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Editorial

COVID-19 and Contributions from Animal-based Research

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Nearly 3 yr have passed since the world went into lockdown as mankind faced with an adversity never seen before—a virus whose origins are still a subject of debate was being transmitted from person to person and a pandemic was declared. Once bustling cities became ghost towns. Human physical and emotional bonds were threatened to their core not only by the shutdown of public venues and the cancellation of events, but by social distancing and our inability to of family, friends, and strangers alike. Governments scrambled to ensure public health and prevent catastrophic loss of human life and economic collapse. Medical staff cared for the sick and the dying. Millions contracted the infection worldwide, and families and friends mourned as their loved ones succumbed. As the pandemic unfolded, the world watched, most with concern and uncertainty of what the future held, and others with relative nonchalance.

The situation was eerily like a science fiction Hollywood movie playing out real-time—but without any script and with the audience providing the cast, playing out the next scenes, the climax, and the ending. Meanwhile, the scientific community was both puzzled and challenged. Society was caught unaware and unprepared. A few months after the original lockdowns of spring 2020, the scientific community became the protagonist of the story and a bearer of hope for the world. It produced cures and vaccines at a pace that had never been seen before. Slowly, communities started to reopen, and life started to return to normal, or so it seemed. However, the virus mutated repeatedly, and scientists had to adjust accordingly. Only in the past year or so, 2 yr after the virus emerged, has life normalized, albeit arguably a little differently from what it was before the pandemic.

We published the first COVID special topic issue of *Comparative Medicine* in October 2021.[6] Since that time, many changes have occurred in our understanding of and the fight against SARS-CoV-2 and COVID-19. Perhaps, and, hopefully, we are nearing the end of the pandemic, but reflecting on the scientific advances made is a valuable exercise. The current COVID-19 special topic issue highlights the significant role of animal-based research in these advances.

The first article by Gozalo et al., *Coronaviruses: Troubling Crown of the Animal Kingdom*,[5] reviews the classification, origin, etiology, transmission mechanisms, pathogenesis, clinical signs, diagnosis, treatment, and prevention strategies for coronaviruses that affect animals while briefly describing coronaviruses that affect humans. This very thorough paper seeks to expand our knowledge of this complex groups of viruses in order to better prepare us to design strategies to prevent and/or minimize the impact of future coronavirus outbreaks.

The paper by Andrade et al., *Eliminating Potential Effects of Other Infections during Selection of Nonhuman Primates for COVID-19 Research*,[1] focuses on the use of nonhuman primates for COVID-19 research. It discusses numerous coinfections of NHP with COVID-19 and other infectious agents, including influenza virus, select respiratory bacteria, and vector-borne agents. The paper further describes possible interactions that can develop relevant to COVID-19 studies if the NHP subjects have coinfections. The review presents compiled data on the use of NHP in COVID-19 studies and emphasizes the need to create the most reliable NHP model for those studies by extensive screening for other pathogens.

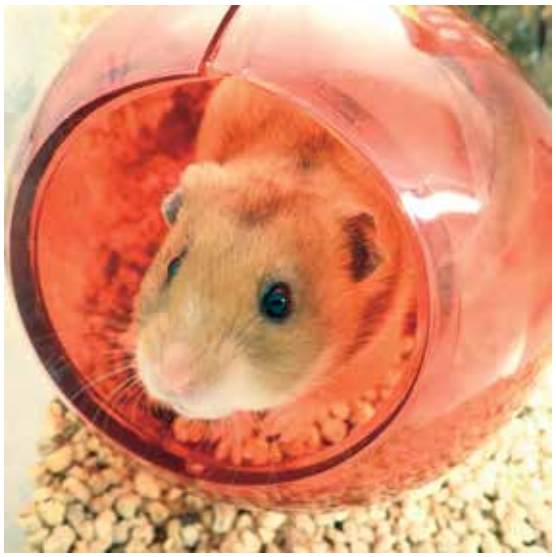

Figure 1. A hamster that was used in COVID-19 research at Johns Hopkins Univeristy.

