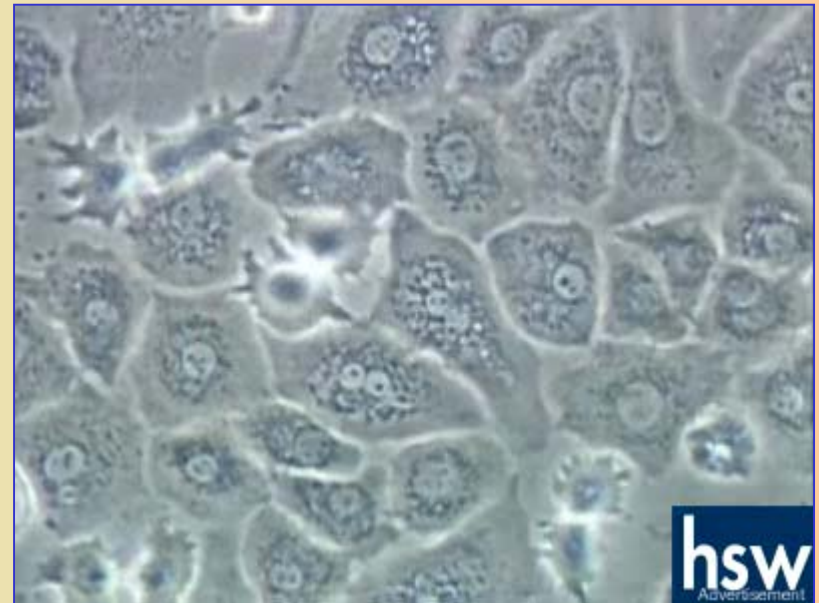


# Human Genome

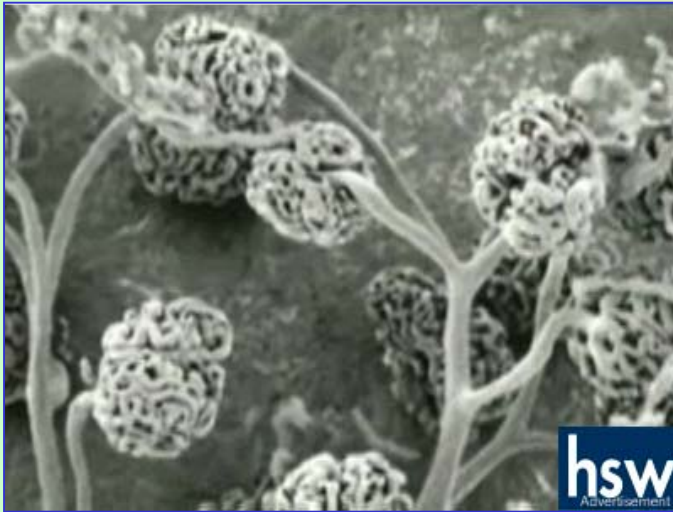


In that case, P53 calls up the enzymes that would destroy the cell: it is better to lose a damaged cell than risk a process out of control that would become a cancer.

Our tissues are constantly replenished with new cells. That is useful in places where cells are lost such as inside our blood vessels



# Human Genome



As we age, this process slows down and eventually can come to a halt.

The telomere (a region of repetitive DNA at the end of chromosomes) plays a vital role in protecting the end of each chromosome and keeping it healthy. Telomeres get shorter over time



# Human Genome



Eventually you get to the state where telomeres no longer function to protect the DNA and it becomes impossible for the cell to keep dividing.

Some scientists think that this process plays an important role in aging, so they are avidly studying the telomeres "to search the fountain of youth".

"We know that aging is genetic".



Video:

<http://videos.howstuffworks.com/hsw/20131-the-human-genome-mapping-humanity-video.htm>