ROBERT KOCH INSTITUT

The VirusExplorer for Diagnostic Electron Microscopy

Catalogue of Virus Images

(from database version 20161222)

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Advanced Light and Electron Microscopy (ZBS 4)

Robert Koch Institute

D-13353 Berlin

www.rki.de/cl-em

The VirusExplorer for Diagnostic Electron Microscopy

… is an offline stand-alone database which provides electron microscopy images of viruses as a reference and/or training tool for diagnostic electron microscopy. However, it can be used for other purposes as well (e.g. as an image pool for teaching). The image pool concentrates on viruses relevant to human diseases. In the current version we have only included images from material that was prepared by negative staining. The addition of images taken from thin sections is planned for future versions.

The “Catalogue of Virus Images” is a simple collection of all virus images stored in the database within a single PDF document. The images are sorted according to the virus group name (usually the family) and the document is fully searchable.

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If you would like to use the database, please visit www.zenodo.org and search for “VirusExplorer”.

If you experience any problems during usage of the document, or if you wish to provide images, please get into touch with us by using info@rki.de. Make sure stating „VirusExplorer“ in the subject field.

Last but not least, we are very grateful for the image pool Hans Gelderblom and co-workers have produced and conserved and which served as the stock for the database.

Michael Laue & Lars Möller

The VirusExplorer for Diagnostic Electron Microscopy

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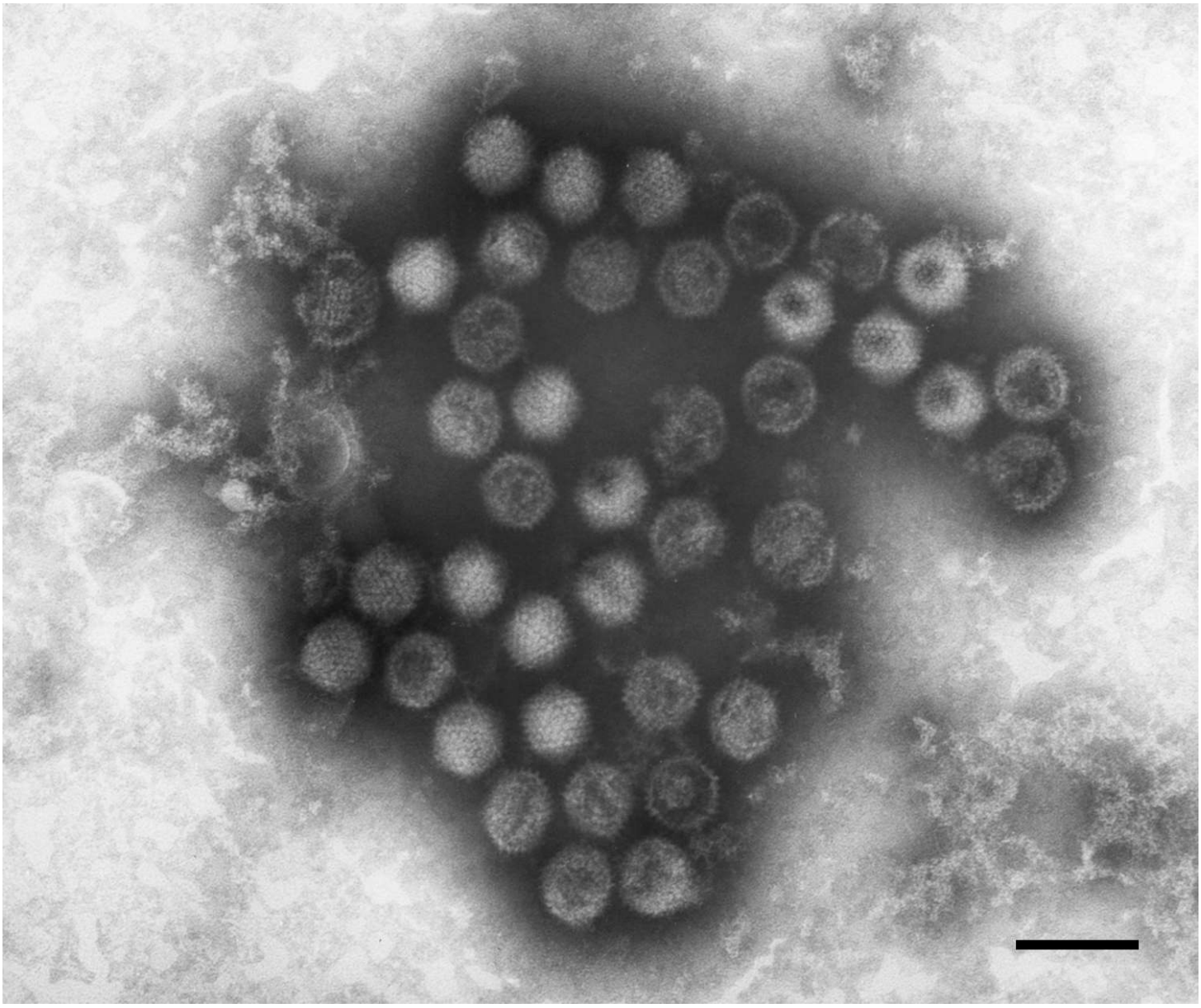
Adenoviridae



Human adenovirus 7 (HAdV-7). Genus: Mastadenovirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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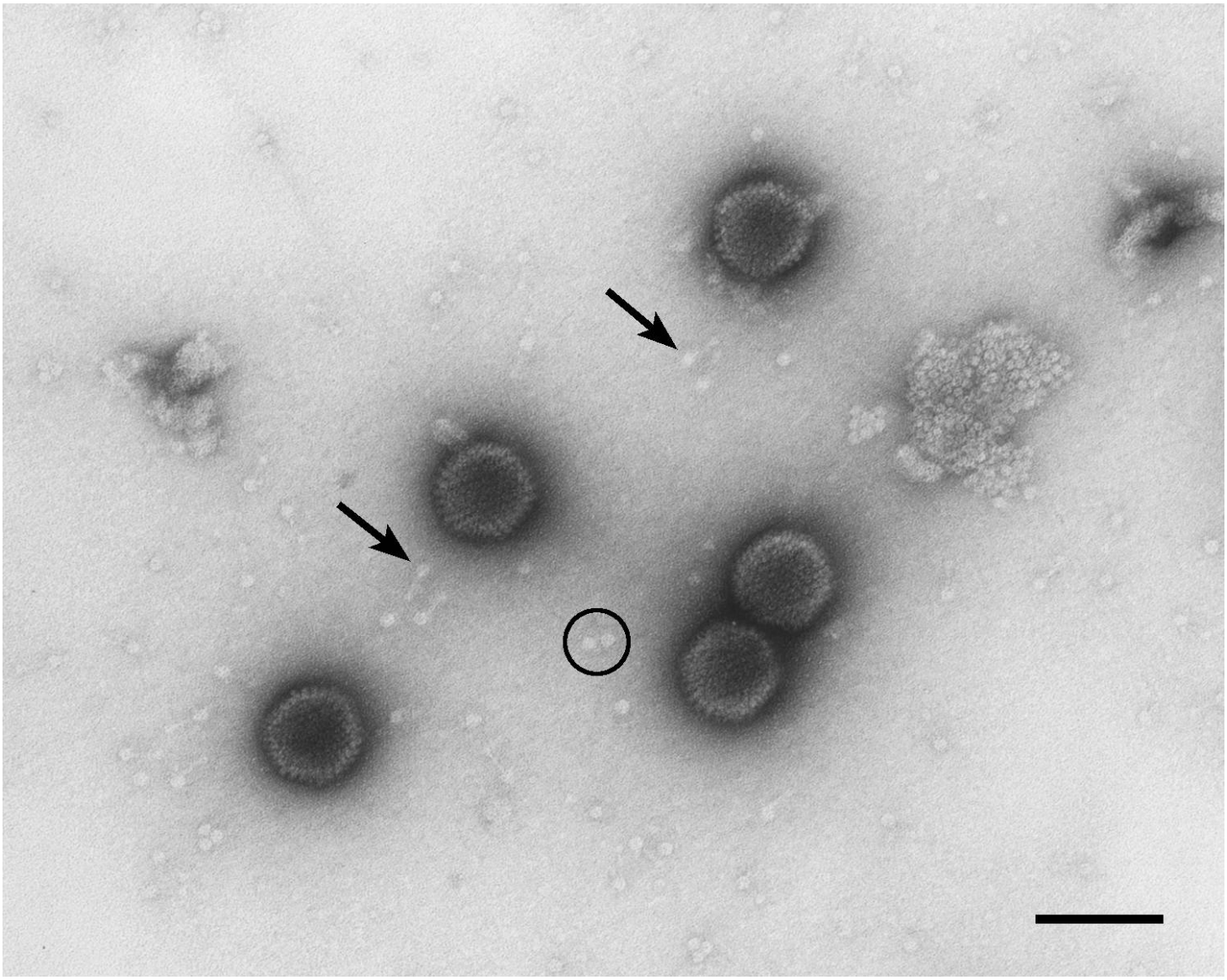
Adenoviridae



Pigeon adenovirus 1 (PiAdV-1). Genus: Aviadenovirus. Negative staining, UA. Isolated spikes (arrows) and capsomers (circle) are localized between virus particles.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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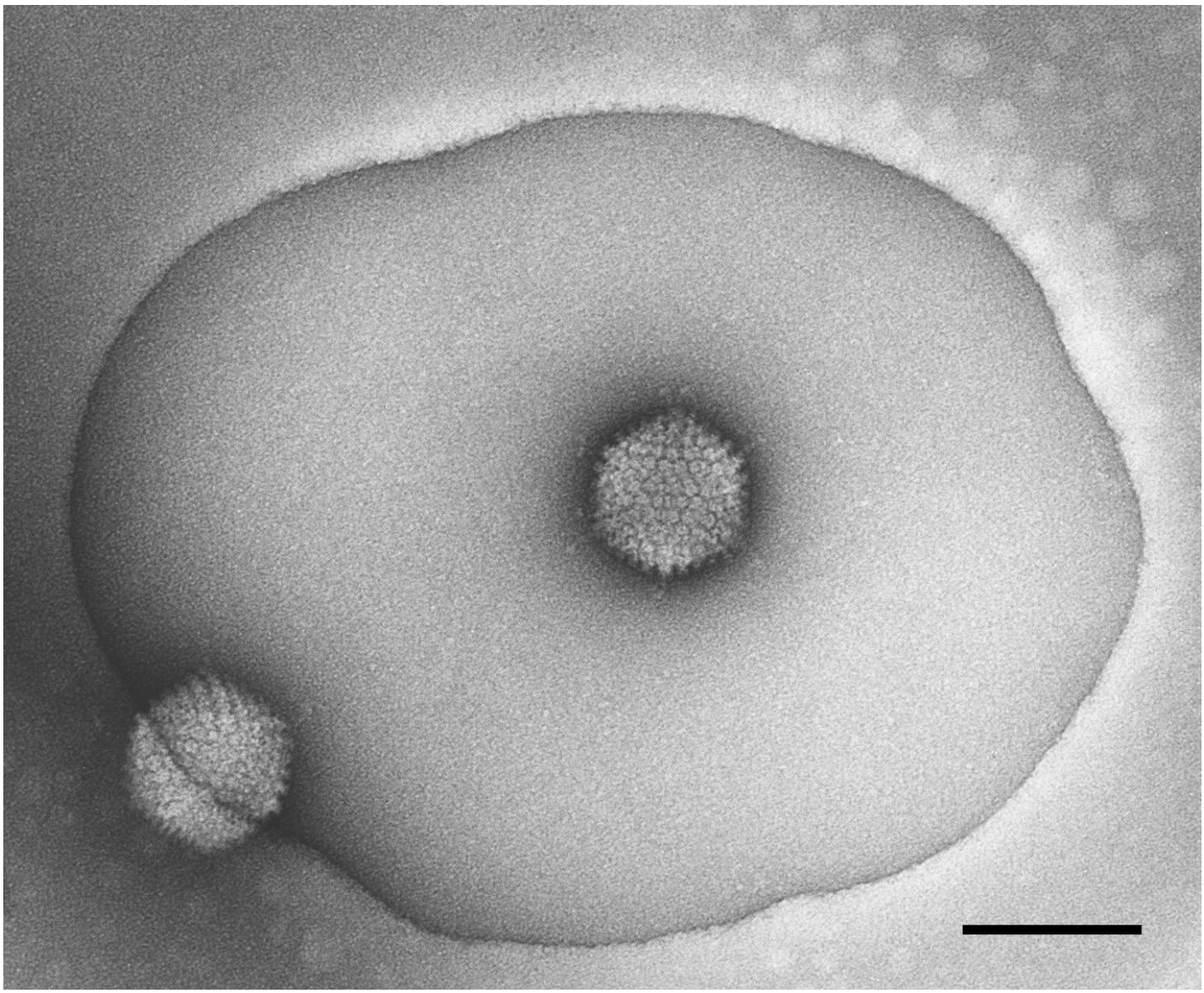
Adenoviridae



Aviadenovirus. Negative staining (UA) of particles on a thin carbon film that hase been placed on a holey plastic film. Particles have retained their characteristic spikes (double fibres) during preparation.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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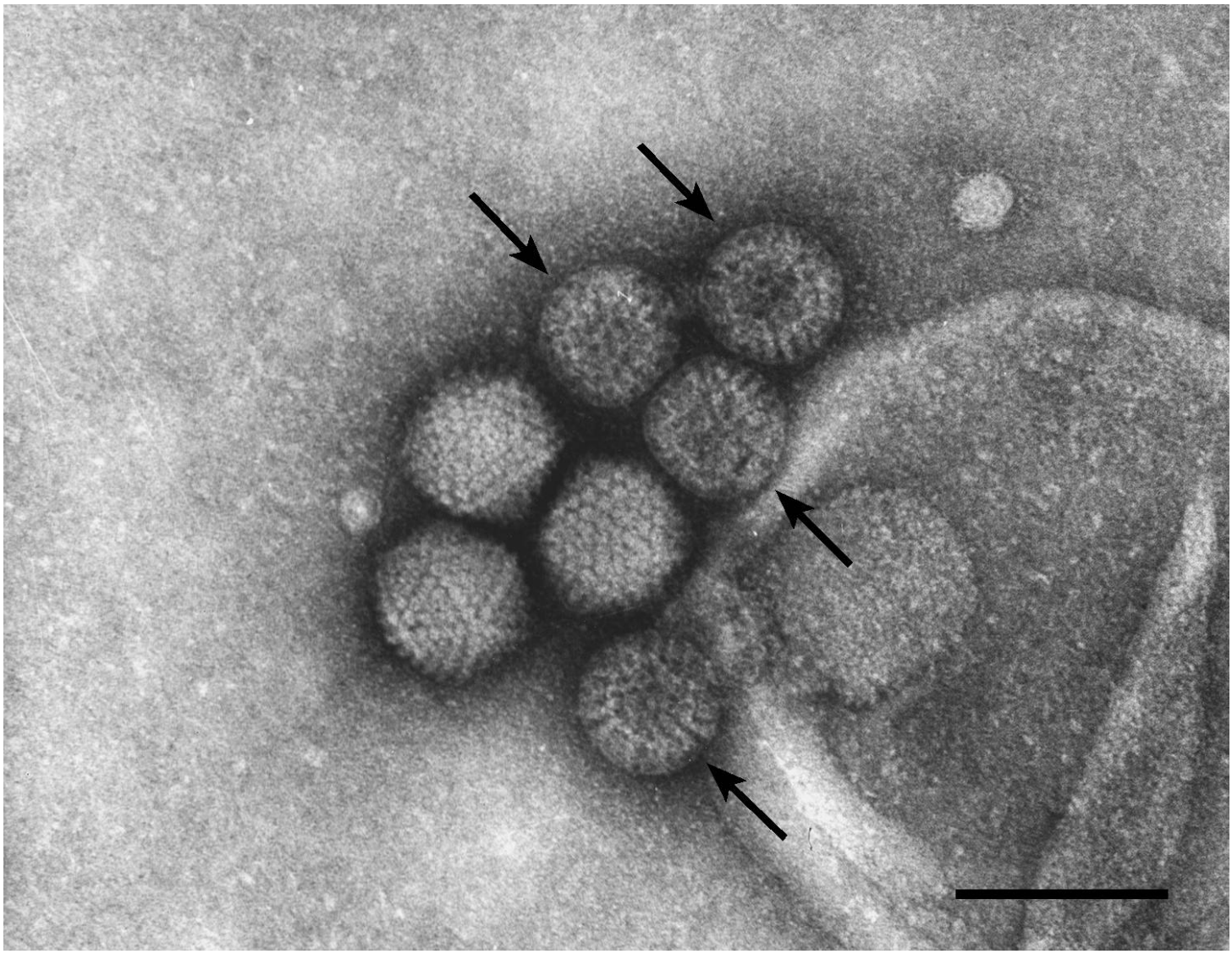
Adenoviridae



