Cosmetics and Genetics: Facts and Visions

Authors: Werner Voss , M. D. (Dermatology), Gerrit Schlippe, M.D. (Dermatology), Dermatest® GmbH

Abstract

During the last few years, genetic engineering has been quite successful. However, as far as growth and regeneration of the skin are concerned, scientists have not yet been as fortunate. A cosmetic that would be able to influence genetic mechanisms is still a far-off dream as is gene therapy in many diseases. If we consider the complexity of control mechanisms of the skin and the connective tissue we can imagine how much time it would take for decisive progress to be achieved in this field. Human connective tissue cells, or fibroblasts, were found to be controlled by at least 337 genes; they behave in very different ways depending on their anatomic region. In addition, dieticians today are convinced that everything we eat or drink influences the efficacy of our genes.

Another area that so far has been investigated only to a small degree is the impact of so-called signal molecules on the genetic mechanisms of the body. In humans, insulin is an example of such a signal molecule potentially co-ordinating the stress reactions throughout the body.

The nutrition molecules are thoroughly checked at the cell membrane before they can enter the cell. Occasionally, however, toxins (e.g. alcohol) may avoid the controls and damage the cells dramatically. On the other hand, vitamin C from orange juice can stimulate genes inside the cell to generate collagen. In one part of the cell - the endoplasmatic reticulum - the new fibre takes shape. The cell core conserves the most precious treasure which is the DNA. Access here is only possible for substances having a special permit: proteins and nutrition substances activating the genes. Of course, toxic substances may cause damage here, too.

These examples are just to show how complicated these problems are in detail. Research in this field is going on in numerous laboratories all over the world. Methods on a molecular level such as DNA microarrays are continuously becoming more accurate and more effective. The results could assume great importance, especially for the development of cosmetic preparations in a few years' time. If it would be possible to cause fundamental changes to the skin and the connective tissue of the skin using signal molecules, we would have made a great step forward.

Introduction

It was only in 1965 that scientists found out that human genes work in almost the same way as those found in bacteria. To allow an organism to exist countless substances have to be constantly produced and the genes control which substance is produced and when. It is only a small step from this finding through to intervention in this process - genetic engineering. Discussions have been going on for more than 40 years now, particularly since human genetic material was completely decoded in 2001. We are now able to read the book of life, although we are still unable to understand it.

Genes in the human body

The human body consists of around 100 billion cells. Almost all of these contain the complete human genetic material, with some 23,000 genes. Chromosomes contain a long string of DNA, packed by means of protein molecules where the genes are localised. One somatic cell contains 23 pairs of chromosomes. One gene normally controls the formation of one or more proteins inside the cell. There are also genes that activate other genes thus acting in a rather indirect way. In doing so, all of them contribute to the development of characteristics