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Book Review

The Genomics Age—How DNA Technology Transforms the Way We Live and the Who We Are. **By Gina Smith. AMACOM, New York, 2004, 240 pages, ISBN 0814408435, $24.00 (paperback).**

Editor's note: The book reviewed here is written for a general audience and especially for educated non-biologists. Hence, I have solicited a review from such a person, and the review is written with that audience, rather than the typical Rejuvenation Research reader, in mind.

THE MOST PRECIOUS VALUES that a person possesses are body and mind. Gina Smith raises her voice to alert her readers that the nature of our bodies and minds as we know them will soon become a thing of the past. To fully understand this revolutionary transition, she offers her book as a clear guide to understanding the changes that are taking place. To introduce a rather difficult and fast-developing concept, an introductory part of her book is devoted to the terminology and history of this field, so you clearly understand where we have been and how we end up in the current direction of genomic development.

The major reason for fast development in the field of genomics is that in DNA, information is recorded in a way very much like information in a computer. DNA is made up of a combination of just four letters that combine into three-letter words, codons, and these code for 20 amino acids, the basic elements of all living matter. This discrete arrangement allows rapidly developing computer technology and genomics to go hand in hand and thereby allowed completion of the human genome project. The digital character of DNA results in proteins made according to its code and these proteins are very similar (e.g., pigs' insulin is so similar to humans' that it has been used to supplement human insulin in the past). The protein production is so similar because of similarity of DNA across vertebrates. The remarkable similarity between apes and humans allows studying age-related diseases on apes whose life span is half that of humans. The shorter life span of apes allows the application of this new knowledge at a faster rate than that of human aging. One thing that is remarkable with apes is that only 21 single changes in DNA, related to hearing, may be the difference that resulted in development allowing communication between humans.

Smith points out that today couples have the choice of pre-implantation genetic diagnosis and in vitro fertilization. This technique allows parents to produce multiple (~30) embryos. These embryos are examined for genetically inherited diseases and parents get to choose the embryo serving their needs the best. How close is this to playing God? Is avoidance of serious DNA defects the only justification for this method or should we also choose color of the eyes, intelligence, gender, obesity and other cosmetic differences when deciding what embryo to allow to enter the mother? Because this procedure is expensive, only wealthy clients will most likely use it. Perhaps this will be a new factor directing the current course of evolution, sharply changing the character of "survival of the fittest." This technology may, for example, eliminate small people, dwarves, as they are thought to have a genetic disorder. Is that really a disorder or just another possible evolutionary branch? If we allow parents to design their children, how contrasting will be their ideas? What is good and wrong for their newborns? Will this technology lead to only a narrow spectrum of people controlled by the media?

Say it becomes feasible to get your genes tested against a fast-growing number of genetic diseases. Is it good to know that you have Huntington's disease while you are still

healthy? Is it good to know that you will almost certainly die of this terrible disease because there is no cure? Some would decline. But what if a cure becomes available? If you knew that you had the disease then maybe you would act quickly, acquire this new technology and live a healthy, happy life. These concerns fuel most of the content of this book.

Smith points out that, though progress in genomics has been relatively fast, this progress could be much faster; therefore, cures could be readily available to those destined to die. The main reason for the slow advance of the DNA revolution is poor genetic knowledge by members of the general public, who may have never heard about DNA. Many people fear DNA manipulation because of their religious fear of playing God.

As medicine has become more and more deeply associated with exact disease mechanisms it has changed from being first of all curative, then preventive, and finally predictive to the reverse—predictive first, then preventive, and finally curative.

Smith also discusses that perhaps this technology will slow down or even stop aging. Will the anti-aging development help to make aging slow enough that aging citizens will gain time, with hope for medicine allowing them not to age at all? Smith points to examples from nature indicating that there is no reason for species to die at a predefined age based on size. For example, the mouse, canary, and bat are all the same size but have contrasting life spans of 2, 15, and 50 years. And it is not just the life span but the health span that is promised to be enlarged.

Some in the scientific community believe that telomeres at the ends of chromosomes may be a deciding factor of the aging of the individual. Perhaps a search for telomere lengths all over the world will allow us to find humans whose telomeres are the longest and see if this group also lives the longest.

Other factors controlling premature aging include variation in the microsomal transfer protein, which assures a long life span in humans by preventing clogging of the vessels. However, to speed up anti-aging research much more funding is important to ensure the fast transfer of developing technologies into pharmaceutical products. To ensure this, venture capitalists need to be offered a “cookbook” to assure them that the development of critical medications extending the lives of citizens will happen in real time.

Several ideas presented in this book show how to slow aging. One method is caloric restriction. Should we use natural starvation or develop a drug? Caloric restriction in many species is found to postpone aging.

We know today that the gene TEP1 on human chromosome 14 codes for telomerase and in the middle of chromosome 4 there is the microsomal transfer protein gene (arteries). Both of these genes may influence the rate of aging. Should we develop genetic therapies to manipulate these genes and live longer?

Smith points out that DNA sequencing of roundworm and fruit fly is as time consuming as for the human genome; however, these animals allow us to reach conclusions about genes causing diseases much faster, due to their fast reproduction rates.

Experiments with fast-reproducting animals identified the protein VEGF (vascular endothelial growth factor) that allows building blood vessels to feed cancer cells. This knowledge inspired scientists to develop drugs cutting the blood supply from cancerous cells. The genome project also enabled us to establish a similarity between wound healing cells and cancer cells.

Smith discusses the consequences and limits of human cloning. Is cloning of humans ethical? Is cloning of human organs ethical? There are still problems with cloning including the large size of many cloned animals and the frequent occurrence of cancer and arthritis. But should we at least fund therapeutic cloning? For example, cloned stem cells can be differentiated into neurons to treat Parkinson’s disease as cloned cells can travel to the damage areas as observed in rats. There are also possibilities of using adult stem cells that may be potentially used for therapeutic techniques. Parthenogenesis is another way out, enabling us to create stem cells without male chromosomes.

Some researchers believe that they could have saved millions of lives with no ban on embryonic stem cell research and involvement of

religious issues in politics. Why can the church deny the rights of others to receive appropriate therapies?

It is being shown that germ-line gene therapy is possible and may be available soon. It is common sense to give our future descendants more effective genes. It goes against human nature not to try to improve the lives of our children and those that follow. If aging is important for humanity, why are there so many brilliant people wasting time on solving mysteries other than aging?

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