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Agricultural Biotechnology

ARIE ALTMAN (ed.)
1998. Marcel Dekker Inc., New York.
770 pp. 26 × 19 cm
ISBN 0-8247-9439-7

Agricultural Biotechnology (AgBiotech) deals with the utilization of living organisms, or portions of them, to obtain or modify products, to improve plants, animals or microorganisms for specific purposes in crop plant and animal livestock production or even fish production. AgBiotech is not an independent science, but consists of the application of scientific knowledge from other fields such as molecular and cellular biology, biochemistry, genetics, microbiology, embryology, animal and plant physiology, chemical and biochemical engineering, and even information technology and robotics, with the objective of developing productive processes in agriculture.

This book covers an extensive field of modern agricultural biotechnologies, excluding food biotechnology, and is grouped in five major areas: biotechnology on plants and specific plant crops, microbial agro-biotechnology, livestock biotechnology, marine biotechnology, and legal and public aspects. A total of 36 chapters have been written by 74 authors, including authorities and specialists on different aspects of agricultural biotechnology around the world. The first chapter of the book is an excellent introduction to a historical perspective and the limitations of traditional agriculture, the different faces of modern biotechnology, and up-to-date of the AgBiotech industry, and the impact in biodiversity and the environment. The first part consists of a series of chapters on clonal germplasm micropropagation, production and conservation; genetic engineering and technology of plants for crop improvement and metabolite production. The second part consists of microbial agro-biotechnology and deals with biocontrol of phytopathogenic bacteria and fungi and pest and weed control, biofertilization, phytoestimulation and bioremediation of pesticide impact and agricultural chemicals. The third part describes livestock biotechnology and includes contents on animal germplasm selection, embryo manipulation, reproduction and fertility; transgenic livestock technology for growth, milk, eggs and novel proteins; and biotechnology in Veterinary diagnosis. Part four is a contribution to biotechnology of transgenic fishes and marine invertebrates, applications of macro and micro-algae in bioremediation and production of valuable products. Part five gives an excellent overview on plant patent process, certificates and intellectual property rights, ethical aspects and public acceptance. The last part offers three chapters on relevance of biotechnology for food production in developing countries, its impact in the environment, and an update of the prospects and limitations.

The book is strongly recommended to advanced students, scientists and technologists, dealing with life sciences, directly or indirectly related with agricultural and veterinary sciences, and undoubtedly will contribute to provide them with a multidisciplinary view of biotechnology. It is especially recommended to microbiologists because it gives several examples of new fields of application of microbiology in agriculture, not adequately covered in most textbooks available.

Emili Montesinos
University of Girona

In Situ PCR Techniques

OMAR BAGASRA, JOHN HANSEN
1997. Wiley-Liss Inc., New York.
142 pp. 23 × 15.5 cm. Price: £ 32.50
ISBN 0-471-15946-8

Is this just another PCR laboratory manual? At least after reading the title you may start thinking whether it has something different from other similar manuals. It says “In Situ”. This fact may strike the novel molecular biologists who have learned all the characteristics and possible problems of the polymerase chain reaction when performed in an Eppendorf tube. What does it mean “In Situ”?, they may wonder.

Since Kary Mullis’ invention of the PCR, virtually all areas of molecular biology have changed. The detection and analysis of specific nucleic acid sequences has raised a whole bunch of new applications. Many fields have benefitted from the developments and application of the conventional PCR and its modifications. However, in a wide range of embryogenetic, organogenetic and pathogenetic processes, in situ PCR may help to uncover some of the questions still not clear in molecular biology.