Human adenovirus (HAdV) and Human rotavirus (HRV, arrows) from stool. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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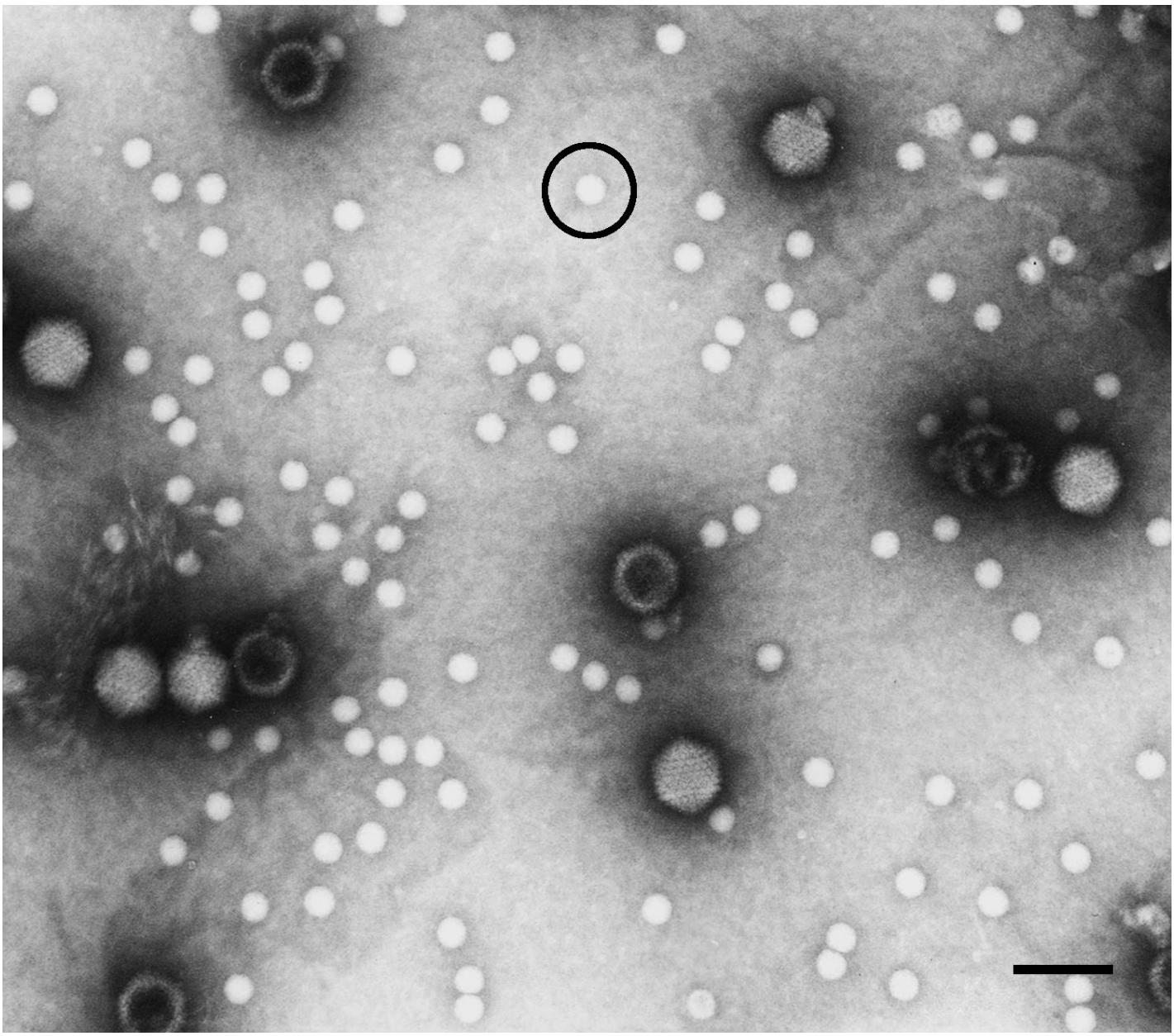
Adenoviridae



Human adenovirus 2 (HAdV-2). Genus: Mastadenovirus, and Adeno-associated virus (AAV, Parvoviridae, circle). Negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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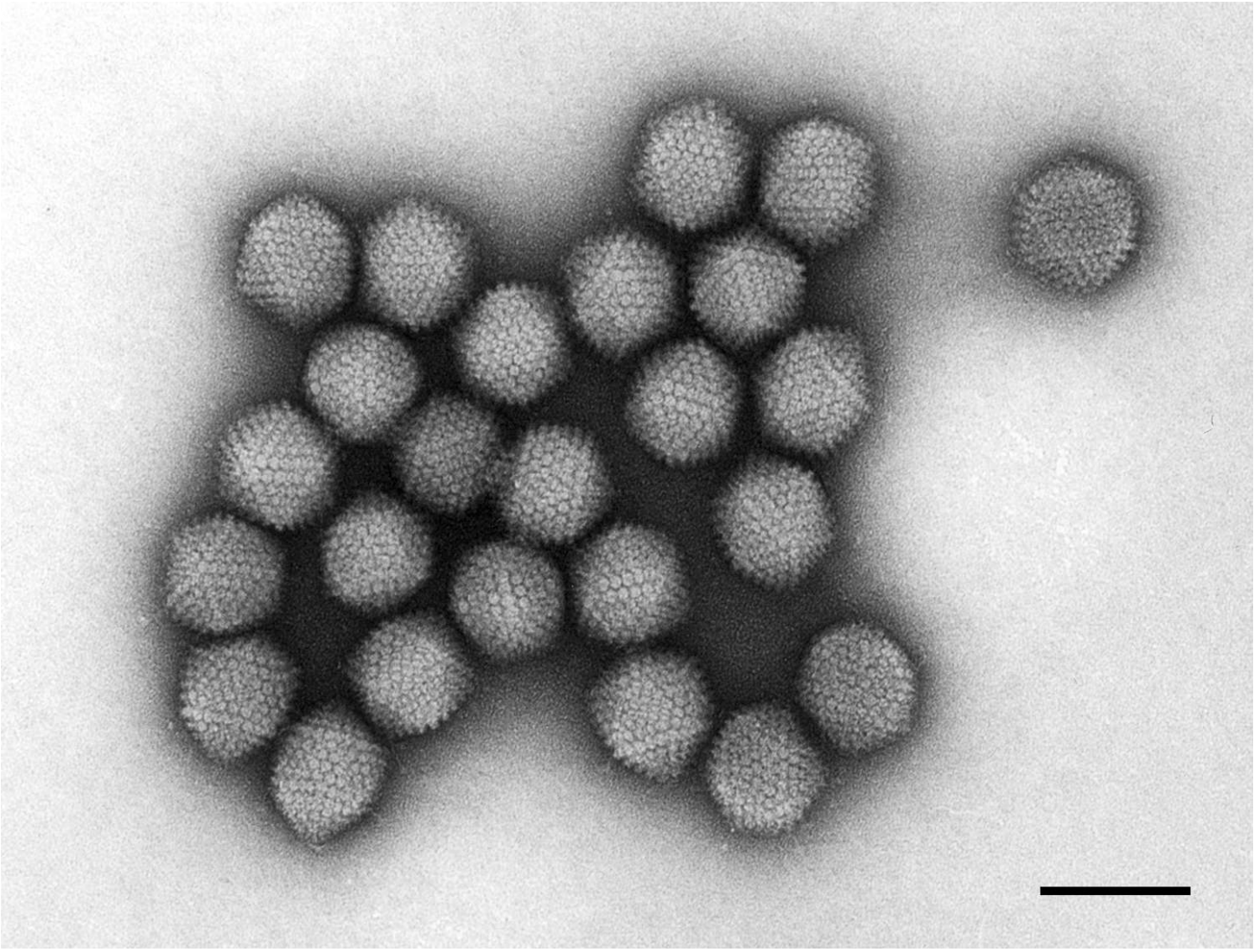
Adenoviridae



Fowl adenovirus 2 (FAdV-2). Genus: Aviadenovirus. Negative staining, UA. Spikes are visible on some of the virions.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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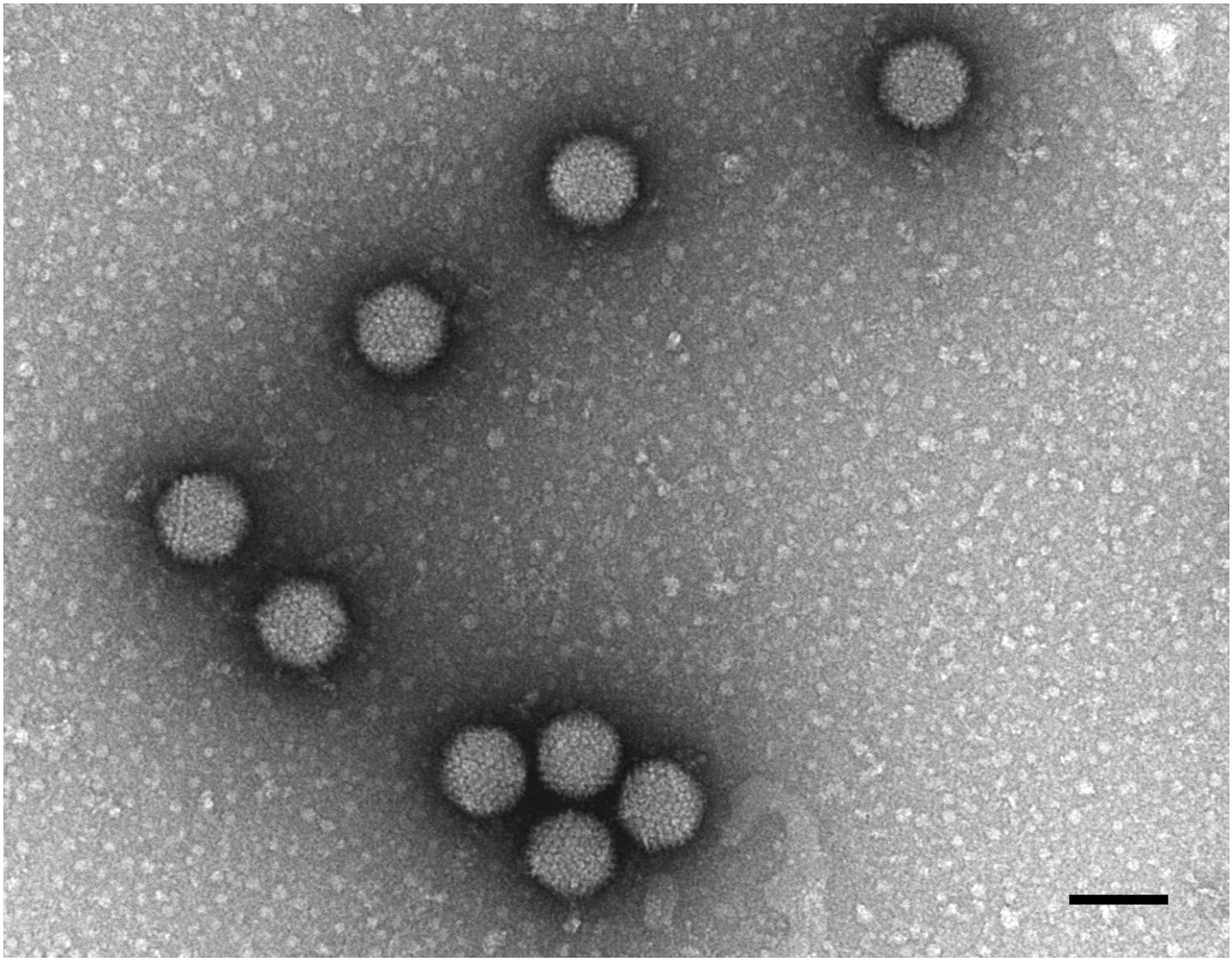
Adenoviridae



Recombinant Human adenovirus 5 (rHAdV-5). Genus: Mastadenovirus. Negative staining, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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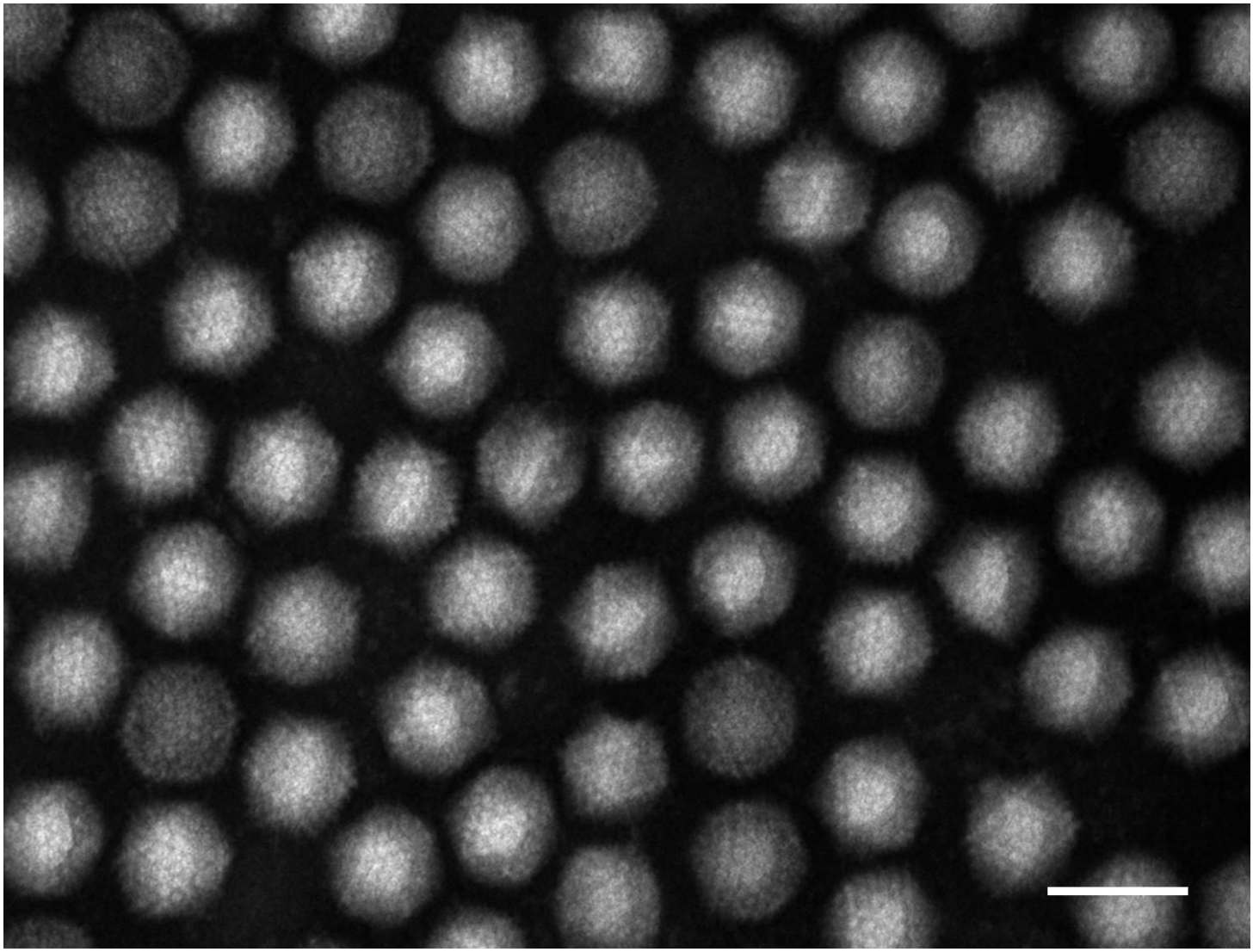
Adenoviridae



Recombinant Human adenovirus 5 (rHAdV-5). Genus: Mastadenovirus. Negative staining, PTA.

