



Review

# Emerging and Novel Viruses in Passerine Birds

Richard A. J. Williams <sup>1,2,\*</sup> , Christian J. Sánchez-Llatas <sup>1</sup> , Ana Doménech <sup>2,3</sup> , Ricardo Madrid <sup>1,2</sup> , Sergio Fandiño <sup>2,3</sup> , Pablo Cea-Callejo <sup>1,2</sup>, Esperanza Gomez-Lucia <sup>2,3</sup> and Laura Benítez <sup>1,2</sup>

- <sup>1</sup> Department of Genetics, Physiology, and Microbiology, School of Biology, Complutense University of Madrid (UCM), C. de José Antonio Nováis, 12, 28040 Madrid, Spain; chrsan01@ucm.es (C.J.S.-L.); rimadrid@ucm.es (R.M.); pcea@ucm.es (P.C.-C.); lbenitez@ucm.es (L.B.)
- <sup>2</sup> “Animal Viruses” Research Group, Complutense University of Madrid, 28040 Madrid, Spain; domenech@ucm.es (A.D.); sergifan@ucm.es (S.F.); duato@ucm.es (E.G.-L.)
- <sup>3</sup> Department of Animal Health, Veterinary Faculty, Complutense University of Madrid, Av. Puerta de Hierro, s/n, 28040 Madrid, Spain
- \* Correspondence: richwill@ucm.es

**Abstract:** There is growing interest in emerging viruses that can cause serious or lethal disease in humans and animals. The proliferation of cloacal virome studies, mainly focused on poultry and other domestic birds, reveals a wide variety of viruses, although their pathogenic significance is currently uncertain. Analysis of viruses detected in wild birds is complex and often biased towards waterfowl because of the obvious interest in avian influenza or other zoonotic viruses. Less is known about the viruses present in the order Passeriformes, which comprises approximately 60% of extant bird species. This review aims to compile the most significant contributions on the DNA/RNA viruses affecting passerines, from traditional and metagenomic studies. It highlights that most passerine species have never been sampled. Especially the RNA viruses from *Flaviviridae*, *Orthomyxoviridae* and *Togaviridae* are considered emerging because of increased incidence or avian mortality/morbidity, spread to new geographical areas or hosts and their zoonotic risk. Arguably poxvirus, and perhaps other virus groups, could also be considered “emerging viruses”. However, many of these viruses have only recently been described in passerines using metagenomics and their role in the ecosystem is unknown. Finally, it is noteworthy that only one third of the viruses affecting passerines have been officially recognized.

**Keywords:** biodiversity; DNA viruses; emergence; metagenomic studies; passeriformes; RNA viruses; spillover; zoonoses



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## 1. Introduction

An emerging viral disease can be defined as a new occurrence of a disease because of: (a) the evolution or change of an existing virus or its spread to a new geographic area, species or ecological niche; (b) its rapidly increasing incidence, in terms of numbers of infected individuals or geographic range; or (c) a previously unrecognized disease or virus [1–5]. A viral disease of the past (i.e., one previously considered to be controlled) that re-appears with an increased prevalence in an area with susceptible host populations, expands its host range or appears in a new clinical form, is usually termed as re-emergent viral disease [4,6]. Many recent human emerging viral diseases have an animal origin, some with a significant impact on animal or public health, such as SARS-CoV-2, and two viruses that infect passerines: influenza A virus (AIV) and West Nile virus (WNV). The advent of modern, more powerful sequencing and bioinformatics technologies has increased the discovery of novel viruses in animals, with or without causing disease, that may be pathogenic, emergent, or zoonotic. Many of these novel and potentially emerging viruses are found in avian species that are present in virtually every ecosystem. Surprisingly, although passerines are the most abundant and diverse avian species worldwide, little is

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