# New molecular structure reveals how bluetongue virus enters host cells

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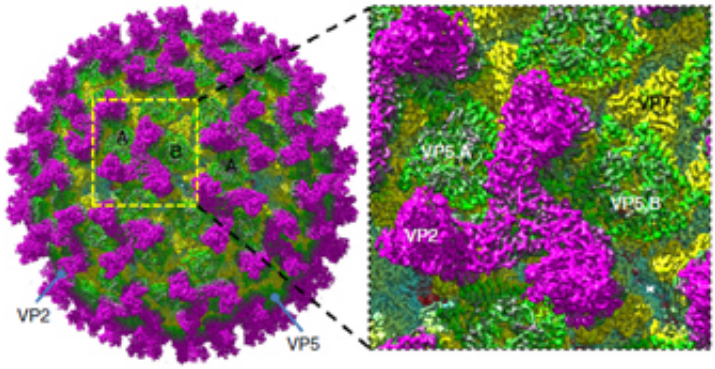


A five-year research partnership between the London School of Hygiene & Tropical Medicine and the University of California, Los Angeles (UCLA) has revealed the atomic-level structure of the bluetongue virus (BTV), a disease that has killed an estimated two million cattle in Europe over the past two decades. The results are published in the journal *Nature Structural & Molecular Biology*.

Led by Polly Roy, Professor of Virology and Wellcome Trust Senior Investigator at the London School of Hygiene & Tropical Medicine, the research shows the atomic detail of the individual components of the virus particle, and how these function biologically at different levels of acidity (pH).

The team used cutting-edge cryo electron microscopy from the Electron Imaging Center for Nanomachines, led by Dr Hong Zhou, at UCLA's California NanoSystems Institute. With this technology they demonstrated how the virus enters cells to initiate infection via a two-stage process, and how the different molecular components fit together. This new understanding will enable researchers to develop new vaccines with broader protection against BTV and related viruses.

Viruses establishing infection in host cells is a highly coordinated process. The molecular and chemical details are relatively clear for enveloped viruses, such as influenza, HIV and herpes, but up to now the mechanisms for cell entry of non-enveloped viruses, such as BTV and others, had not been well understood.

Over the past decade Professor Roy has undertaken the first complete molecular understanding of BTV. This includes its replication cycle from virus entry via genome replication to virus assembly and structure, cell-to-cell transmission, and the engagement of the virus particle with the host cell.

Professor Roy said: "We are delighted with these results, which show the virus in the highest possible detail at different pH levels. This represents a key piece in the puzzle and a significant step forward for understanding molecular structures and mechanisms in this family of viruses. We hope it will enable the design of specific anti-viral agents and new and efficient vaccines for the control of bluetongue and related viral infections of animals and humans".

This work also has promising implications for understanding similar human and animal pathogenic viruses, such as rotaviruses and the Rift Valley fever virus.

**More information:** Xing Zhang et al. Atomic model of a

nonenveloped virus reveals pH sensors for a coordinated process of cell entry, *Nature Structural & Molecular Biology* (2015). DOI: 10.1038/nsmb.3134

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