An example of these applications is how O. Bagasra pioneered the development of in situ PCR techniques. He was studying the transmission of HIV-1 from mother to fetus by using conventional PCR when he realized, together with H. W. Lischner, the incalculable value of PCR for detecting individual HIV-1 infected cells. It could also be used to distinguish between latently and productively infected cells, and to differentiate maternal from infant cells in tissue sections. The main criticism raised by some experts was that cells were going to be disrupted under the temperatures required to anneal DNA and there was no way for the amplification products to diffuse outside the cell. Since then a cascade of new approaches and findings have improved the technique. Haase et al. used a set of multiple overlapping primers to produce amplification products spanning more than 1000 bp, which are large enough to slow diffusion from their site of origin. Nuovo et al. incorporated digoxigenin-labeled nucleotides to the reaction so that the PCR products could be detected directly by histochemical techniques. At the end, the Bagasra approach to in situ amplification of gene sequences, which is described in the book, has been proved to be especially sensitive and specific. It is evident the enormous potential of this technique because its ability to detect a single copy of a specific microbial, neoplastic, messenger or mutated nucleic acid sequence in a

cell smear, cell suspension, tissue section, or chromosome. This answers the question stated at the beginning of this review: this is the real mean of "In Situ".

The text is well organized although full of details about the different techniques. It is a book to be used in the lab and the format helps in doing so. In the first two chapters, it gives a review of the conventional PCR techniques and includes the solution-based reactions. Chapter three gives useful information for those not familiar with histological techniques for the preparation of glass slides and tissues. Chapter four to six condense the in situ PCR. DNA, RNA targets; special amplifications; and the hybridization reactions cover with full details the performance of this technique. One chapter on validation and controls is extremely useful for those approaching PCR for the first time. Two appendices (Computer-assisted designing of primers and The detection of rare events) are of great help for the practical work in the lab.

This manual will be extremely useful to researchers and laboratory technicians looking for maximum specificity or sensitivity in qualitative searches for cells containing low levels of genes or messenger as well as for those seeking greater sensitivity, precision, and reproducibility in enumeration of such cells. The book provides you with a wide range of details not written anywhere but useful to carry out laboratory work.

Imma Ponte
Autonomous University of Barcelona

Diagnostic Virology Protocols

JOHN R. STEPHENSON, ALAN WARNES (eds.)
1998. Humana Press, Totowa, New Jersey.
370 pp. 23.5 × 15.5 cm. Price: $ 99.50 (hardcover)
ISBN 0-89603-479-8

Diagnostic Virology Protocols edited by John R. Stephenson and Alan Warnes, belongs to the collection "Methods in Molecular Medicine". As the editors point out in the preface of the book "the accurate and reliable diagnosis of transmissible diseases is the most powerful weapon available to ensure their control and in some cases eradication". In general, viruses have proved to be much more difficult to detect than other infectious agents; their size and absolute dependence of the host for propagation have rendered useless methods traditionally used for other microorganisms. Until the development of tissue culture in the 1950s, viral diagnosis was entirely dependent on the skill of the clinician. In the past virus diagnosis has been less valuable than similar tests for bacterial and parasitic infections since the technology has been too slow to directly affect the treatment of the patient from whom the sample was taken. Several technological innovations, developed over the last ten or fifteen years, revolutionized diagnostic virology: solid-phase assays (such as RIA), ELISA and latex-agglutination technology have become increasingly popular since they use less material and may be readily adapted to automated laboratory protocols. The onset and rapid evolution of PCR technology has, almost for the first time, enabled pathologists to consider viral diagnosis to affect treatment. PCR is sensitive enough to detect and identify, provided that careful and appropriate controls are employed, viral genomes in the early stages of infection. Additionally, the product of the PCR reaction can have its entire nucleotide sequence determined at a later date for the unequivocal confirmation of the diagnosis. Such accurate information early in viral infection enables to decide whether antimicrobial therapy should be applied, and in most cases, the unnecessary use of antibacterial drugs can be avoided since overprescription has been implicated in the rise of antibiotic-resistant bacteria.