Image source: Norbert Bannert, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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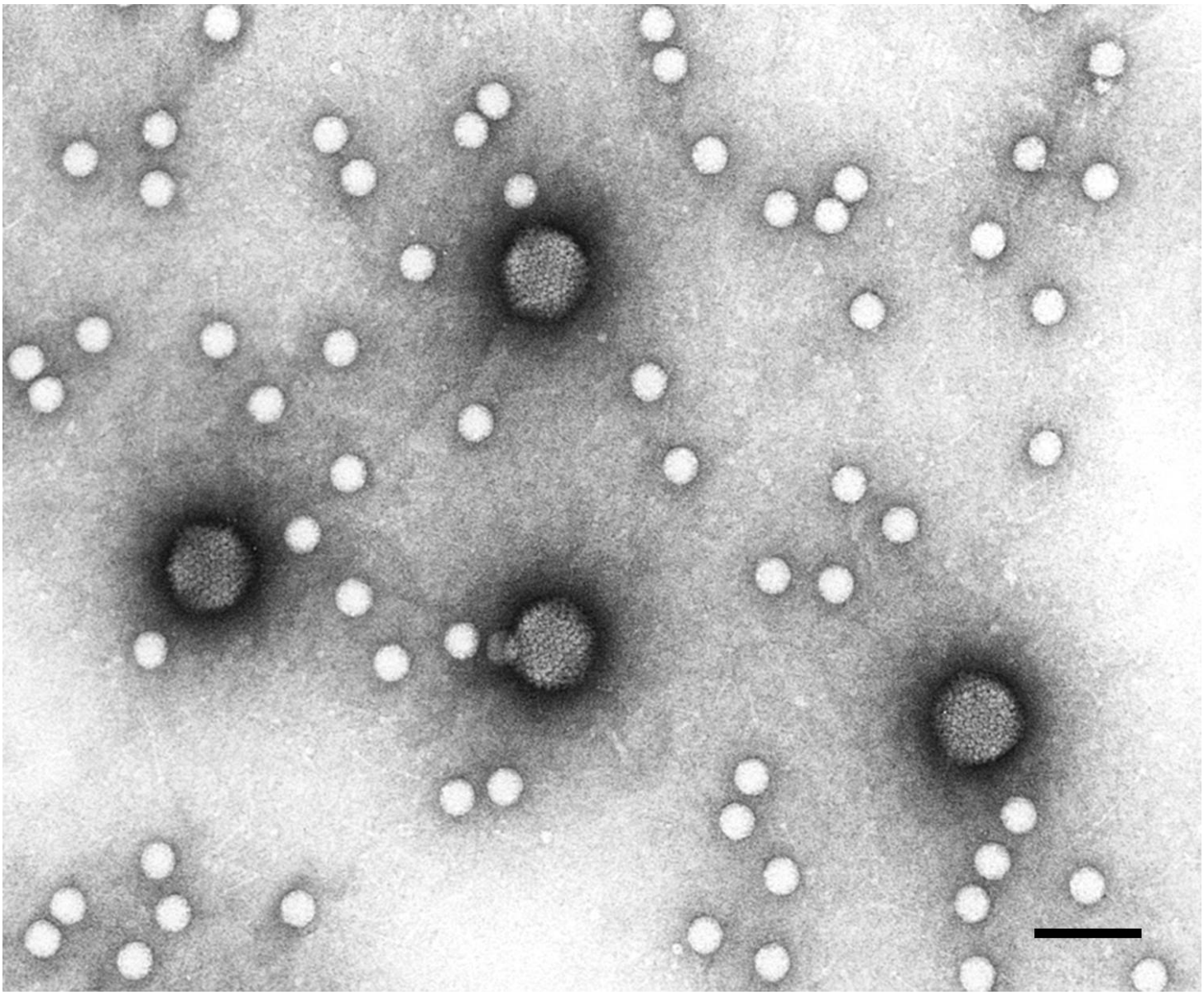
Adenoviridae



Human adenovirus 2 (HAdV-2). Genus: Mastadenovirus, and Adeno-associated virus (AAV, Parvoviridae). Negative staining. UA. The big icosahedral adenovirus particles are accompanied by much smaller round particles of Adeno-associated virus.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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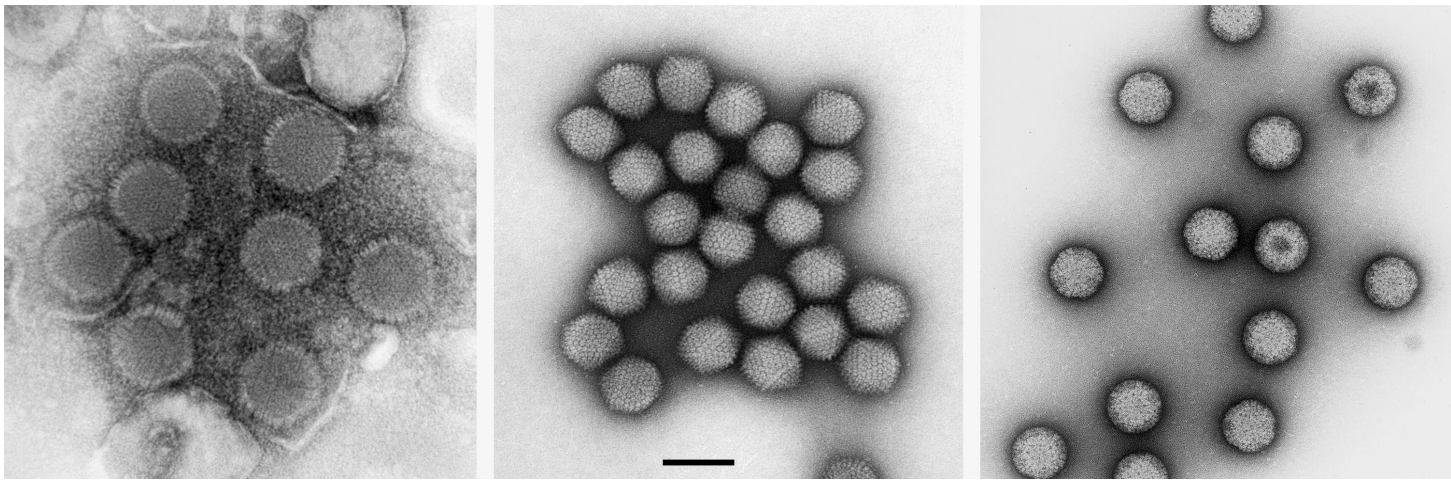
Adenoviridae



Comparison of three virus particle morphotypes (from left to right): Herpesvirales (naked capsids of Murine herpesvirus 8), Adenoviridae (Genus: Aviadenovirus) and Reoviridae (Genus: Orthoreovirus).Negative staining, UA. Isolated Herpesvirus capsids are bigger than Adenovirus or Reovirus particles. In addition, all particles clearly differ in their ultrastructure. For more details please refer to the virus group descriptions.

Image source: Lars Möller & Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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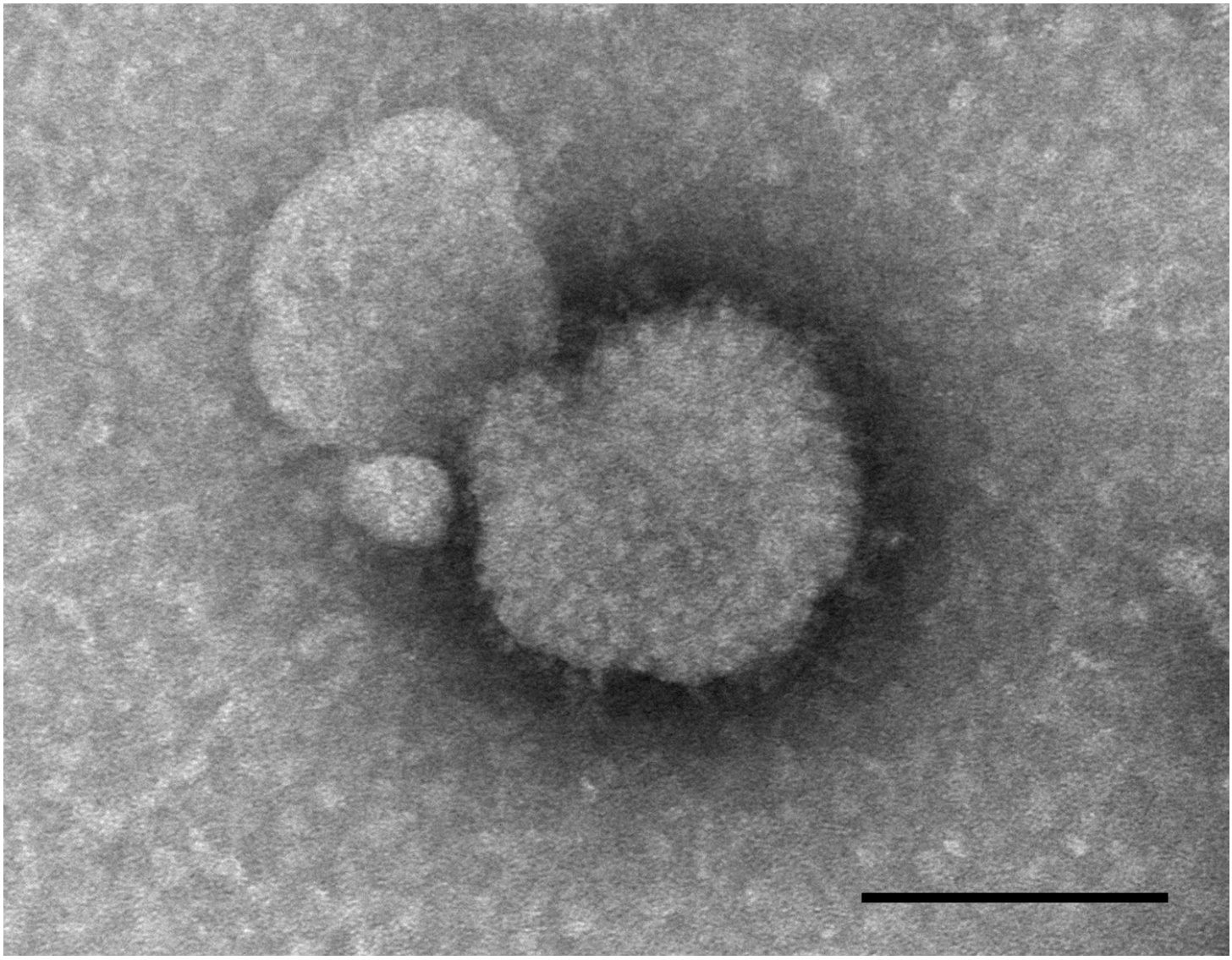
Arenaviridae



Lymphocytic choriomeningitis virus (LCMV), Armstrong. Genus: Mammarenavirus. Negative staining, PTA.

Image source: Mathew J. Hannah, Public Health England. Scale bar (if not stated otherwise): 100 nm

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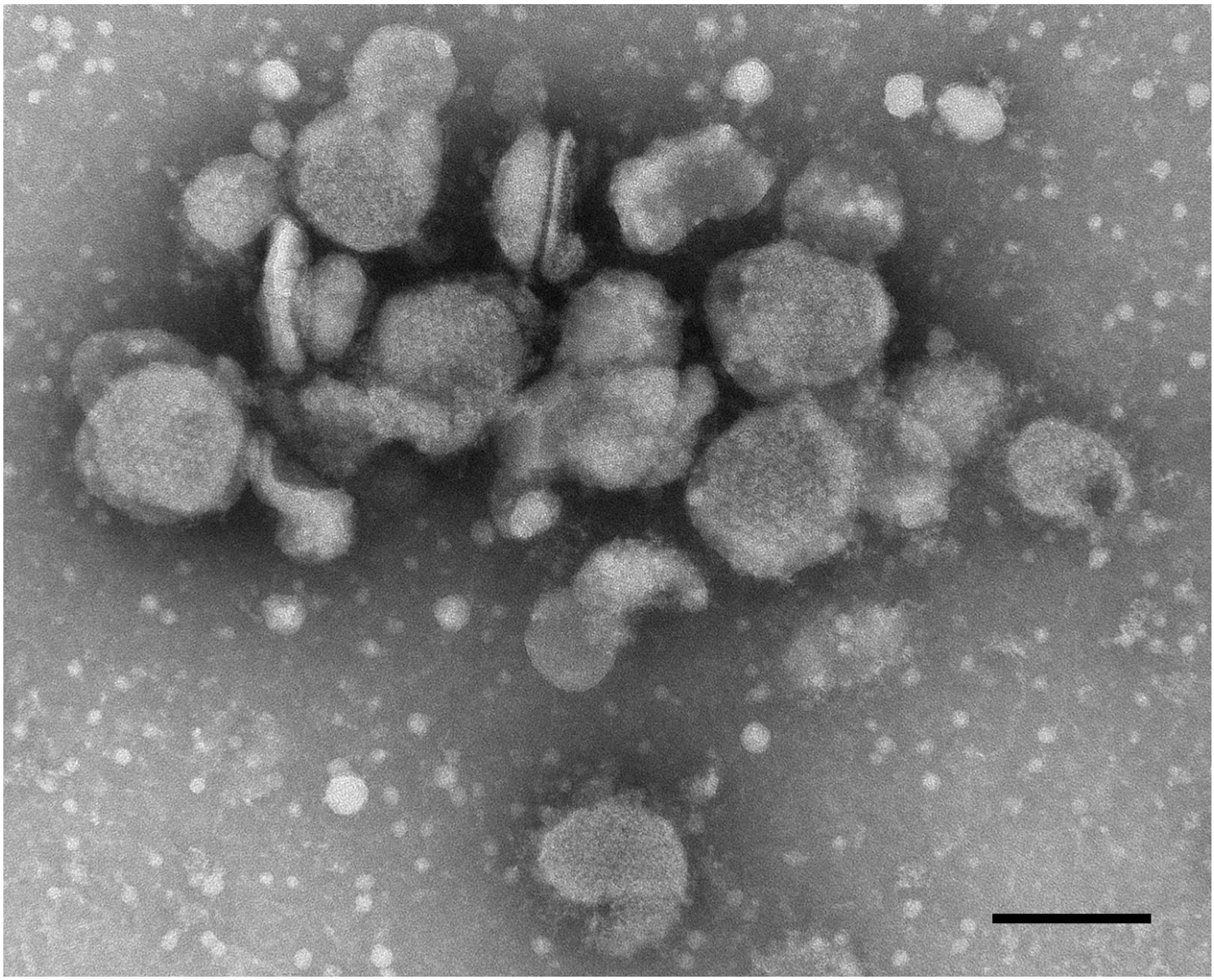
Arenaviridae



Lymphocytic choriomeningitis virus (LCMV), Armstrong. Genus: Mammarenavirus. Negative staining, PTA.

