Chapter 9

THE RECOMBINANT DNA TECHNOLOGIES

“...eugenics and genetics, they are clearly related”*

GENETIC ENGINEERING AND RELATED TECHNOLOGIES – BIOLOGICAL PERSPECTIVE

Recent developments in genetic engineering have brought an unprecedented increase in our power over living things. Gene mapping together with recombinant excising and splicing techniques hold great promise for producing new kinds of plants, animals, drugs and for treating human genetic diseases. Transgenic plants and animals are genetically novel creatures because they carry integrated foreign genes, which are correctly expressed and inherited by subsequent generations.

The technology used to produce transgenic organisms is known as recombinant DNA technology, or more popularly as genetic engineering and cloning. ‘Recombinant DNA’ means DNA made up of connected segments from mixed sources; for example, from different species or a combination of natural and synthetic DNA. Recombinant DNA technology has revolutionized experimental biology by advancing understanding of gene construction and regulation and through applications in agriculture, veterinary science, medicine, forensics and environmental pollution. In the area of pollution, for example, genetically engineered bacteria equipped with DNA that codes for enzymes that breakdown constituents of oil, have been developed to help combat toxic oil spills. Biotechnology companies to deal with other pollutants, such as sewage and dioxins, apply similar principles. It


I. Pollard, Life, Love and Children
seems, therefore, that the major goals of biotechnology are no different than those for conventional technology. For instance, the aims of animal husbandry involve increases of fecundity, feed-use efficiency, food production and disease resistance. For centuries these characteristics have gradually been improved by slow breeding programs designed to combine beneficent traits of individual animals. Now the animals can be radically changed in just one generation; for example, transgenic pigs expressing the human growth hormone gene grow fast and produce animals with less fat. It must be qualified, however, that foreign genes can have profound effects on the overall pattern of gene expression and responsiveness to changing environmental conditions.

Embryo transfer technology (chapter 8) has equipped scientists for the manipulation of embryos at the cellular level, transfer them from one maternal location to another and access their genetic material. It is interesting to note that one successful technology has empowered the veterinary and medical professions with the ability to select for sex, desirable physical characteristics and lack of deleterious genes. Even the hereto most distant prospect of mammalian cloning has become reality with the birth of Dolly - the sheep cloned from DNA taken from a live udder cell of a six-year-old ewe (chapter 10). This latest reproductive technology, understandably, caused an immediate preoccupation with how genetic advances will affect people’s lives; often in bizarre and sensational ways. However, cloning technology should not obscure the more immediate positive goals of gene technology. On the other hand, science’s seemingly limitless power to redesign our lives biotechnologically has raised well-grounded fears, and sparked ethical concerns as never before.

Balanced biologically informed debate has to be encouraged since innovations in genetics open possibilities of influence not just for the present generation, but also for future ones by influencing the kind of living organisms brought into the world. On the optimistic side, the manipulation of heredity in medicine and agriculture for carefully defined purposes and under appropriate supervision, can both be ethically acceptable and socially desirable. For example, the application of embryo technology for the preservation of endangered species holds broad appeal. Viewing the question from the historical perspective, we must also acknowledge that genetic manipulation is not new - just the technology involved. Chapters 2 to 4 draw the reader’s attention to ways that congenital risks can be heightened by parental lifestyle or sexual practice, which also deserve serious consideration of how best to protect the common rights of children to be born free from preventable disability. Parents have, since the earliest times, genetically engineered their own kids, demonstrating that human conduct and cultural