In *Diagnostic Virology Protocols*, we find chapters covering the major groups of viral pathogens, as well as those introducing and assessing the utility of a number of recently developed technologies. Some of the authors of *Diagnostic Virology Protocols* are virologists with a wide reputation and recognized experience in viral diagnostic. Most of the contributors are from the UK, where a long time tradition in diagnostic virology exists. Methodologies are accurately described and should be reproduced by the reader without major problems. The reader may occasionally consider that an alternative procedure could work better for a given virus strain, bur overall in one or other chapter all widely used technologies are found. Some confusion may arise when different protocols are suggested by different authors for the same objective, for instance stool sample processing for RT-PCR. However, this only shows that there is no universal procedure for a given diagnostic step. Viruses causing veterinary diseases are not considered in the present book. However, protocols for viruses of veterinary relevance may be adapted from the information from this work on similar virus strains.

In conclusion, *Diagnostic Virology Protocols* may be strongly recommended to basic and clinical virologists who look for state-of-the-art methodologies to apply in their current virological studies.

Albert Bosch
University of Barcelona

Adenovirus Methods and Protocols

W.S.M. WOLD (ed.)
1998. Humana Press, Totowa, New Jersey.
(Series: Methods in Molecular Medicine, vol. 21)
352 pp. 23.5 × 15.5 cm. Price: $ 99.50 (hardcover)
ISBN 0-89603-551-4

This book belongs to the "Methods in Molecular Medicine" collection and consequently its content relies on methodological procedures. *Adenovirus Methods and Protocols* includes the description of basic procedures for the growth and titration of adenoviruses and for their genetic manipulation. Several approaches used for the study of the immunological response to adenovirus as well as for the study of their oncogenic capacity and their pro-apoptotic activity are also covered. Other topics include: methods for the study of some adenoviral regulatory proteins such as the proteins involved in gene expression and messenger splicing of the protease involved in protein

maturation, methods for the study of the virus entry, purification and detection methods and computer-based procedures for the phylogenetic analysis.

Although the 25 different chapters are written by different authors (45 contributors), they are equally structured in a brief general introduction to the topic, followed by a material selection, a methods selection and a fourth section with special notes or comments that clarify some aspects of the methodology described, and which are included in numerical order in the text of the procedure. This latter section is, maybe, the most interesting part of each chapter, because one can solve problems related with the techniques, taking in mind the considerations listed.

The book is a very good compilation of recipes, and maybe for this reason it could be found sometimes boring because the lack of illustrations. In conclusion *Adenovirus Methods and Protocols* is an interesting book useful for people starting research on adenoviruses or for people not expert in this group of viruses, but who intend to use adenoviral vectors.

Rosa M. Pintó
University of Barcelona

Darwin Among the Machines. The Evolution of Global Intelligence

GEORGE B. DYSON

1997. Helix Books. Addison-Wesley Pub. Co. Reading, Massachusetts.
286 pp. 24 × 16 cm. Price: $ 25
ISBN 0-201-40649-7

Each of us who dwells in our habit-forming machine-laden world (telephone gabbing, computer surfing, automobile driving in the presence of recorded sound) wonders how we arrived at where we are now. Dyson stimulates our curiosity and satisfies it as he traces the story of the organization and manipulation of great quantities of data. He especially enlightens the curious like me with no particular interest in the history of technology, because he casts his story around the unresolved Charles Darwin-Samuel Butler debate.

On 13 June 1863 Samuel Butler (1835–1902), who was to become the well-known novelist by the age of 23, pseudonymously published an essay, "Darwin among the Machines" in New Zealand's Canterbury Press. Butler, who had just enthusiastically emigrated to the twelve-year old colony and had read the 1859 Origins of Species, continued throughout his literary life to analyze and criticize Darwin's writings, especially the ensuing editions of Origins. He signed his assay as "Cellarius". Thought by many to be Darwin's most able critic, Samuel Butler, in work that he considered more important than his novels, relentlessly attacked the hero from many sides. He especially railed against the point that some claim was Darwin's only, or at least his most original contribution: the explanation of species origin. Darwin posited that small, gradually accumulated accidentally generated (i.e., randomly begot by chance alone) inherited variation is the main process by which living beings change, are selected and therefore evolve. Small accumulated change was declared to lead gradually to large conspicuous change by chance events, by luck. But, for Butler, life including the machines to which life is connected, evolve not by luck but by cunning. Dyson, who sees great evolutionary continuity between life and its extensions, agrees far more with the denigrated Butler on this point than with the celebrated Darwin.