Image source: Mathew J. Hannah, Public Health England. Scale bar (if not stated otherwise): 100 nm

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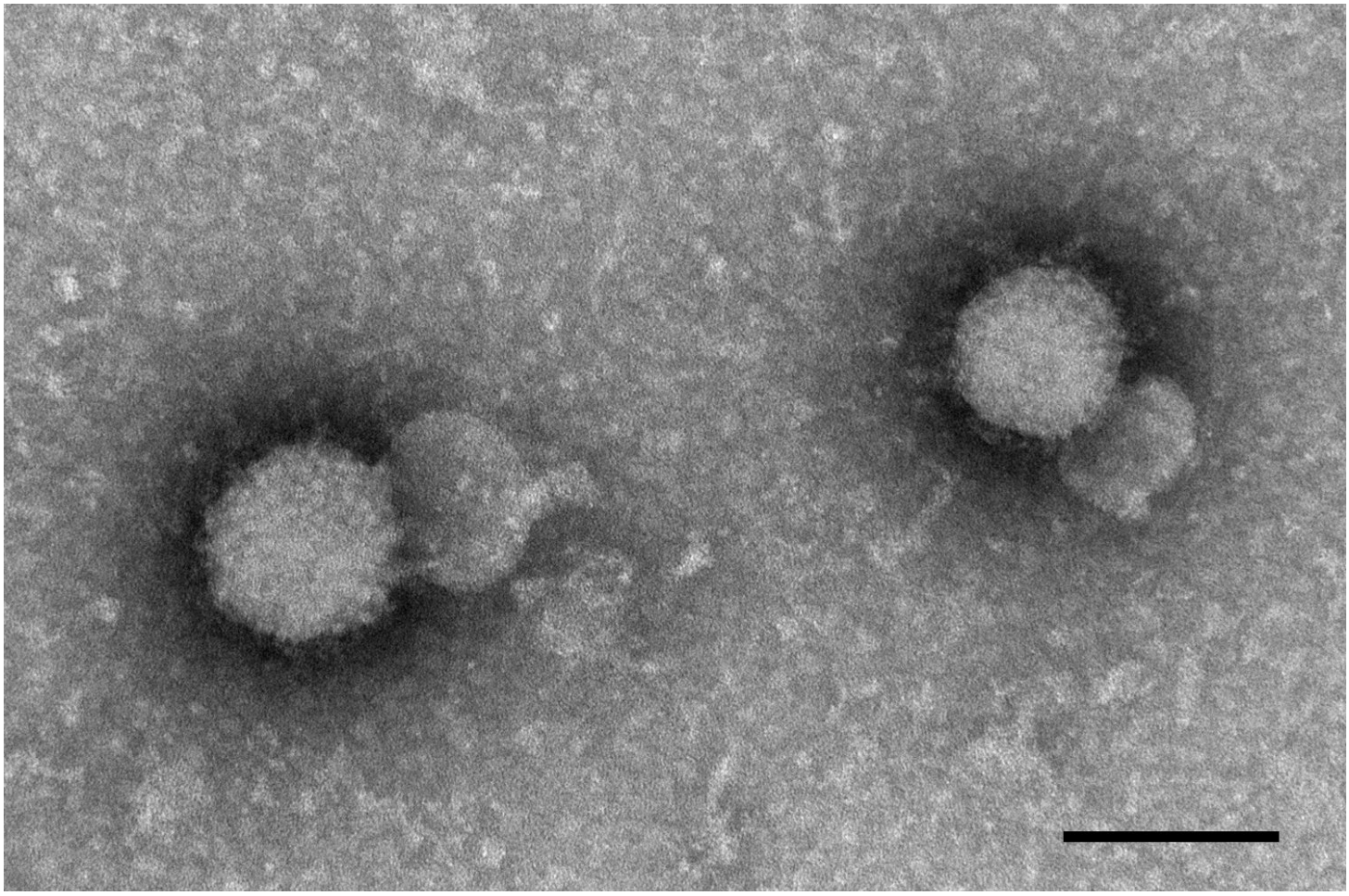
Arenaviridae



Lymphocytic choriomeningitis virus (LCMV), Armstrong. Genus: Mammarenavirus. Negative staining, PTA.

Image source: Mathew J. Hannah, Public Health England. Scale bar (if not stated otherwise): 100 nm

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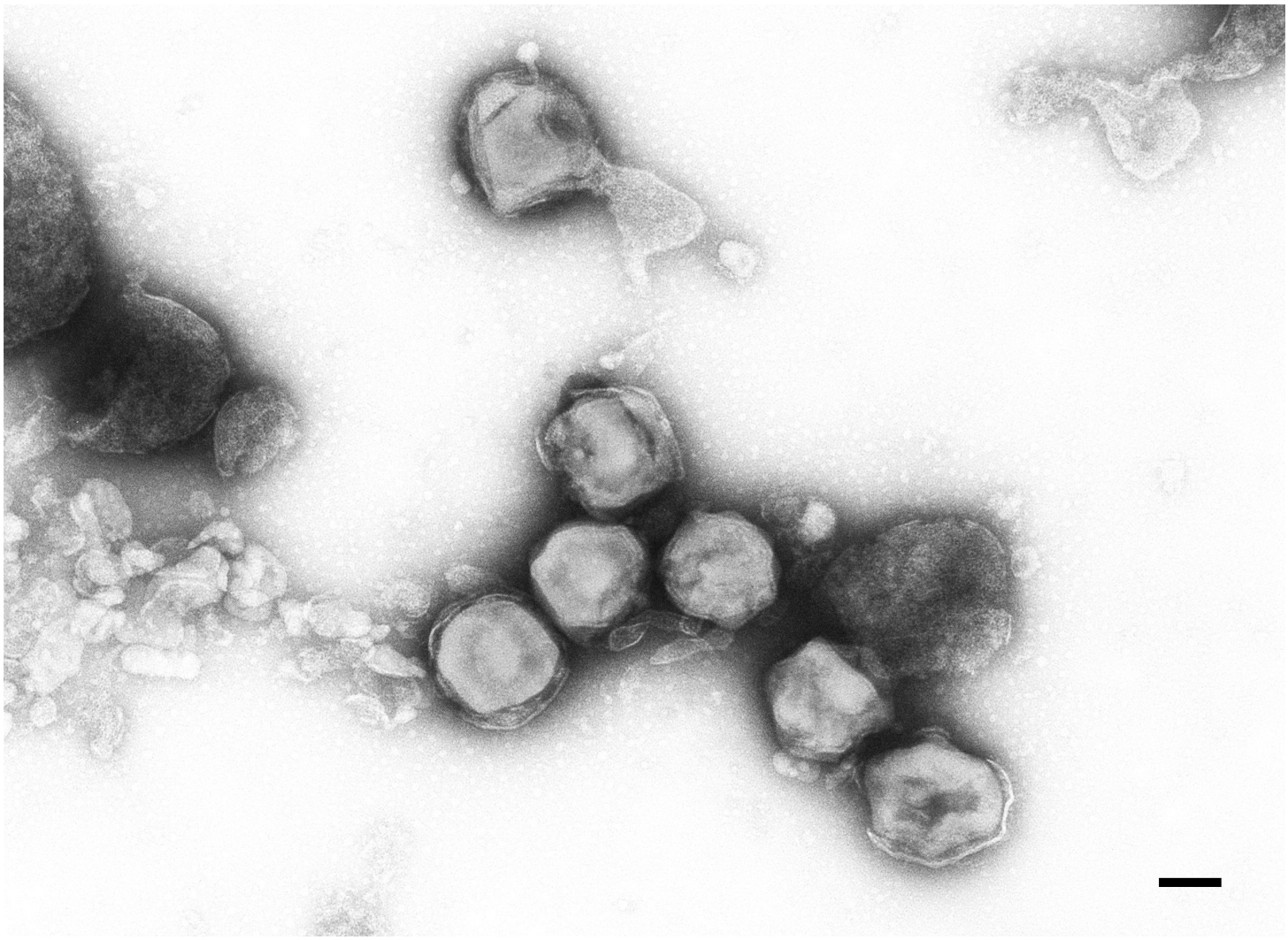
Asfarviridae



African swine fever virus (ASFV). Genus: Asfivirus. Concentrated cell culture supernatant. Negative staining, PTA.

Image source: Kati Franzke, Friedrich-Loeffler-Institut, Insel Riems. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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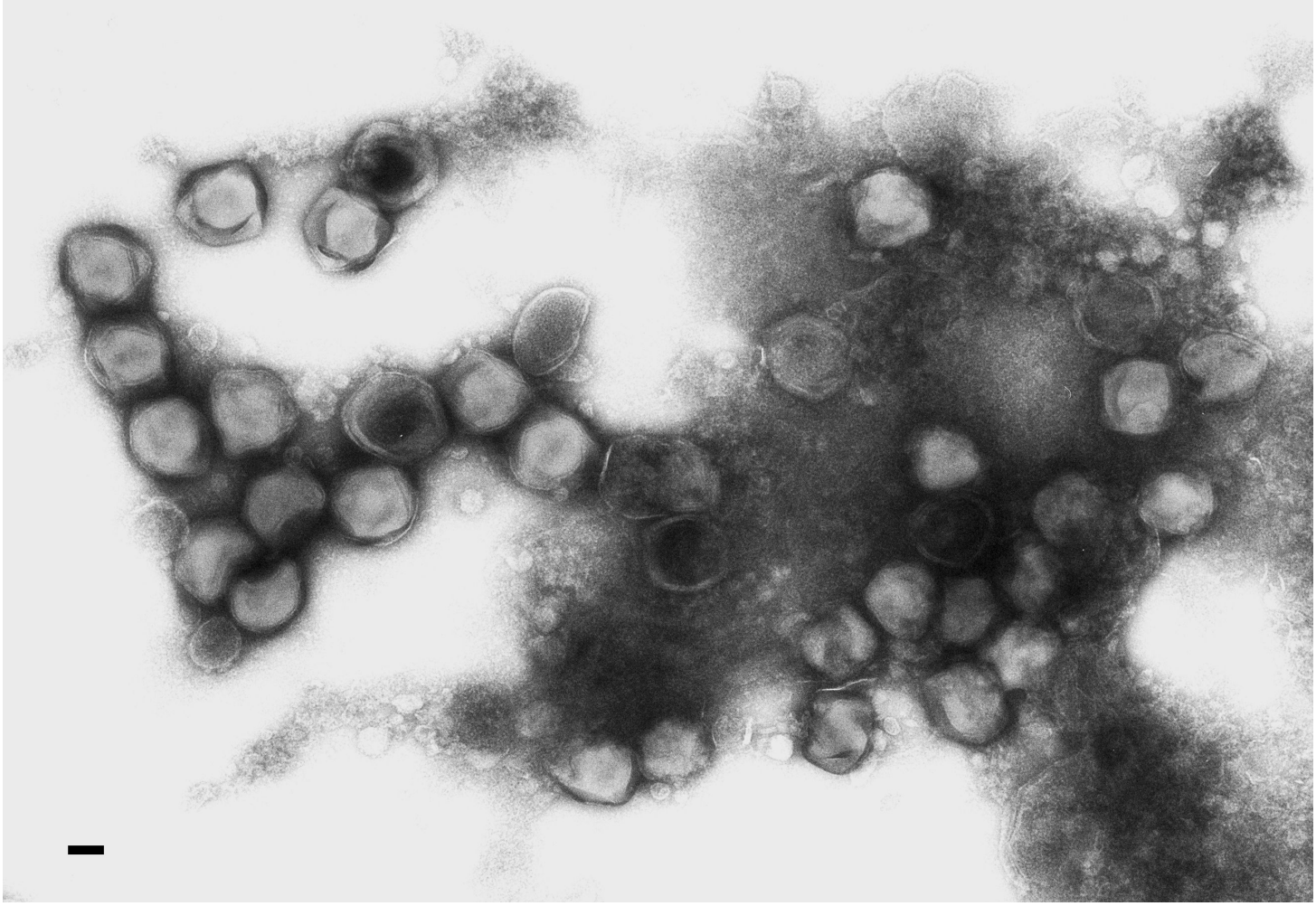
Asfarviridae



African swine fever virus (ASFV). Genus: Asfivirus. Concentrated cell culture supernatant. Negative staining, PTA.

Image source: Kati Franzke, Friedrich-Loeffler-Institut, Insel Riems. Scale bar (if not stated otherwise): 100 nm

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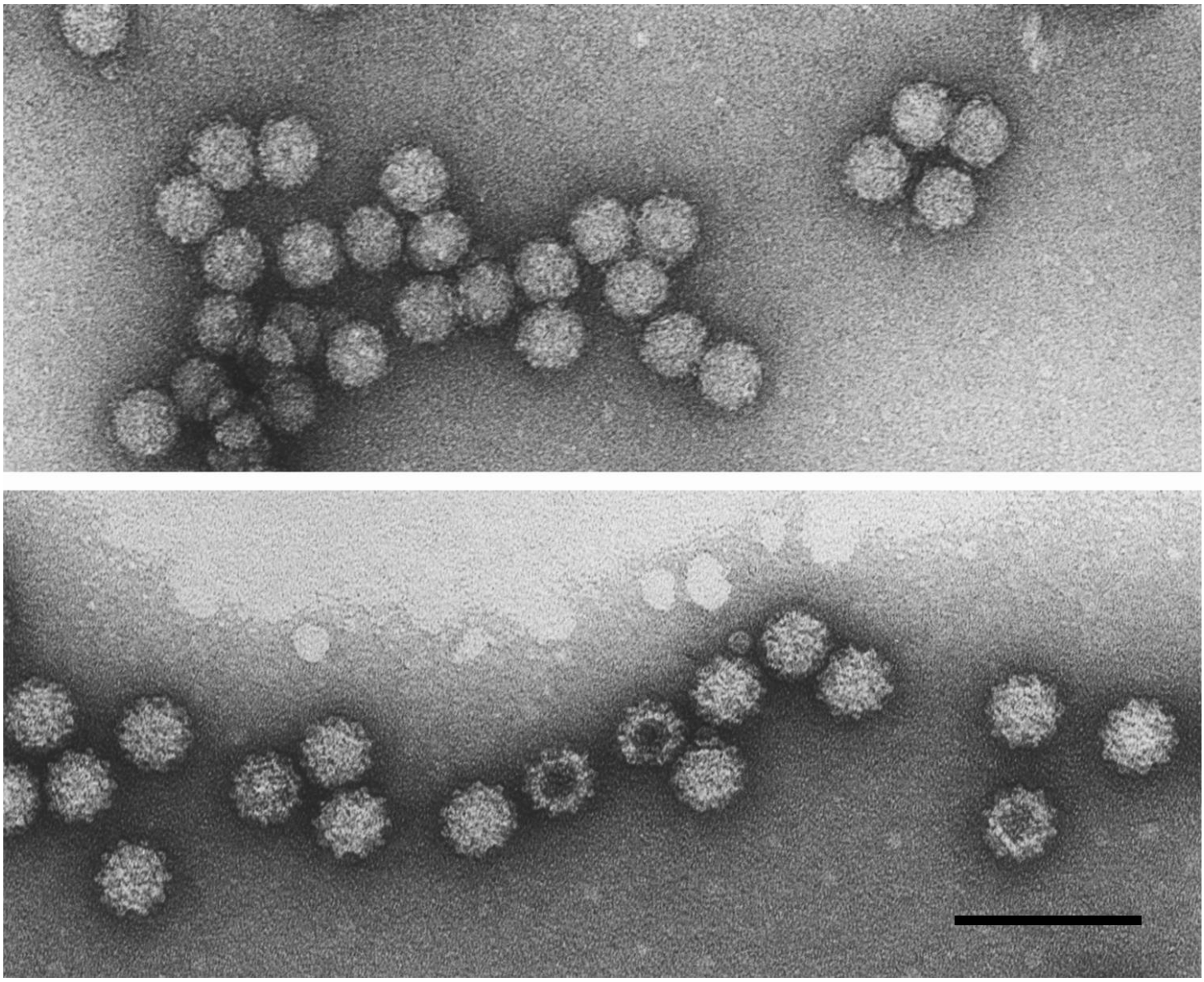
Astroviridae



