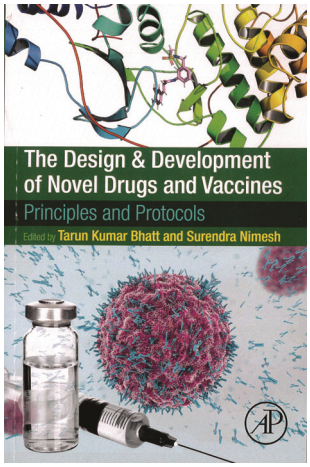

The Design & Development of Novel Drugs and Vaccines: Principles and Protocols. Tarun Kumar Bhatt and Surendra Nimesh (eds). Academic Press, an imprint of Elsevier, 125 London Wall, London EC2Y 5AS, UK. 2021. xviii + 289 pages. Price: US$ 150.

Design and development of various drugs and vaccines are the need of the modern world allowing the doctors to combat various diseases and disorders. Also, development of new drugs and vaccines has been helpful in tackling the epidemics and pandemics globally, including the current COVID-19 pandemic. The basic understanding of the concept and working protocol is, therefore, an absolute necessity to substantially improve rational drug design. Different books are currently available on either drug or vaccine development. The Editors, however, precisely coupled both the aspects in the book which will be useful for the students and scholars working in this field. The book has been divided into five clearly defined parts which cover computational drug design; computational vaccine design; *in vitro* studies; *in vivo* studies and finally clinical trials and FDA approval.

The first part covers various aspects of computational and structural bioinformatic approaches to design novel drugs against the target protein. Also, computational screening against different targets for lead identification and optimization has been discussed and elaborate tutorials for evaluating the stability of protein–ligand complex employing molecular dynamics simulation have been given. This concept has great implication in modern day scenarios as biomedical researchers globally are looking for novel drugs against SARS-CoV-2. Though vaccines provide safe, long-lasting protection from viral infection, this approach is proving to be a challenge for the current SARS-CoV-2 virus owing to its high mutation rates. The authors have summarized the working concept of vaccine development and described how developing new therapeutics from scratch can be performed. The chapter also provides comprehensive information about various databases of drug-like compounds including natural compounds, which can be used for repurposed drugs. For postgraduate students, young researchers and early carrier scientists, the screenshot-guided tutorials would be helpful to perform both computational work (molecular docking and MD simulation) and data analysis from such studies.

The book also covers various aspects related to computational designing of vaccine by detailing the key steps in the selection of a suitable vaccine target (i.e. some antigenic protein showing less homology with human protein and less cross-reactivity). The discussion about *in silico* analyses of viral genomic and proteomic sequences is a good addition. The information about predicting epitope (molecular region of antigen) that can bind with antigen-specific receptors and lead to the production of antibodies is important and the methods of selection of suitable linkers, adjuvant and designing suitable vaccine constructs with stable, soluble and non-toxic conditions are worth reading to grasp the whole concept. Sequentially, the steps involved in validating the vaccine construct through performing protein–protein docking and screenshot-guided tutorials using the HADDOCK server are well discussed. It will benefit the beginners and young investigators in understanding the computational approaches used in the development of vaccines. As an example, the novel SARS-CoV-2 pandemic is rapidly progressing and the need for development of an effective vaccine is critical. The details describing various biophysical methods used for experimental testing of molecular interactions, such as NMR-based methods for studying protein–protein and protein–ligand interactions, are also described.

The next part of the book covers the overall aspects of the present day *in vitro* protocols and molecular biological approaches towards drug and vaccine development. The related concepts for performing such activities in the laboratory are well described conceptually with the necessary details. The authors and editors have put forward considerable effort to make the concept clear, fundamentally sound and easy to follow by masters and Ph.D. students.

The molecular cloning part covers the basics of cloning, PCR, restriction digestion and vector biology with principles of transformation biology towards making different new constructs for the expression studies. The concepts of transfection biology with microinjections and viral systems are well explained with a series of good conceptual cartoons for simple understanding at all levels. Next, the details of protein expression studies with different vector systems have been provided. It is corroborated well with the basic knowledge of the process, as well as the experimental conditions. Then detailing on different aspects of bio-assays is comprehensive. The concepts are concise and diagrams are really easy to comprehend. The chapter on biophysical methods has summarized all the present day available techniques in a nut shell, which is appreciable. Students can easily understand the basics of this high value process and can access more details. Concepts of crystallography, SPR, CD details are also mentioned in the chapter. In this chapter, the protocols are concise, easy to grasp, schematics have been provided for better understanding with colour coding and most importantly tabular information has been provided for quick learning. The section ends with FAQs, which are nice and referencing is adequate for this easy grab concept.

The addition of *in vivo* study towards understating the development of drugs and vaccines is essential and this book has tried to cover this aspect from a different angle. The authors have provided details for the selection of different kind(s) of animal models, profiling of the models, dose selection procedure, different kinds of administration routes to the small animals, experiments on them and related ethical guidelines towards vaccine development. Next, the concept of immunogenicity of different vaccine candidates has been discussed starting from cytokine profiling, immune response, inhibition assay and followed by evaluation of the lead molecules towards testing procedures. The different kinds of procedures have been discussed at their basics with the schematic that is easy to understand. The final chapter in this section is focused on the different physiological parameters related to the vaccine or drug testing where they have focused on the biochemical procedures, haematological aspects, assessing serum parameters, associated oxidant/anti-oxidant parameters. The

general approach as an umbrella concept is good overall in this chapter. It has touched most of the basic procedures, as well as principles of the current day experimental protocols for vaccine and drug development processes.