In Dyson's narrative of the origin and evolution of computers, technical, indeed intrinsically boring subjects come alive. The mechanics of grenade throwing and who won the contract to tabulate the 11th United States census (and why he won) are a charming part of the larger narrative. When rifles and machine guns that could kill with a precision far superior than a "kilogram of iron and high explosive hurled 30 m through the air", grenades were prematurely perceived as doomed and obsolete.

Another of Dyson's major points, in addition to the idea that timing and sequence are everything, is the correctness of Samuel Butler's view that animate life and machines co-evolve. Both bodies and their extensions change as a part of the evolutionary process in ways, not really predictable, that reflect the past experience of life as a whole. Butler wrote about perfection in mechanized development only superficially tongue-in-cheek. Speaking on behalf of the machines (in a 15 September 1863 letter, to the Canterbury Press) Butler says, "Our plan is to turn man's besotted enthusiasm to our own advantage, to make him develop us to the utmost, and find himself enslaved unawares". The same Butler, who accused Darwin of taking the life out of natural history, appropriately put life into the machines. He signed this letter "Lunaticus". Claims Dyson: "Samuel Butler foresaw the evolution, perhaps not so far off as he imagined, of that phenomenon, somewhere between mechanism and organism, now manifested as the World Wide Web" (p. 33).

Somewhat reminiscent of the 17th century Bach family or the 19th century Darwins, Huxleys and Butlers, these Dysons illustrate an old English saying, "If you want to educate a man begin with his grandfather". George, our author (born in 1953), is son of prolific and wise mathematical physicist and his former writer-logician wife Verena Huber-Dyson. (Freeman Dyson's latest book is Imagined Worlds, Harvard Univ. Press, 1997.) His grandfather (also George Dyson, 1883–1964), "was a professional musician who first secured fame and lasting fortune by his mastery of the art of throwing bombs [hand grenades]" (p. 219). His older sister Esther is the well-known computer guru, who designs living in the digital age. And, finally, George's daughter Lauren, five years old in 1994, when parent and child were watching Tom Ray's digitally self-reproducing organisms on a tape, corrected her father. George the father, as no doubt Charles Darwin would have, insisted to Lauren that Ray's screen images were only imaginary creatures. Lauren, precociously, and in my mind appropriately, on the side of Samuel Butler in the Darwin-Butler debate, insisted they were not imaginary (see p. xii). In the case we see the incipient education of the child began not with her grandfather, but with her greatgrandfather.

The reality of the imagination is a powerful subtheme in this delightful and original book. So meander other variations in Dyson's myriad subthemes: for example, wildness and

unpredictability, wilderness and creativity and two approaches to boat building. In one the builder, like George himself does in real life, assembles a skeletal kayak and provides it a skin that permits it to float. This compares to designing a computer. Alternatively one digs out a large intact log to make a dugout canoe by removing the wood one chip at a time. This approach more resembles the degeneration and loss of unconnected neurons in the development of the mammalian nervous system. The natural selection of an intrinsically proliferating system, one with an immense and complicated history, looms large in this book. So does the tendency of the proliferants to form alliances. Dyson has words to add on the role of crisis and historical contingency in shaping the present, the importance of language and habit in children and, much by implication and example, the power on us of our family and local community. Mercifully this work, so accessible and idiosyncratically original is supplied with excellent notes and an ample index.

Lynn Margulis
University of Massachusetts-Amherst