Comparison between Astrovirus (above) and Calicivirus (below). Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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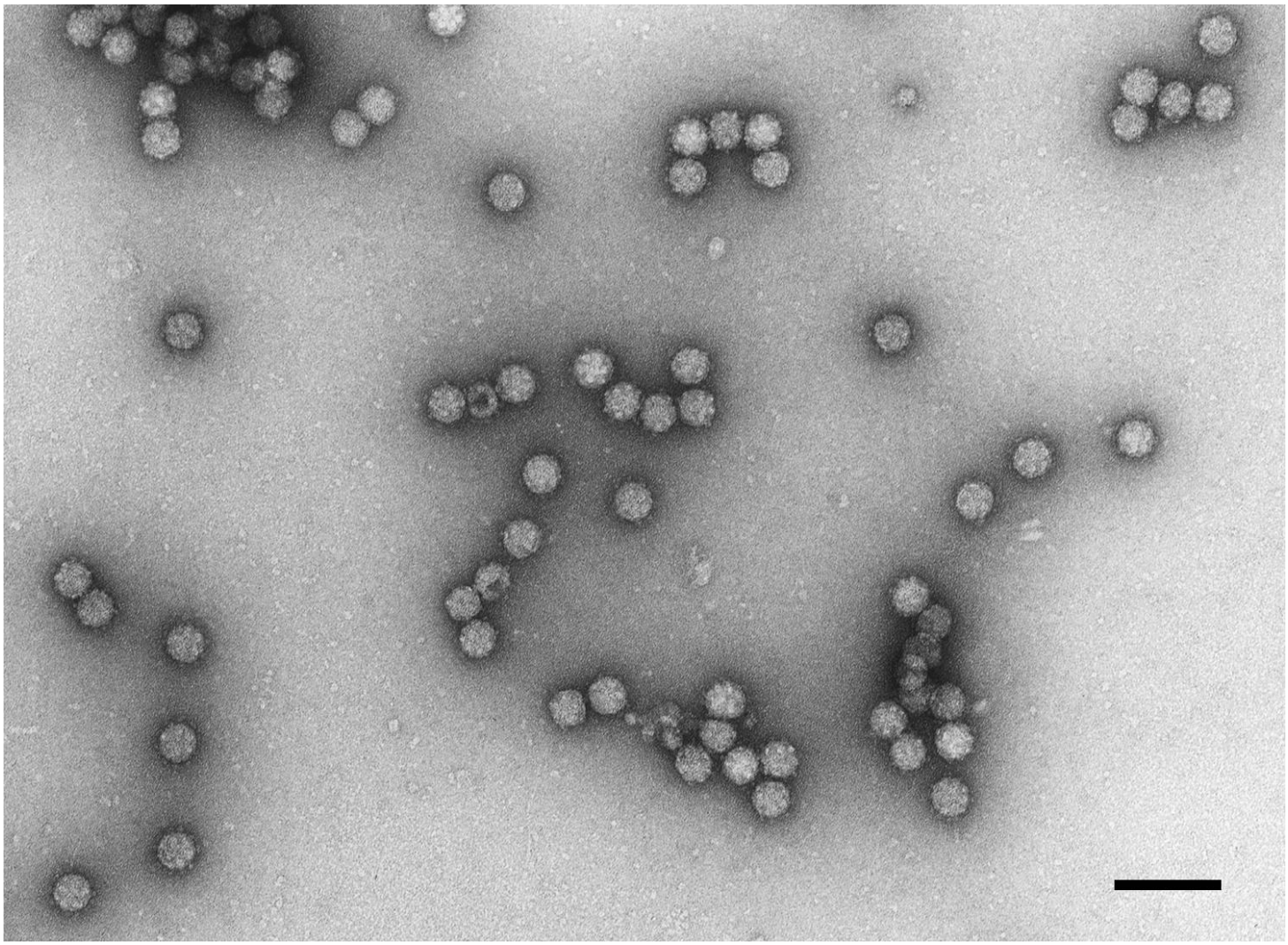
Astroviridae



Human astrovirus (HAstV). Genus: Mamastrovirus. Negative staining, UA. Some of the particles reveal a star-shape surface-sculpture, especially at lower magnification.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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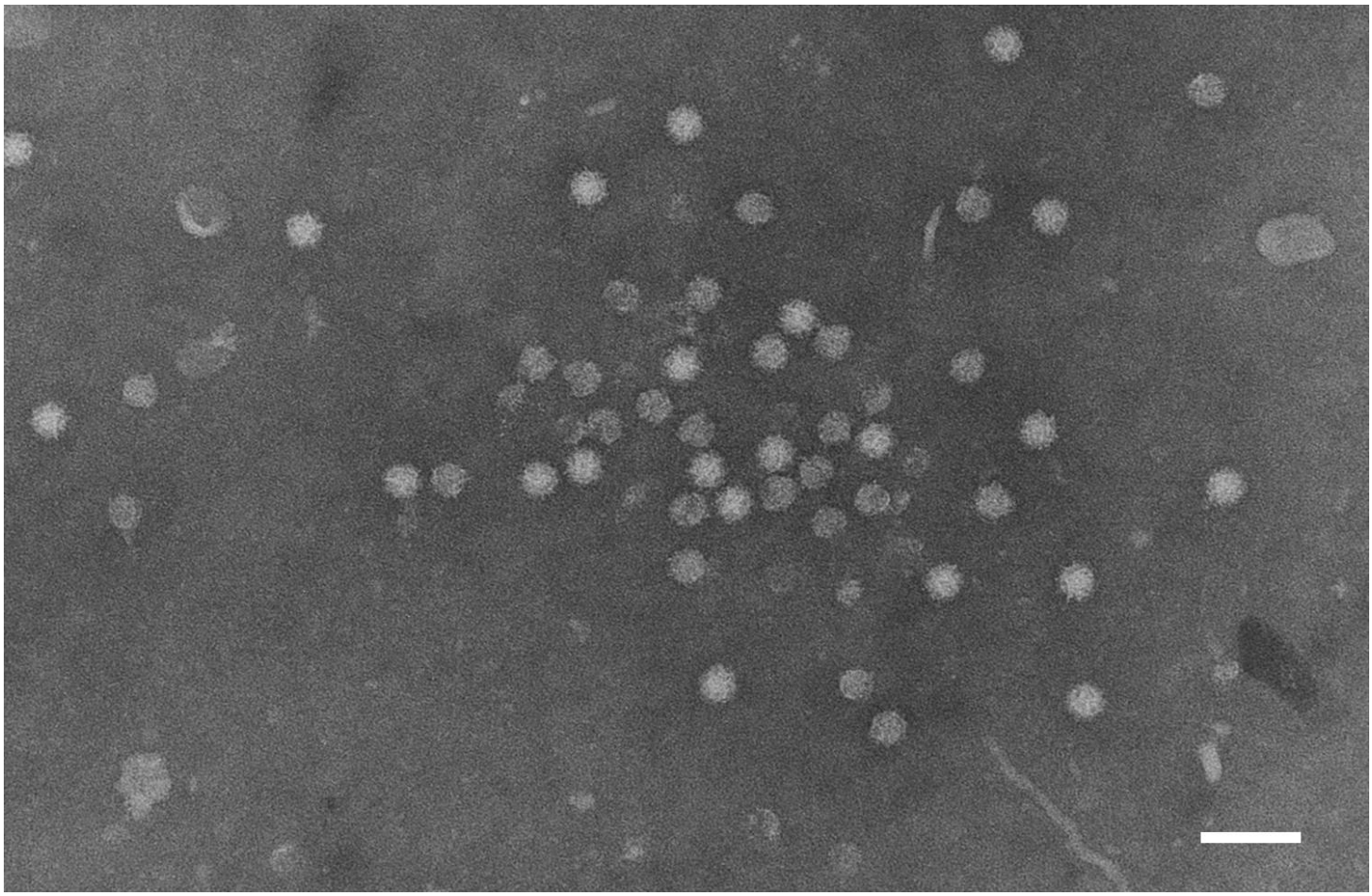
Astroviridae



Human astrovirus (HAstV). Genus: Mamastrovirus. Negative staining, AM.

Image source: Andrea Männel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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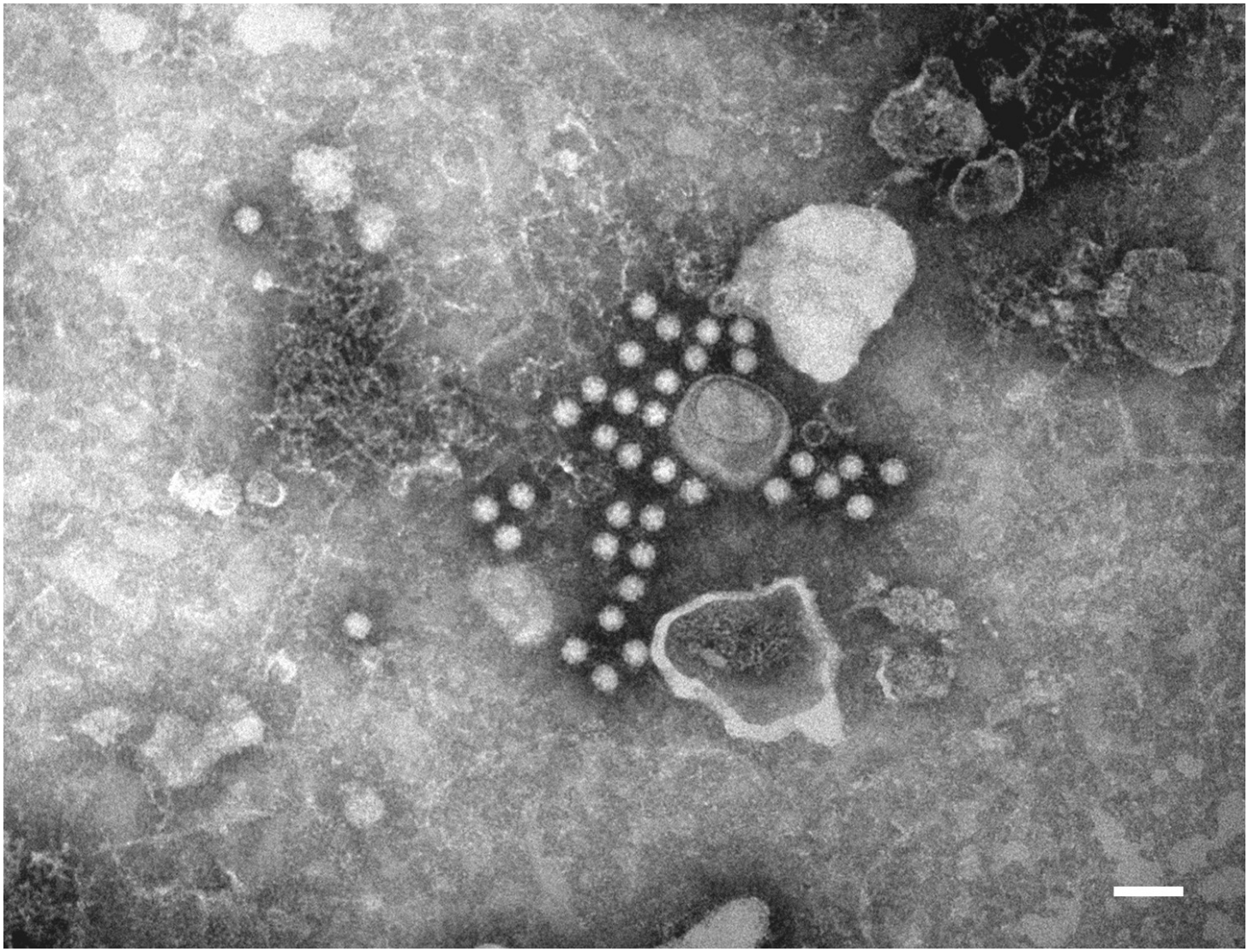
Astroviridae



Feline astrovirus (FAstV). Genus: Mamastrovirus. Negative staining, PTA.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

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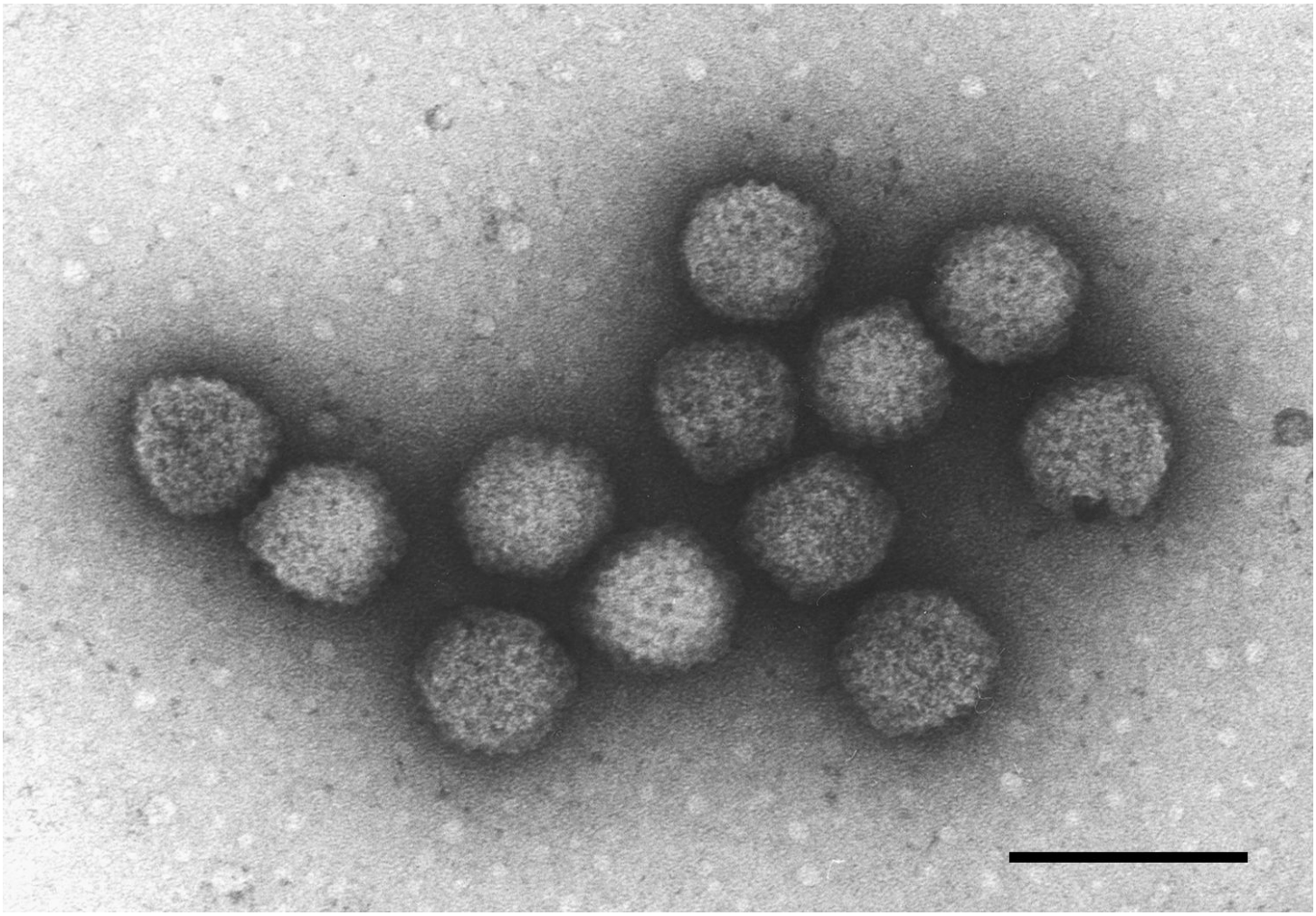
Birnaviridae



