

Implications for the Future: The Genomic Era

How does our knowledge of the human genome help scientists and doctors make advances in health science and medicine?

In the past, doctors and scientists did not have the benefit of a human genetic blueprint to help them better understand sickness and develop appropriate treatments. If a house needs repair or maintenance, mechanics and engineers can consult the blueprint when analyzing a problem and avoid unnecessary work, or, more importantly, avoid worsening the problem.

Similarly, the blueprint of the human body provided through the Human Genome Project will help analyze problems when something goes wrong with a person (that is, when someone develops a disease). In the future, when a doctor is treating someone who is sick, he or she will be able to consult the



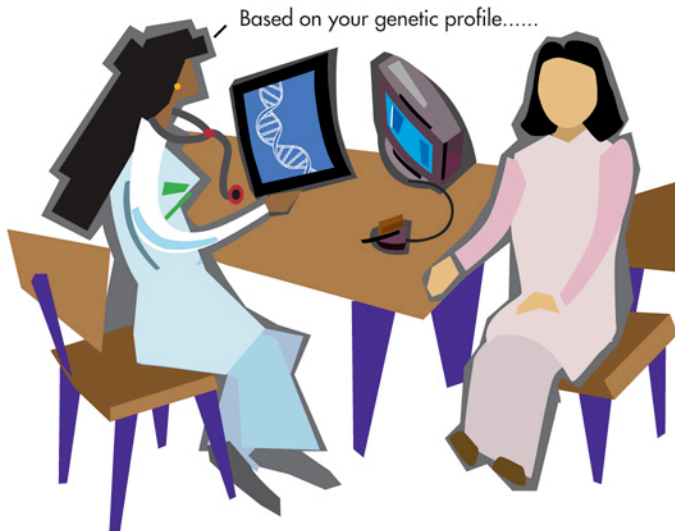
patient's genetic blueprint in order to determine what variation of genes that patient has and prescribe a particular treatment that he or she knows is most likely to be effective for that individual. This will also help doctors avoid prescribing a drug that could cause a serious side effect.



With the completion of the Human Genome Project, we are now entering the Genomic Era.

The Human Genome Project has successfully determined the 99.9% of the genome that we all share in common. However, we said at the start that we are all unique. This wonderful diversity is also reflected in the different diseases that afflict us as individuals. So, one of the next challenges of the "Genomic Era" is to learn all of the possible genetic variations that can occur within the entire list of genes that malfunction to cause disease. This will help lead to new prevention strategies and treatments. Doctors will begin to think of diseases in terms of their causes, rather than only their symptoms. It has been said that "an ounce of prevention is worth a pound of cure." The Genomic Era promises great improvements in the prevention of illness, partly by identifying individuals at high risk of developing a disease. This will make medicine more effective and precise because doctors will be able to take the necessary measures to prevent illness, rather than waiting until symptoms occur.

The environment is critically important too. Currently, relatively little is known about the genetic basis of some common diseases such as, cancer, diabetes and Alzheimer's disease, where risk factors may be associated also with diet, cigarette smoking or other environmental factors. Future genomic research will enhance our understanding of which genes interact with which environmental factors to cause these diseases. As our understanding of the genetic component of these and other diseases increases we will be better able to identify individual risks and to develop new, more efficient drugs. Drugs based on a precise understanding of the causes of disease will be more effective and less likely to cause side effects.



There are many other potential benefits of the Human Genome Project involving human health. There are also other benefits that don't directly involve human health, but will advance our knowledge of the world in which we live. As we look to the future of health sciences we see a bright new horizon.

"For the first time in history, humankind can read its genome - its Book of Life. This book is unlike any other, for, in reading it, we will uncover an ever-expanding view of ourselves."

- Francis S. Collins
Director, NHGRI

