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EDITED BY
Kei Sato,
The University of Tokyo, Japan

REVIEWED BY
Mahan Ghafari,
University of Oxford, United Kingdom
Junna Kawasaki,
Chiba University, Japan

*CORRESPONDENCE
So Nakagawa
so@tokai.ac.jp

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Editorial: Proceedings of the first RdRp Summit

So Nakagawa[1,2,3]*, Artem Babaian[4,5], Simon Roux[6] and Uri Neri[6]

[1]Department of Molecular Life Science, Tokai University School of Medicine, Isehara, Kanagawa, Japan, [2]Division of Omics Sciences, Institute of Medical Sciences, Tokai University, Isehara, Kanagawa, Japan, [3]Division of Interdisciplinary Merging of Health Research, Micro/Nano Technology Center, Tokai University, Hiratsuka, Kanagawa, Japan, [4]The Department of Molecular Genetics, University of Toronto, Toronto, ON, Canada, [5]The Donnelly Centre for Cellular & Biomolecular Research, University of Toronto, Toronto, ON, Canada, [6]U.S. Department of Energy Joint Genome Institute, Lawrence Berkeley National Laboratory, Berkeley, CA, United States

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Editorial on the Research Topic
Proceedings of the first RdRp Summit

This Research Topic, "*Proceedings of the first RdRp Summit*", was compiled by inviting contributions from participants of the first RdRp Summit related to RNA-dependent RNA polymerase (RdRp) of RNA viruses, along with researchers across this field. RdRp is an essential enzyme for RNA virus replication and serves as a hallmark for identifying and analyzing RNA viruses using metatranscriptomic (untargeted RNA sequencing) data. Given the extensive genetic diversity of RNA viruses, RdRp-guided RNA virus discovery has become the primary strategy for exploring the uncharted "dark virosphere".

The RdRp Summit was launched to bring together experts in this rapidly growing field. The first meeting was held on 22–23 May 2023 in Valencia, Spain. Conducted in a hybrid format with both in-person attendance and online streaming, the meeting attracted 91 participants. The core discussions and outcomes of the first RdRp Summit are documented in detail in this Research Topic by Charon et al.

In this Research Topic, Sakaguchi et al. present a major update to the NeoRdRp database. NeoRdRp is a curated reference framework designed to improve the discovery and annotation of RNA viruses using RdRp annotation and sequence data, including hidden Markov model (HMM) profiles. Compared to earlier versions, NeoRdRp has significantly grown, expanding from 1,182 to 19,394 RdRp HMM profiles, derived from 12,502 and 557,197 amino acid sequences, respectively. This major enhancement enables the detection of a much broader range of RdRp-containing sequences than was previously possible.

Tahzima et al. explore the intrinsically disordered regions (IDRs) of RdRps. By integrating biophysical insights with advanced deep learning algorithms, such as AlphaFold2 (AF2), they demonstrate the potential to efficiently estimate the conformational diversity and folding dynamics of RdRps. Their study and surveys suggest that prioritizing structural dynamics, including IDRs, over primary amino acid sequences may provide a framework for improving the discovery of highly divergent RdRps.

Following the success of the first meeting, the second RdRp Summit was held on 11–12 May 2025 in Lisbon, Portugal. Two years had passed since the first meeting, and numerous

studies and projects conducted during these two years were presented and discussed, along with remaining challenges in the field (1). We hope that the articles collected in this Research Topic will further catalyze the growth of this exciting and rapidly evolving field of research.

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