Infectious pancreatic necrosis virus (IPNV). Genus: Aquabirnavirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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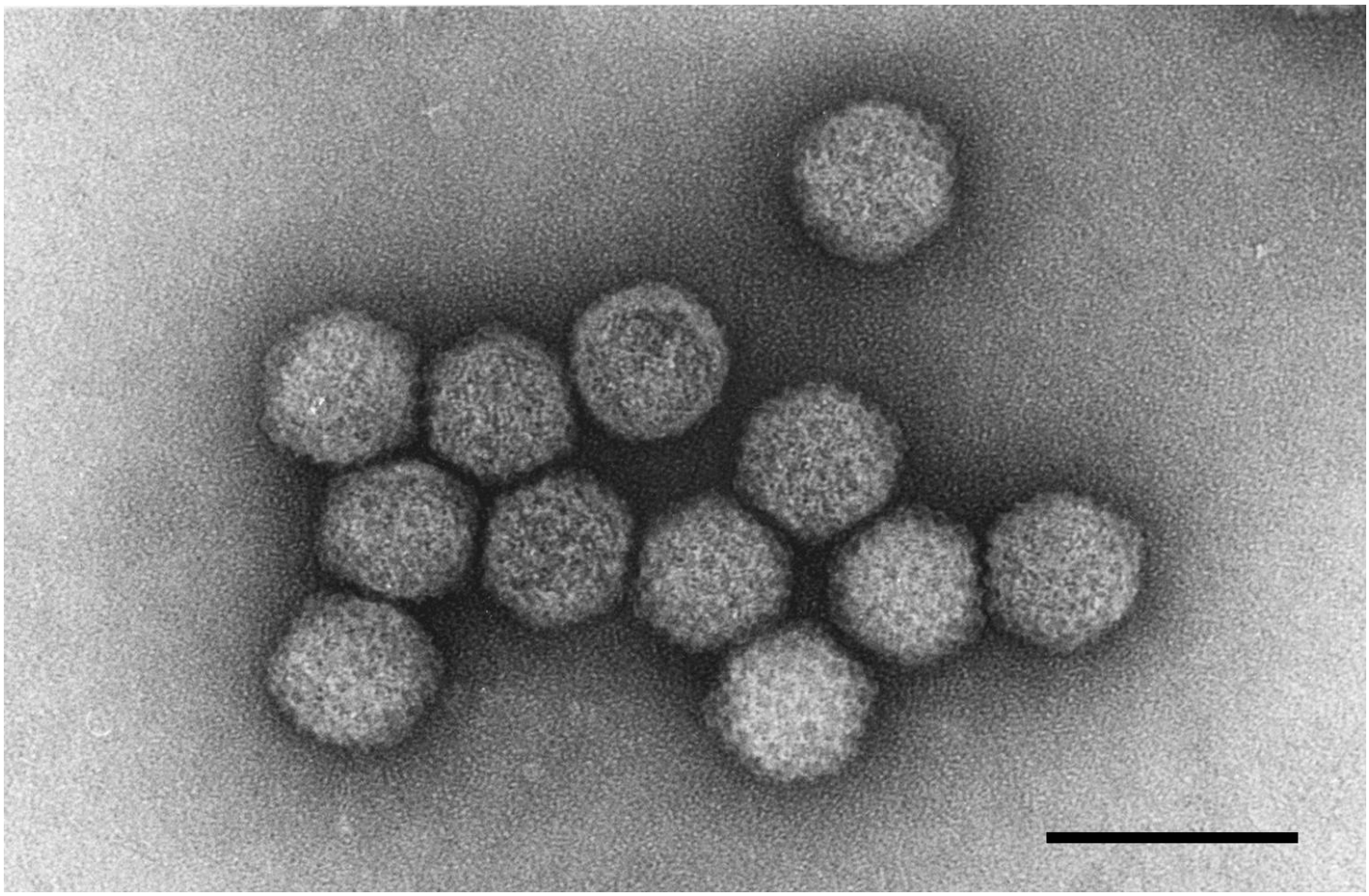
Birnaviridae



Infectious bursal disease virus (IBDV) / Gumboro disease. Genus: Avibirnavirus. negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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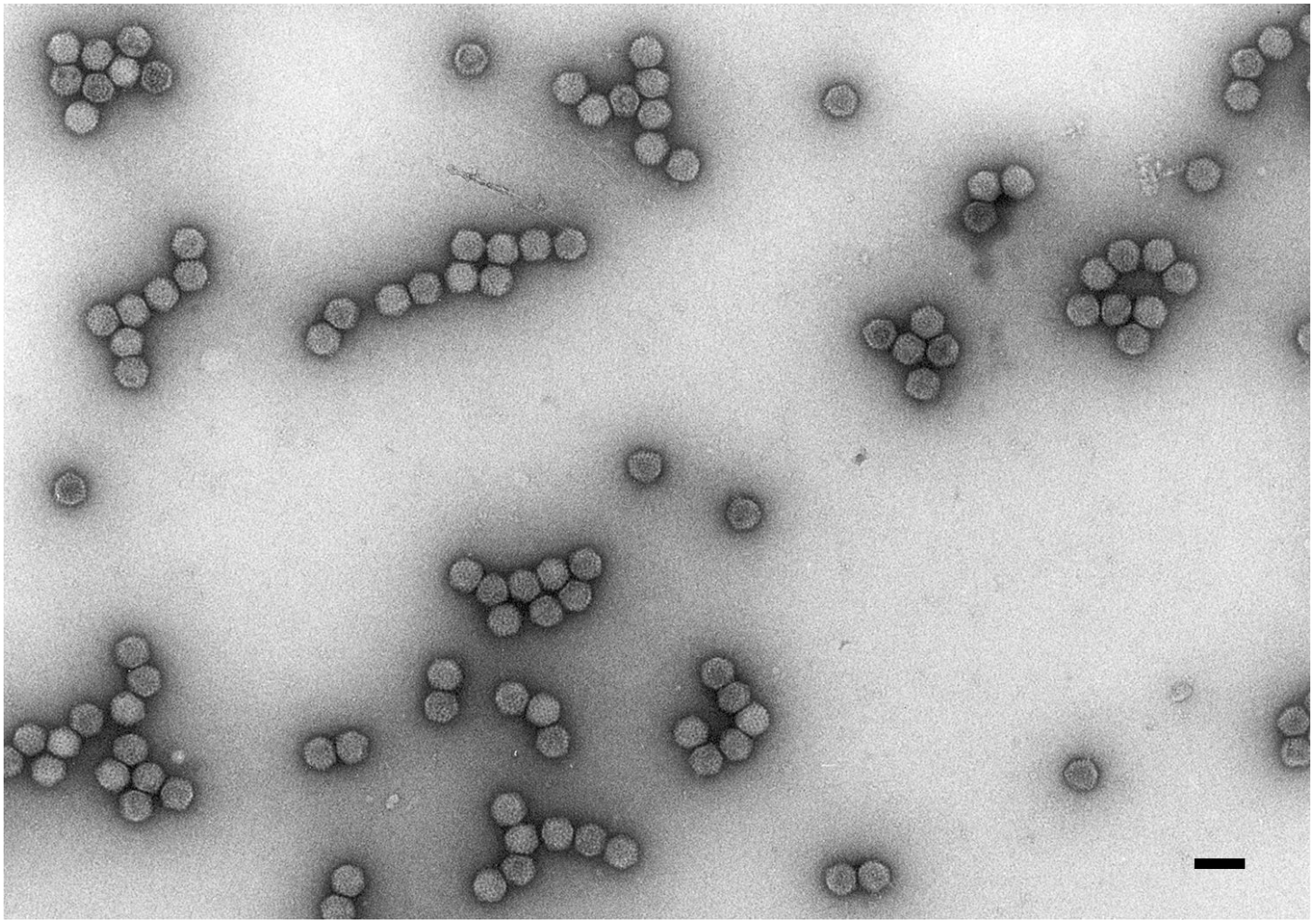
Birnaviridae



Infectious bursal disease virus (IBDV) / Gumboro disease. Genus: Avibirnavirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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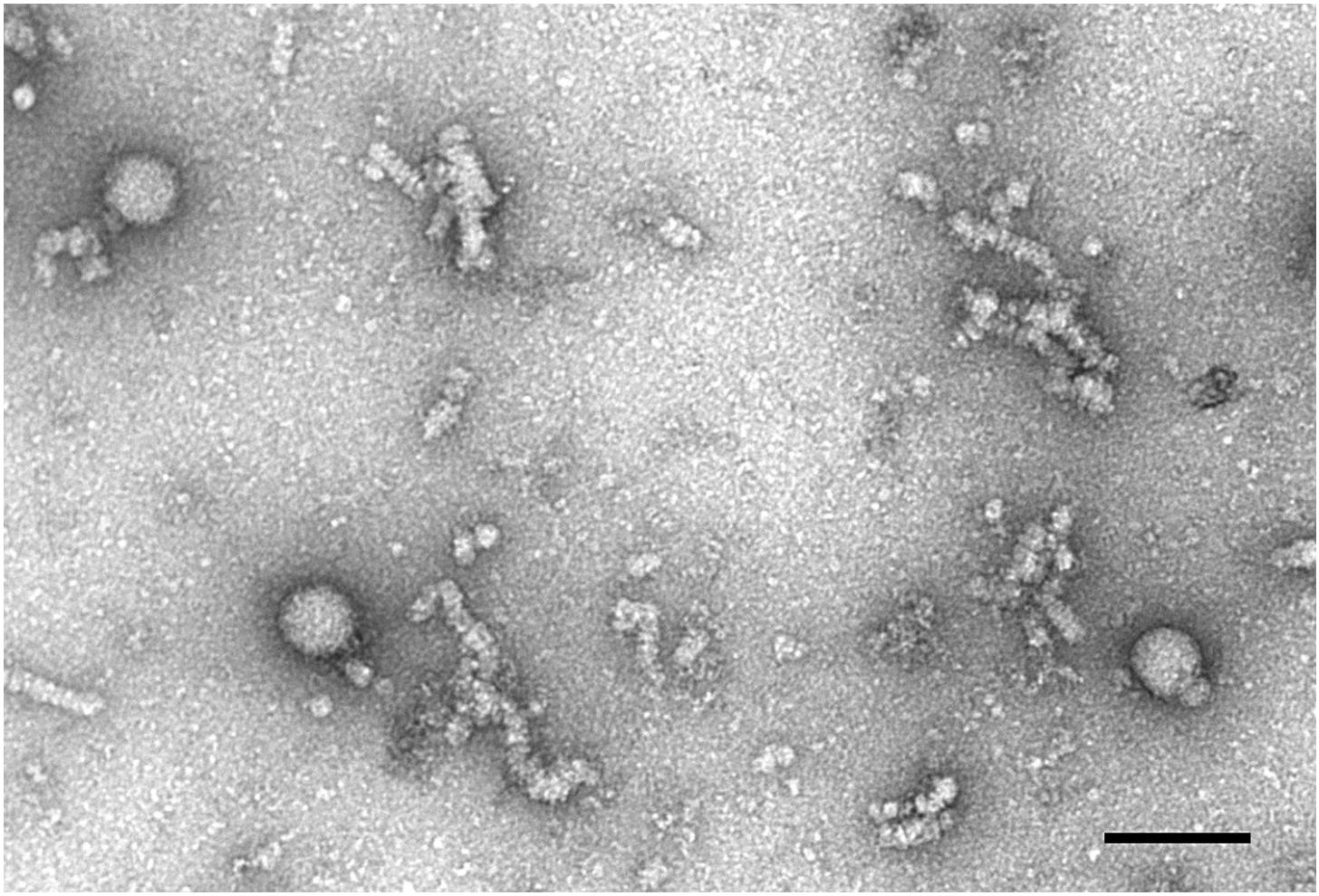
Bunyaviridae



Gouleako virus (GOLV). Genus: unassigned. Negative staining, UA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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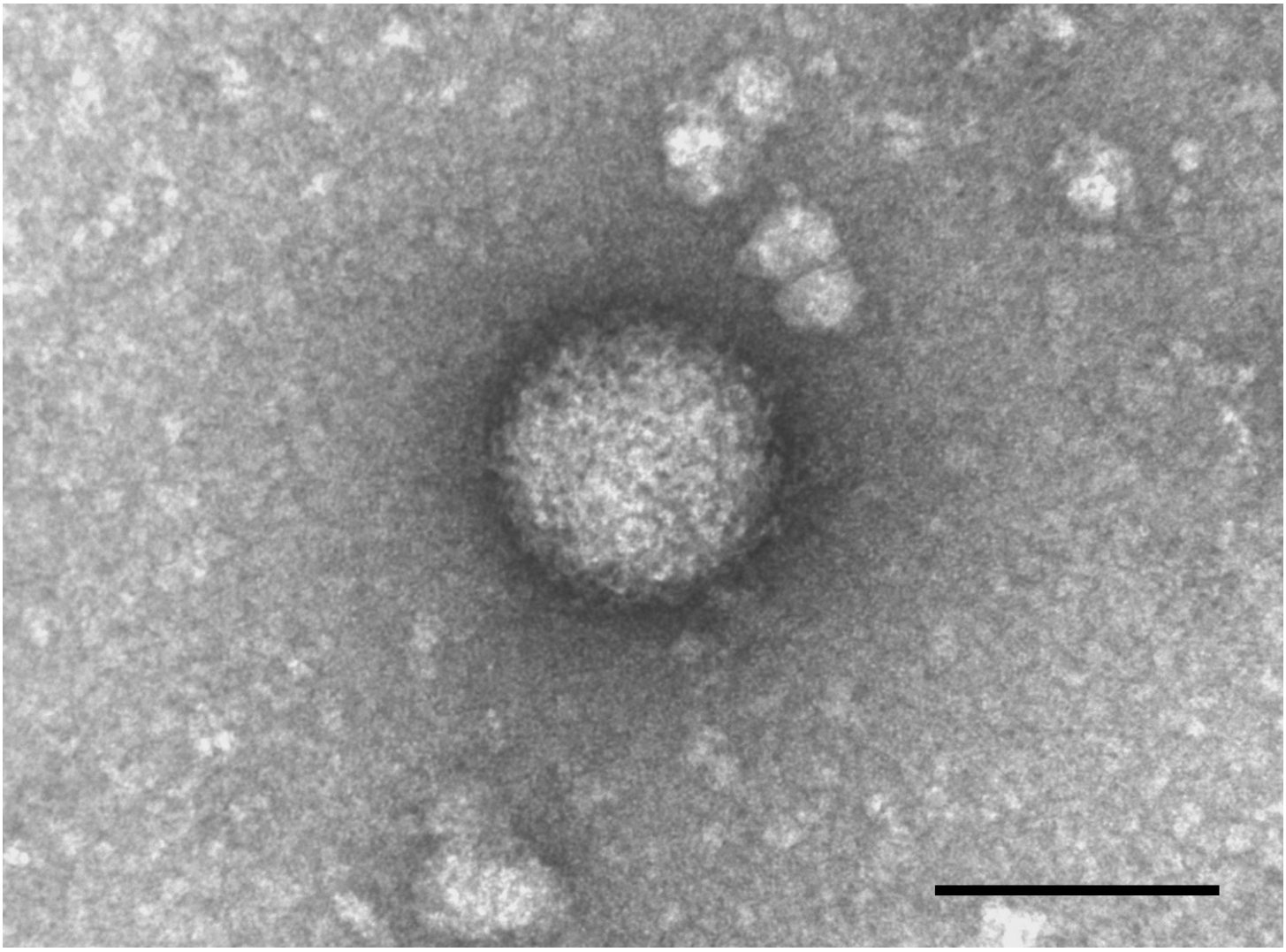
Bunyaviridae



