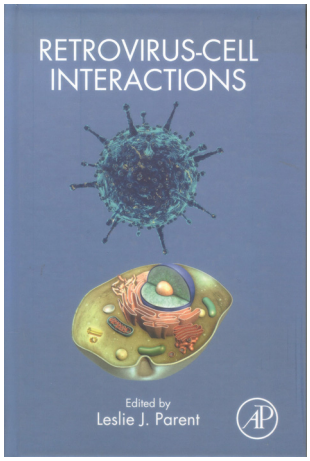


Retrovirus-Cell Interactions. Leslie J. Parent (ed.). Academic Press, An Imprint of Elsevier, 125 London Wall, London EC2Y 5AS, UK. 2018. xxxv + 584 pages. Price: US$ 165.00.

Retroviruses can cause tremendous harm and can infect hosts ranging from amphibians, birds, fish and mammals. These viruses require the aid of various cellular components for their replication and these complex interactions are only beginning to be dissected. The first edition of the book *Retrovirus-Cell Interactions* includes comprehensive data on documented historical facts along with advances in retroviral research. The book aptly describes the cross talk and interactions that retroviruses have with their host cells and provides information of the Nobel prizes in the field.

The first chapter deals with the envelope proteins of retroviruses such as glycoproteins. The many entry receptors aid in the classification of retroviruses and the captured envelope proteins are classic examples of gene theft from a parasite which influences host–pathogen interactions.

The second chapter describes the early events during infection, and the methods to study incoming viral RNA and proteins. Modifications such as SUMOylation have been discussed although more light needs to be shed on protein modification during the early events of retroviral infection. The components of a pre-integration complex, which are delivered to the nucleus, have been summarized. In conclusion, more scope remains to study the early events of infection so that therapeutic interventions can be sought for to prevent retroviral infection.

A detailed overview of the nucleoporins (Nups), which are part of the nuclear pore complexes, the largest cellular protein complexes, have been provided in chapter 3. Different Nups have been implicated in not only the replication process but also in virion egress from the cytoplasm and in generating new virus progeny. The tremendous tact of being able to co-opt host machinery allows the virus to replicate and produce more virus progeny.

Chapter 4 describes how lentiviruses and gammaretroviruses suitably locate the genomic loci for their integration using the aid of LEGGF/p75 and BRD2-4 proteins at transcriptionally active sites. Structural components of the proteins and the complexes they form are discussed comparing integrases, which are key proteins in viral integration process. The identification of molecular mechanisms involving retroviral integration and the host factors has been discussed. Focus on unravelling of factors involved in retroviral integration would aid in the development of their inhibitors for therapeutic benefit.

Further, because viral replication is dependent on RNA polymerase II, chapter 5 delves into the RNAP II transcription of HIV-1 provirus and its latency. Also, how knowledge of endogenous retrovirus has furthered better understanding of cancer and stem cells has been observed although ERVomics would be needed to enhance information in this area.

Chapter 6 describes that HIV-1 RNA processing and its control is critically important because of the dependency of HIV-1 on the cell for its metabolism and spread by generating progeny virions. A single 9 kb transcript through suboptimal splicing gives rise to more than 40 mRNAs. These mRNAs are dependent on the HIV-I factor Rev for their transfer to the cytoplasm. Roles of SR proteins have been discussed in detail. Structure and function of small molecules such as clomiphene, 5350150 to manipulate HIV-1 RNA processing have been described. Regulatory studies on the HIV-RNA processing would be needed in future to refine strategies for better antiviral activity without side effects on the host.

Chapter 7 describes the RNA helicases which play roles in eukaryotic cell growth by supporting gene expression and sensing infectious viruses and how HIV-1 commands its activity for its own replication. Detailed events with respect to the cellular RNA helicases have been described because the retroviruses use cellular machinery by virtue of communicating with RNA helicases at every step. RNA helicases have also been used as drug targets in different settings but serve as agonists to retroviruses.

In chapter 8, a multitude of host factors which allow trafficking of viral genetic material from the transcription site to the virion have been reviewed. The components that interact with Gag during its way to the plasma membrane where these new virions are released by budding are described. Gag structural proteins, encoded by a major gene, undergo conformational changes to bind various viral factors such as Gag-Pol, Env proteins, viral RNA and a range of host factors such as host proteins, host RNA and lipids. In this chapter, the host proteins that have been mentioned get hijacked to benefit retroviral replication. This chapter also highlights gaps that need to be addressed and further investigations for novel targets in therapy.

In chapter 9, protein transport and its components which are evolutionarily conserved from yeast to man have been given more importance in retroviral infection. The ESCRT system included proteins and protein isoforms, which function collectively for not just delivery of cargo, but also broad spectrum of cellular activities have been described with structural information. The viruses use ESCRT components to facilitate their egress from the cell. The gene structure of the highly conserved protein Tsg101 has been discussed in detail along with its interactions with ubiquitin and participation in budding of virus. Additionally, the roles of Tsg101 in budding of other viruses have been tabulated comprehensively. A section on major questions such as how Tsg101 plays a role in budding or how no pharmacological inhibitors to Tsg101 are currently available have been included.

In chapter 10, detailed emphasis on the composition of cellular and viral membranes has been provided. The role of lipids in entry of retroviruses and their roles in retroviral assembly have been discussed. The roles of cholesterol and sphingolipids have also been discussed. Further, sections pertaining to how lipid-modifying agents such as cholesterol-modifying agents, inhibitors of sphingolipids in retroviral replication inhibition have been included. The authors in this

chapter suggest that topical interventions would hold promise with better understanding of role of lipids.

