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This Week's Citation Classic®

Andrewes C H & Horstmann D M. The susceptibility of viruses to ethyl ether. *J. Gen. Microbiol.* 3:290-7, 1949.
[National Institute for Medical Research, London, England]

The sensitivity to ethyl ether of 25 viruses was examined by a uniform technique. Those tested were either very sensitive or highly resistant. The findings may be of value in any attempt at virus classification. [The *SCI*® indicates that this paper has been cited in over 310 publications since 1955.]

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In 1948 I was working at the National Institute for Medical Research at Hampstead (London) on the sensitivity of vaccinia virus to ether. It seemed worthwhile to apply the uniform technique that had been devised to other viruses. Dorothy Horstmann, a visiting worker from Yale, joined me in this project. We divided between us the available viruses. Tissue suspensions or filtrates were titrated in experimental animals or tissue cultures before and after the treatment. The viruses tested fell into one of two groups: either the titre was reduced 1,000-fold or more, or else it was quite unaffected.

One of us (CHA) had collaborated with W.J. Elford and others in estimating the sizes of viruses, using the collodion membranes of various pore sizes that he had devised.[1] When we put together those values with the results of the experiments with ether, it seemed that the agents tested could be roughly placed in eight groups. One of these, containing agents related to psittacosis, is no longer included with the true viruses. This work greatly stimulated my interest in virus classification.

At about this time, F.O. Holmes[2] had published a scheme for virus classification and nomenclature that I and many others, especially animal virologists, considered to be on the wrong lines, relying, as it did, on pathological changes and symptoms produced in infected hosts. There seemed a danger that virus taxonomy would get off "on the wrong foot," so I managed to persuade the International Committee for Bacteriological Nomenclature to turn its attention to viruses. Accordingly, it constituted a subcommittee to consider virus taxonomy and appointed me its first chairman. This met at the fifth International Congress of Microbiology at Rio de Janeiro in 1950.

The subcommittee suggested eight criteria, based on properties considered to be of most value in virus classification. Of primary importance were those concerning the intrinsic properties of the virion: size, shape, structure, and chemical composition. Pathological effects and symptoms produced in infected hosts were thought to be of much less importance. A few virus groups were suggested as being worth careful study as potential families or genera.[3] Some of these corresponded with the groups indicated in our 1949 paper.

These first steps toward a taxonomy of viruses were followed at successive international congresses by modification and extension until most viruses could be placed, at least provisionally, in an orderly scheme. Later it was agreed that, as viruses were not bacteria, a Virus Nomenclature Committee should be formed, independent of the bacteriological one. The scheme proposed determined the arrangement of viruses in a book I wrote in 1964 entitled *Viruses of Vertebrates*.[4] This is now in its fourth edition.[5] H.G. Pereira and others collaborated in editions after the first.

Today, virologists will automatically place the agents they are studying in their proper place among the viruses. I venture to feel that present acceptance of this orderly arrangement owes not a little to the stimulus of our 1949 paper, at least as far as animal viruses are concerned. Doubtless, this explains why that paper has been so frequently cited.

1. **Elford W J.** The sizes of viruses and bacteriophages and methods for their determination. (Doerr R & Hallauer C, eds.) *Handbuch der Virusforschung.* Wien: Springer, 1938. Vol. 1. p. 128-81.
2. **Holmes F O.** *The filterable viruses. Bergey's manual of determinative bacteriology.* (Suppl. no. 2, ed. 6.) Baltimore: Williams & Wilkins, 1948. p. 1127-286.
3. **Andrewes C H.** The Rio Congress decisions with regard to study of selected groups of viruses. *Ann. NY Acad. Sci.* 56:428-32, 1953.
4. ----------. *Viruses of vertebrates.* London: Bailliere, Tindall & Cox, 1964. 401 p. (Cited 160 times.)
5. **Andrewes C, Pereira H G & Wildy P.** *Viruses of vertebrates.* London: Bailliere Tindall, 1978. 421 p.

