Introduction to Molecular Biology Basic Theories and Techniques

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Recent advances in molecular biology and application of recombinant DNA techniques into many fields of biomedical research have certainly brought a revolution in life science. Undoubtly we now live in an era when not only experimental biologists but also every clinician need to know the basics of molecular biology and to learn related techniques. In fact, a growing numbers of physicians today would like to practice and apply molecular techniques in their clinical research settings.

Perhaps among the numerous achievements and contributions made through the use of powerful molecular techniques in medicinal science, the hallmark and essence of recombinant DNA technology is to isolate, analyze, and manuplate genes to put them back to living cells, leading to an effective over-production of medically important proteins. In clinics, DNA-diagnostics are now being used to identify viral infections and genetic mutations for the diagnosis of various infectious and genetic diseases. Furthermore, with an efficient gene transfer techniques being developed, it is now also possible to introduce or knock-out specific target genes to study the role of the gene as well as to treat genetic defects.

The presentation is aimed to introduce clinicians the most basic and core principles and techniques of molecular biology, in particular recombinant DNA technology. This includes cloning procedures for gene library construction and molecular analysis of DNA, RNA and proteins (Southern, Northern, and Western blot analysis). DNA-based diagnostic techniques with a combined use of polymerase chain reaction (PCR) and DNA sequencing, together with conventional DNA hybridization technique using various probes will be presented. In addition, prospects and practical approach of human gene therapy using an efficient gene-transfer technique will be introduced.