Gouleako virus (GOLV). Genus: unassigned. Negative staining, UA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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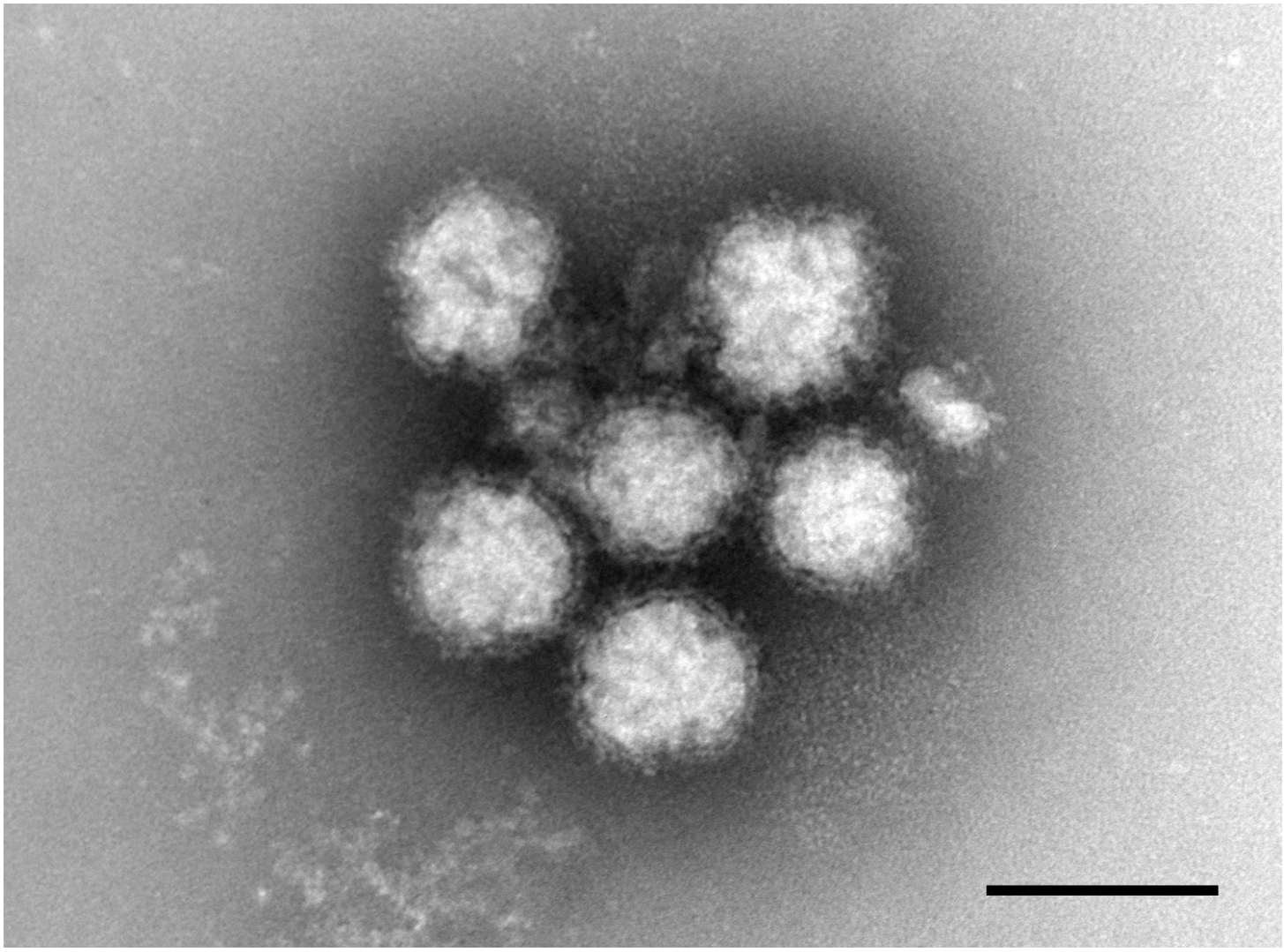
Bunyaviridae



Schmallenberg virus (SBV). Genus: Orthobunyavirus. Negative staining, PTA.

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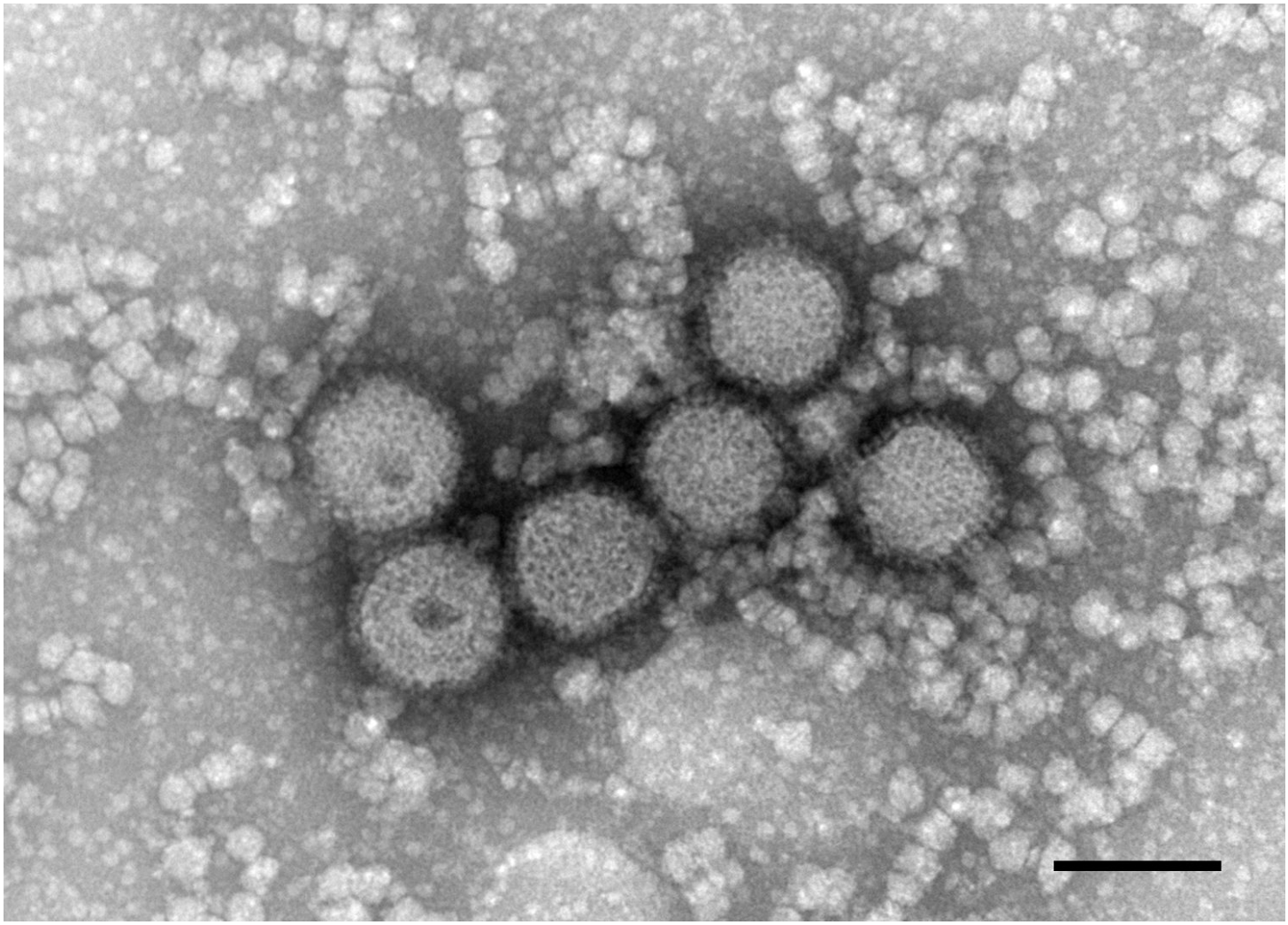
Bunyaviridae



Rift Valley fever virus MP12 (RVFV). Genus: Phlebovirus. Negative staining, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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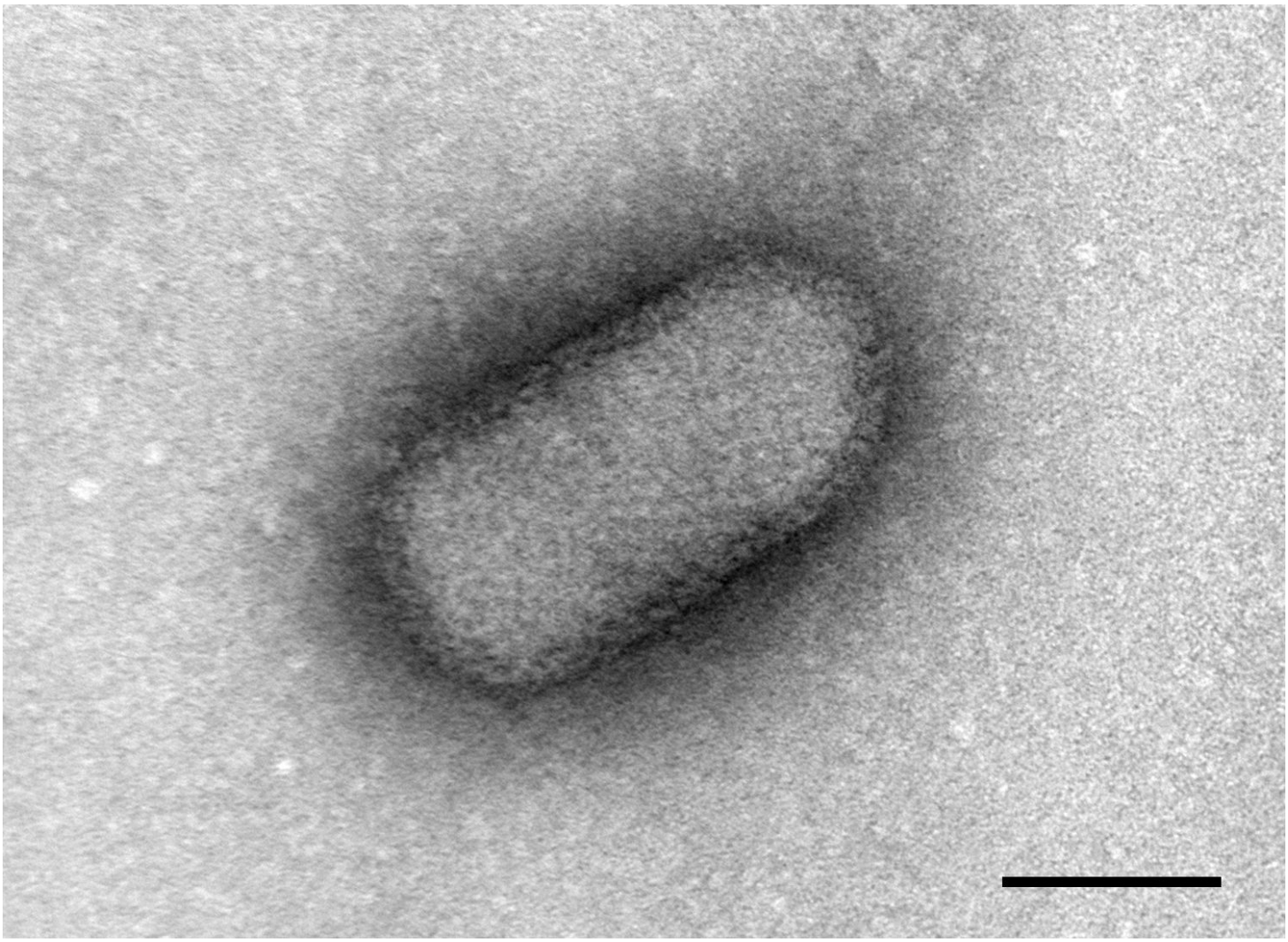
Bunyaviridae



Gouleako virus (GOLV). Genus: unassigned. Negative staining, UA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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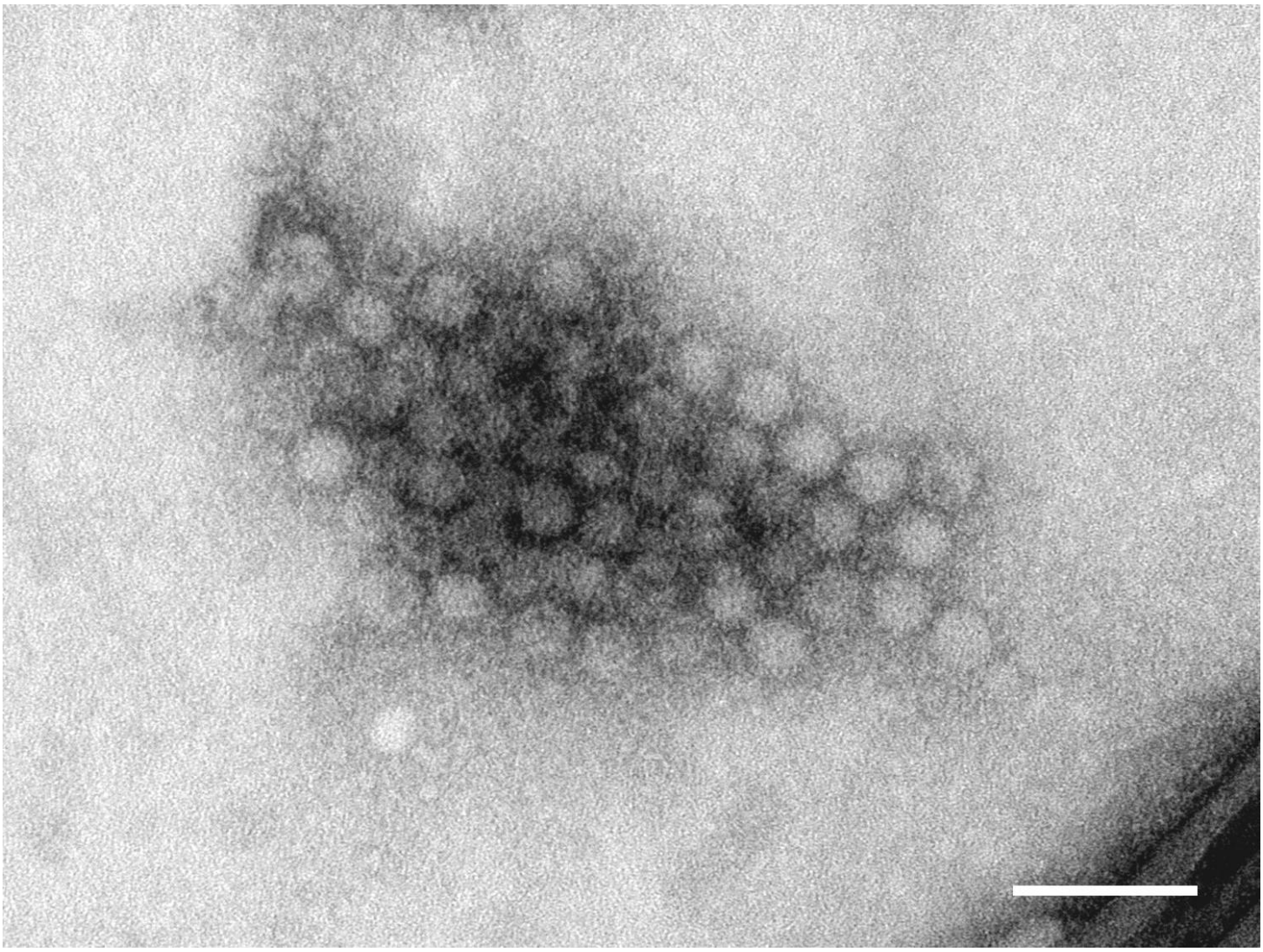
Caliciviridae



Norwalk-like virus. Genus: Norovirus. Negative staining, PTA. A cluster of Norovirus particles in a stool sample from a large outbreak in Germany, 2012. The preceeding image shows an overview of this cluster withi the complex structures present in a stool sample.