The steps of the host gene that impede retroviral infection and pathways that get turned on by viral gene products resulting in initial immune response to the infection have been described in detail in chapter 11. The viral proteins that subvert the innate immune response of the host have been described. By directly hampering the early infection steps, different signal transduction signals are relayed so that infection can be resisted but retroviruses have acquired different means to circumvent the factors, which restrict their multiplication. This chapter should inspire younger scientists to pursue retroviral research in future.

Chapter 12 deals with the roles of both viral and host non-coding RNAs in aiding replication of retroviruses in detail. RNA comprises at least 50% of retroviral mass and RNAs such as Transfer RNA, 7SL RNA, U snRNA, Y RNA and vault RNA have been described in this chapter. The mechanism of RNA interference through comparison with RNAi mechanism in plants, which plays roles in immune response has been described. Current treatments for RNA-based therapeutics for HIV-1 have been described. The authors of this chapter conclude that novel roles of ncRNA are being elucidated which would be important for future endeavours in therapy.

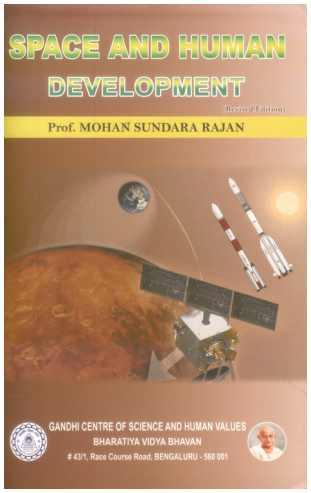
Transposable elements are a significant feature of eukaryotic genomes and among them are retroelements on whose roles chapter 13 focuses. The chapter further explains the structure–function of retroelements, how their expression is controlled through mechanisms of redundancy, PAMPs and among other factors, cytoplasmic DNA and also how innate immune system regulates these in detail. Perspectives in the chapter present interesting viewpoints with highlights on eight areas which would produce a high impact in retroviral research and lead the way for better therapies.

Various methods such as two hybrid screens, mass spectrometry, RNA interference and genome wide screens, RNA sequencing, and CRISPR technology to study retroviruses have been discussed in chapter 14. Various proteins such as gag and integrase to be used as bait to find host proteins have been described. Methods to find host factors that interact with viral proteins and nucleic acids to restrict viral replication would be important so also to identify mechanisms by which retroviruses hijack host factors which are important for their replication cycle.

The book is an interesting read, is well documented, and caters to scholars intent on furthering their research in retroviral research.

MATTO ROHINI

Divecha Centre for Climate Change,
Indian Institute of Science,
Bengaluru 560 012, India
e-mail: rohinimattoo@iisc.ac.in



Space and Human Development, Revised Edition. Mohan Sundara Rajan. Bhavan's Gandhi Centre of Science and Human Values, Bharatiya Vidya Bhavan, No. 43/1, Race Course Road, Bengaluru 560 001. 2017. viii + 116 pages. Price: Rs 120.

India's space programme since its inception in the 1960s, has been driven by the desire to harness space technology for national development. Indigenous efforts to develop launch vehicles, spacecraft and their various sub-systems for communication, remote sensing and navigation purposes, spaceport to facilitate launches, and to build a network of mission centres for telemetry, tracking and command of satellites have been successfully undertaken over the last six decades. Important national programmes to use space infrastructure and data for developmental purposes in the field of natural resources survey/monitoring, improving weather forecasting, education, telemedicine, social empowerment, disaster monitoring and mitigation have been conceptualized and executed with enthusiasm. In addition, a few missions to the moon and Mars and an Astrosat mission to study stars have been launched successfully, and significant results have been obtained. The Indian space programme is held in high esteem internationally and India is one of the six countries/agencies in the world to have mastered different aspects of space technology and applications. Such an effort needs to be told to a larger audience through publications.

This book discusses the progress made in space technology and applications in India. It is a small book divided into 19 sections corresponding to various subthemes. It is written in a simple, non-technical language to address the general readers. Initial efforts to begin space activities in India by Vikram Sarabhai, and how he was influenced by his role at the United Nations in the Committee on Peaceful Uses of Outer Space have been described in the inaugural chapter. Establishing the Thumba Equatorial Rocket Launching Station (TERLS) at the fishing hamlet Thumba near Thiruvananthapuram, Kerala, has been enumerated. How Satish Dhawan, who took over the reins of space activities in India, after the untimely death of Vikram Sarabhai in 1971, steered the programme are described in the subsequent chapter. Indigenous efforts in building satellite launch vehicles comprising solid propulsion, some of the failures, and the important role played by Abdul Kalam are also illustrated. The Satellite Instructional Television Experiment using a borrowed satellite from the United States for beaming socially relevant TV programmes to 2400 villages in India and its social impact have been discussed. Systematic indigenous efforts to build launch vehicles using not only the solid propulsion but also the earth-storable liquid fuels with higher payload-carrying capacities have been well described. How the four-stage Polar Satellite Launch Vehicle (PSLV), with more than 40 successful launches has become the work-horse rocket for many of India's missions, as well as for launching some satellites of other countries has been discussed. Parallelly, efforts made to build cryogenic engines and to have higher capacity launch vehicles to put much higher weight payloads into geosynchronous transfer orbit