The remaining articles focus on 3 organ systems affected by COVID-19 disease. Gabrielson et al.'s paper, *Comparison of Cardiovascular Pathology in Animal Models of SARS-CoV-2 Infection: Recommendations Regarding Standardization of Research Methods*,[4] provides a critical analysis of scientific literature on cardiovascular pathology in human patients and animals. Their analysis indicates that the presence or absence of cardiovascular pathology

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Figure 2. Scientists and laboratory animal science professionals collaborating on COVID-19 research.

is reported infrequently in both human autopsy studies and animal models of SARS-CoV-2 infection. Those that have reported cardiovascular pathology have features of the experimental design, execution, and analysis that reduce confidence in the conclusions regarding SARS-CoV-2 infection as a cause of significant cardiovascular pathology. More importantly, the paper provides recommendations for ensuring a high level of scientific rigor and reproducibility in cardiovascular studies, which is an important principle in the field of animal-based research.

Dillard et al. wrote *Animal Models for the Study of SARS-CoV-2–induced Respiratory Disease and Pathology*.[3] Because COVID-19 is primarily respiratory disease, this review is focused on a comprehensive summary of COVID-19 respiratory disease and associated pathology in humans and in 3 animal species primarily used in COVID-19 research (NHPs, hamsters, and mice). A key strength of this review is its comparative approach. Furthermore, the paper provides a concise reference relevant for choosing an optimal animal model and understanding the pathophysiology of different species of animals infected with of SARS-CoV-2.

Finally, Carpenter et al.'s paper, *Animal Models to Study Neurologic Manifestations of COVID-19*,[2] presents valuable information on the neurologic effects of COVID-19 in both humans and animals. These effects are not as well-characterized in the scientific literature as those occurring in the respiratory system, but the authors carefully combed through published data and provide a thorough analysis of neurologic signs and gross and histopathologic findings of SARS-CoV-2 on the nervous system.

This issue was made possible primarily because of the authors who generously shared their time and expertise. Our colleague-reviewers also provided great feedback to strengthen the scientific merit of the articles. Finally, the *Comparative Medicine* editorial and production staff, especially Dr Linda Toth, Dr Ravi Tolwani, Mr John Farrar, and Ms Alison Brown provided guidance to steer this forward.

The fight against COVID-19 would not be possible without the use of animals. We hope that this issue emphasizes to our community of professionals in research animal care and use. This field should be proud of the work that we do and value the animals under our care. The virologists, immunologists, and other scientists who have been instrumental in pandemic efforts would not been able to carry out their important tasks without our help and the use of animals, which, despite the limitations of models, have paved the way and continue to constitute a fundamental approach for understanding the disease and developing treatments and vaccines against it. We hope that these articles provide scientists with further information and knowledge that will help them in their important work. We dedicate this issue to the animals and the professionals who care for them. As we continue these efforts, we hope that severe illness and death due to COVID-19 will soon be a thing of the past.

References

1. **Andrade MCR, Lemos BRP, Silva LM, Pecotte JK.** 2023. Eliminating potential effects of other infections during selection of nonhuman primates for COVID-19 research. Comp Med **73:**45–57**.** https://doi.org/10.30802/AALAS-CM-21-000086. .
2. **Carpenter KC, Yang J, Xu JJ.** 2023. Animal models for the study of neurologic manifestations of COVID-19. Comp Med **73:**91–103. https://doi.org/10.30802/AALAS-CM-22-000073. .
3. **Dillars JA, Martinez SA, Dearing JJ, Montgomery SA, Baxter VK.** 2023. Animal models for the study of SARS-CoV-2–induced respiratory disease and pathology. Comp Med **73:**72–90. https://doi.org/10.30802/AALAS-CM-22-000089. .
4. **Gabrielson K, Myers S, Yi J, Gabrielson E, Jimenez IA.** 2023. Comparison of cardiovascular pathology in animal models of SARS-CoV-2 infection: Recommendations regarding standardization of research methods. Comp Med **73:**58–71. https://doi.org/10.30802/AALAS-CM-22-000095. .
5. **Gozalo AS, Clark TS, Kurtz D.** 2023. Coronaviruses: Troubling crown of the animal kingdom. Comp Med **73:**44–6. https://doi.org/1030802/AALAS-CM-21-000092.
6. **Villano J.** 2021. COVID-19 and animal-based research. Comp Med **71:**331–332. https://doi.org/10.30802/AALAS-CM-21-000090.