The book is a concise and valuable contribution towards different aspects of drug design and development. The combination of computational approach and experimental model system makes the book interesting and stimulates further reading.

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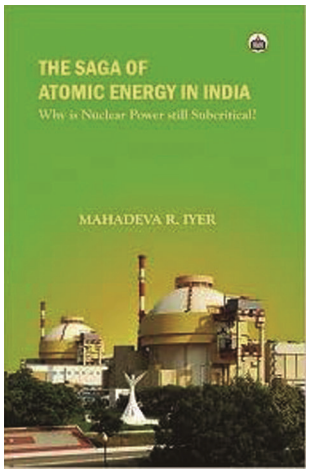

The Saga of Atomic Energy in India – Why is Nuclear Power still Subcritical? Mahadeva R. Iyer. Authorspress, Q-2A Hauz Khas Enclave, New Delhi 110 016, India. 2020. 396 pages. Price: Rs 1575.

This book offers the reader an insider's glimpse of how India's nuclear establishment has evolved and progressed over the past six decades during which the author (Mahadeva R. Iyer) played a key part. The book is unique for its flowing English and focuses on the extensive work that went into making India a comprehensive nuclear power. While many authors have written books on India's nuclear industry, they were more of a description or total criticism. Iyer has brought out both the efforts made and positive outcomes in the saga of atomic energy in India, while pointing out some corrective actions in a constructive manner. The external environment that impacted this national enterprise, mostly adversely, has been brought out lucidly in the book. He has dwelt at length on the growth of atomic energy right from 1944 with the establishment of the Tata Institute of Fundamental Research by Homi Bhabha and later with the setting up of the Atomic Energy Commission in 1949, thanks to the excellent camaraderie between Bhabha and India's first Prime Minster Jawaharlal Nehru.

Iyer's narration is like a story. He explains how the period up to 1974 was a golden one in which India developed indigenous capability to design, construct and operate pressurized heavy water reactors (PHWR), in fuel design, fabrication, reprocessing and waste management. The 1974 Pokhran blast isolated India from all countries, including France and Canada which were cooperating with our nuclear programme. No doubt, the Pokhran blast made the world recognize India as a respectable nuclear power. However, its ramifications were far-fetched. The PHWR construction programmes got delayed due to non-availability of the on-load fuelling machine from Canada. The fuelling machine had already been fabricated in Canada and was ready for shipping to India, but was halted due to international pressure. Iyer describes how the international sanctions provided the drive to rapid indigenization and all PHWRs after the second reactor at Kota were fully indigenous. Pokhran also affected the fast reactor programme, wherein France refused to supply enriched uranium for the core of the fast breeder test reactor (FBTR). Again, this motivated us to develop plutonium-based carbide fuel which was used in a reactor for the first time in the world and successfully operated for more than 20 years without fuel failures.

Iyer describes the three-stage power programme conceived by Bhabha and taken further by Vikram Sarabhai. The irradiation of thorium in PHWRs to convert it to U-233 which is a fissile fuel, its reprocessing at Kalpakkam and its fuelling the KAMINI reactor have been well brought out. Iyer, however, indicates that this experience itself is not sufficient to assume that we have mastered the thorium technology and could go to the third stage of U-233–Th-232 reactors as conceived.

Iyer has allayed the fear of radiation by comparing actual doses received at the boundary of different operating nuclear reactors with natural radiation and those received for medical diagnostics. He shows that the people around nuclear power plants get one-tenth of the natural radiation levels already existing in the absence of the plant. Medical diagnostics, which is essential, needs higher levels of radiation dose. This should be an eye-opener for the public.

Though the Advanced Heavy Water Reactor (AHWR) was conceived at Bhabha Atomic Research Centre (BARC), some new concepts like Advanced Thorium Breeder Reactor (ATBR) are being talked about. Nowadays, this project is not discussed much and also not included in the power profile of the country. Possibly the reason for the delay in the project could be the ready availability of infrastructure and supply of the seed materials of Pu-239 and U-233.

On the fast reactor front, Iyer highlights the continuing delays in the commissioning of the prototype fast breeder reactor (PFBR) at Kalpakkam. This was a totally indigenous effort with vetting of the conceptual design by French and Russian nuclear agencies. The problems at site relate to some of the equipment. Such problems are inevitable with total indigenization. However, Iyer mentions that we should have opted for international collaboration in the manufacture of equipment. He says that the civilian nuclear deal with the US should have included fast reactors as well. On the availability of plutonium (Pu), Iyer points out that 'the initial Pu seed needed for the fast reactor has to come out of the use of domestic uranium in PHWR reactors since the fast reactors are expected to be out of the ambit of IAEA Safeguards as per the current GoI policy. It is reported that the first feed of Pu fuel necessary for PFBR is available'. The reprocessing programme is invariably intertwined with the strategic programmes and it is not possible to discuss Pu resources for fast reactors.

Here the present reviewer begs to differ. We were able to assimilate the PHWR technology with building a series of reactors. In the case of fast reactors we started with a French design, but manufactured all the necessary components indigeneously. Since the components required for PFBR are large in size, the manufacturing had to overcome many obstacles. We become aware of several problems only when we commission and operate a nuclear plant.