Image source: Michael Laue, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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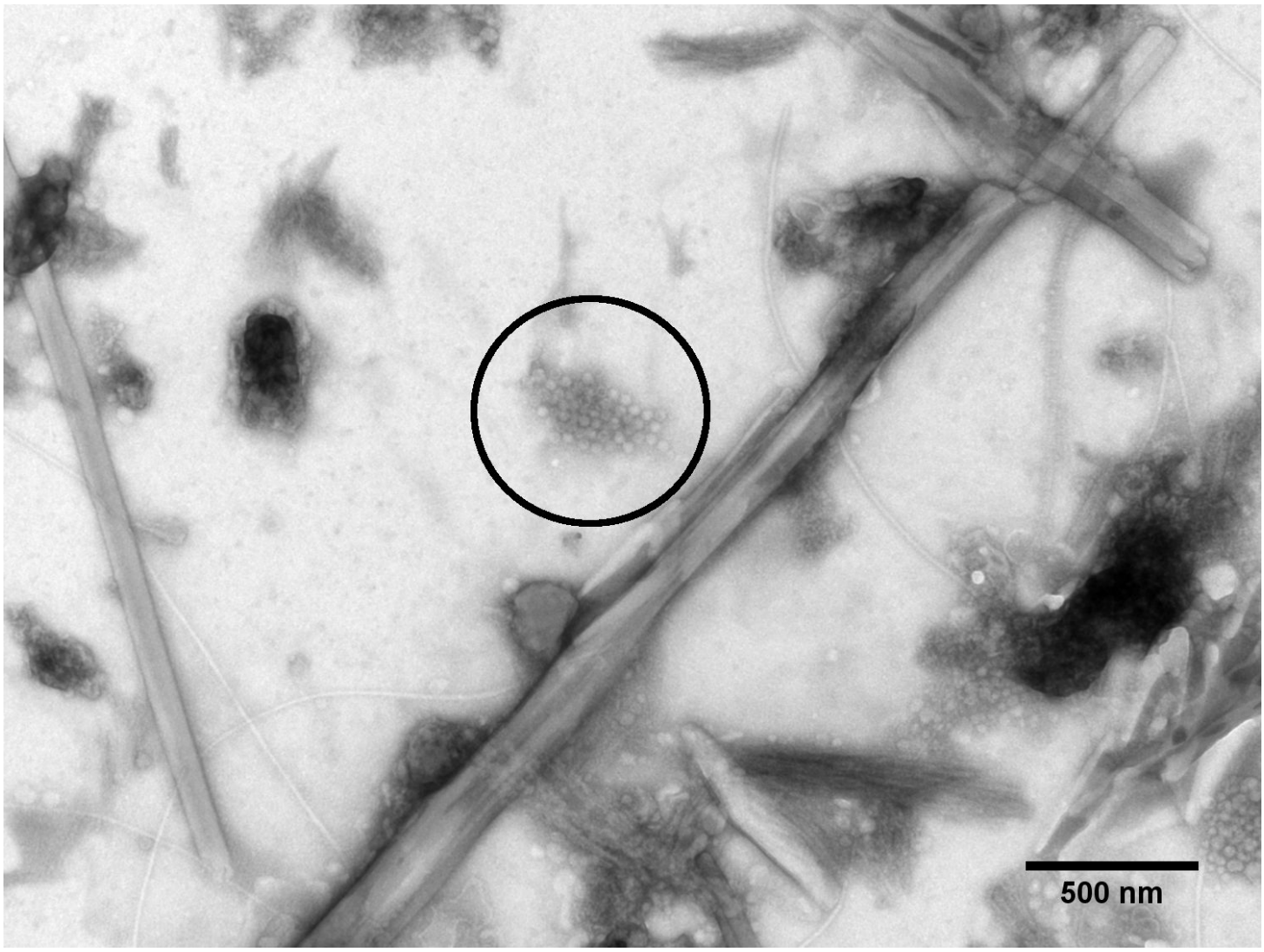
Caliciviridae



Norwalk-like virus. Genus: Norovirus. Negative staining, PTA. A cluster of Norovirus particles (encircled) in a stool sample from a large outbreak in Germany, 2012. The following image shows a magnification of this cluster.

Image source: Michael Laue, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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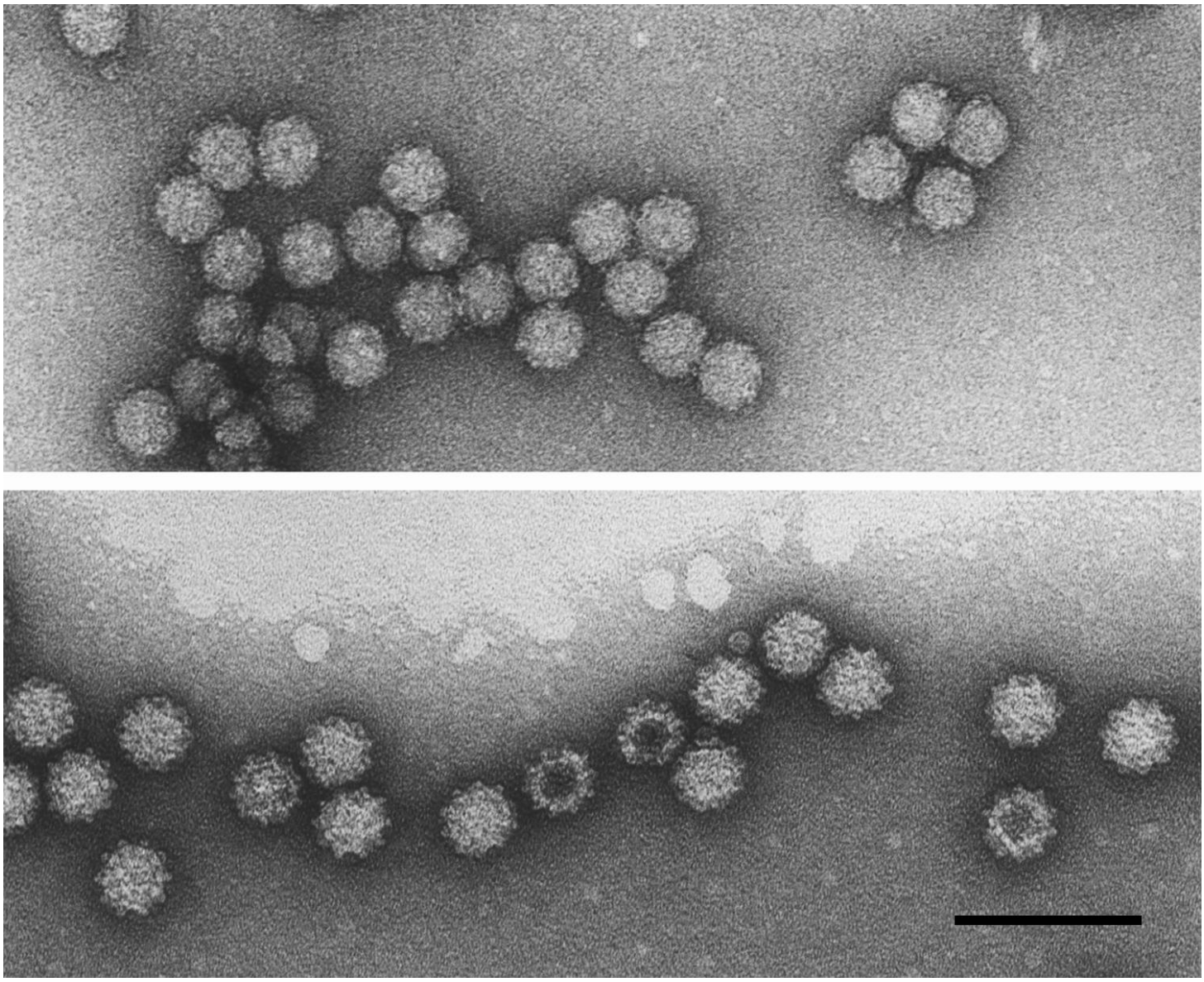
Caliciviridae



Comparison between Astrovirus (above) and Calicivirus (below). Negative staining, UA.

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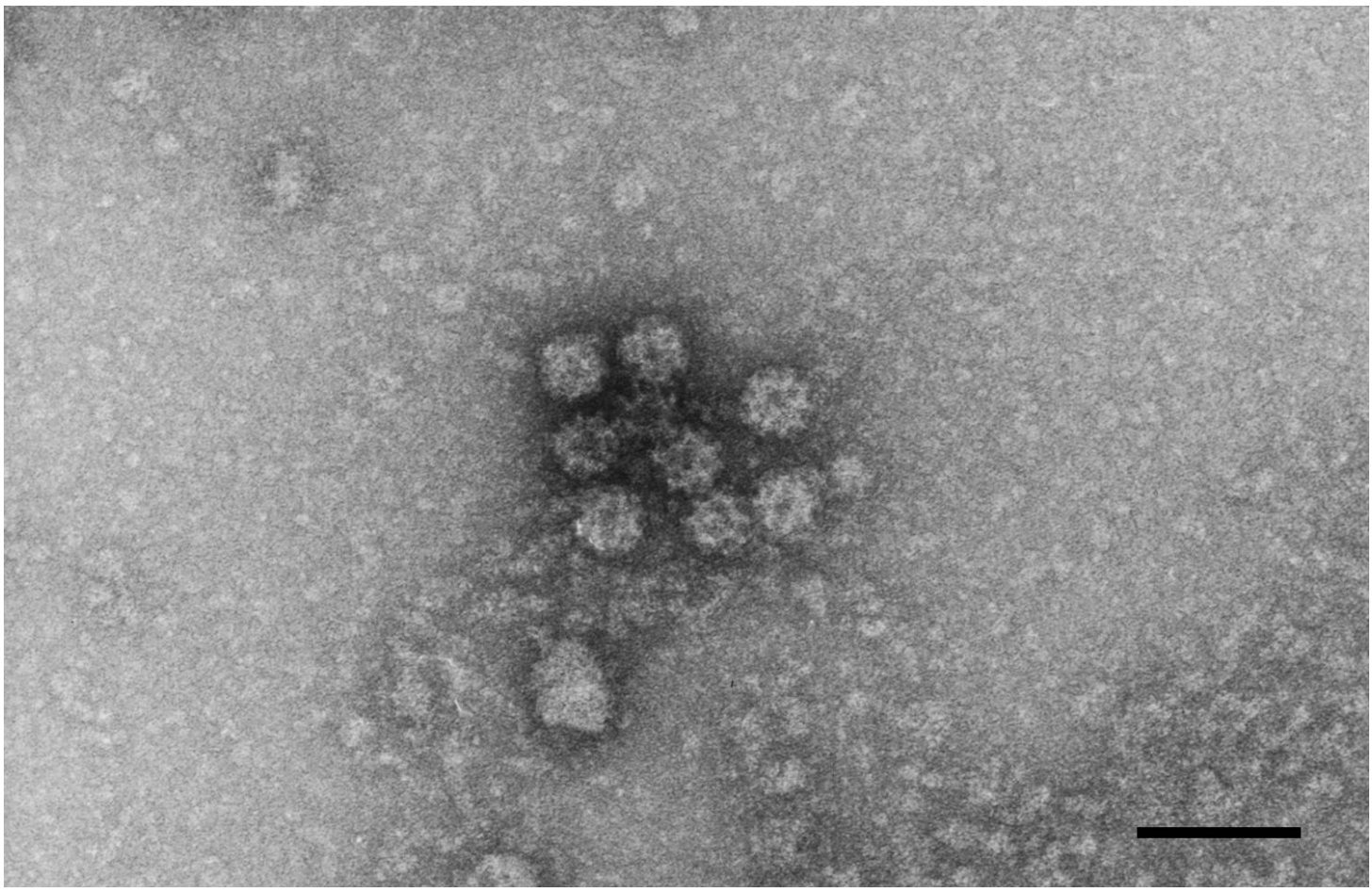
Caliciviridae



Calicivirus from chicken stool. Negative staining.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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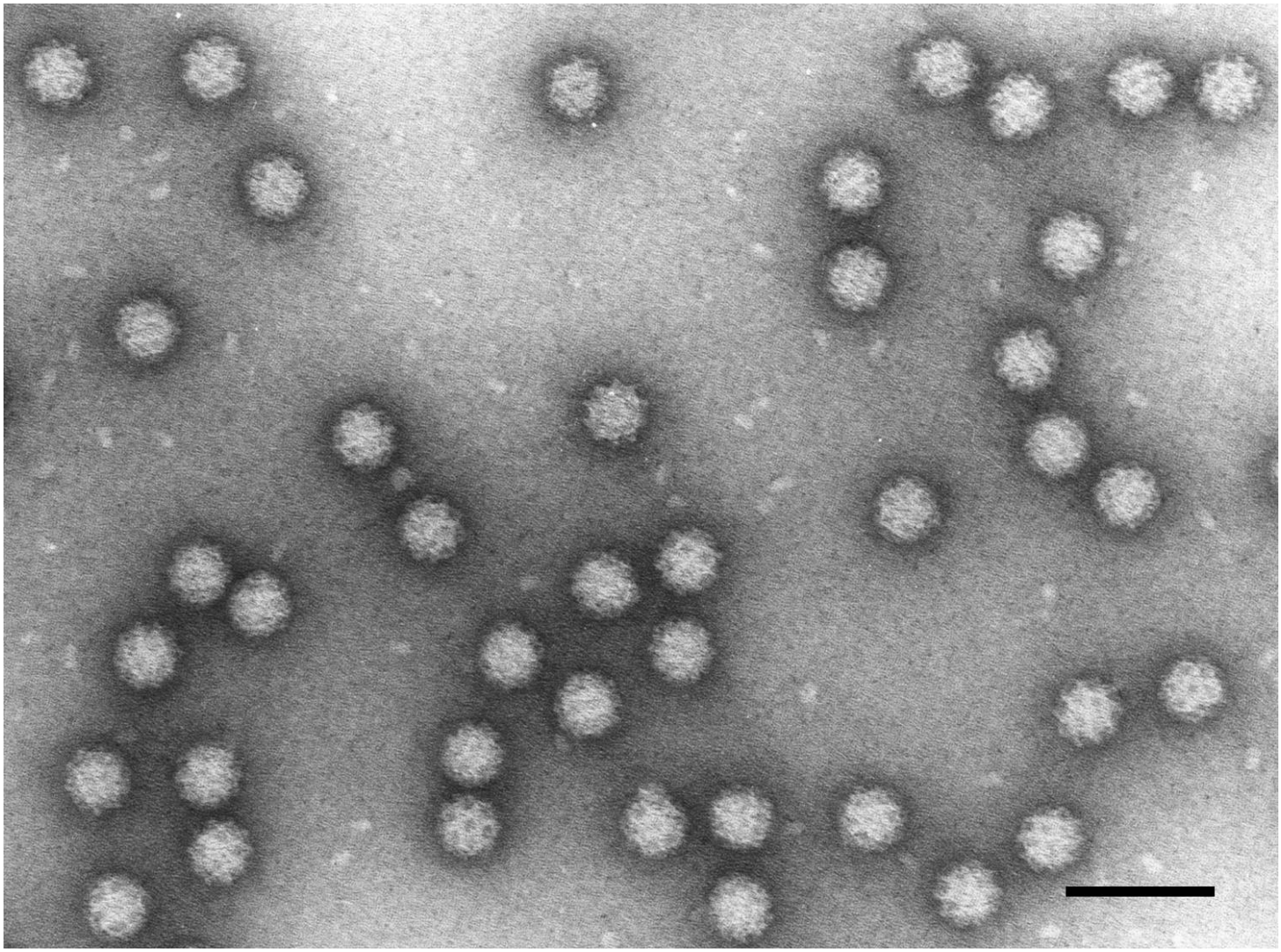
Caliciviridae



Sapovirus. Negative staining

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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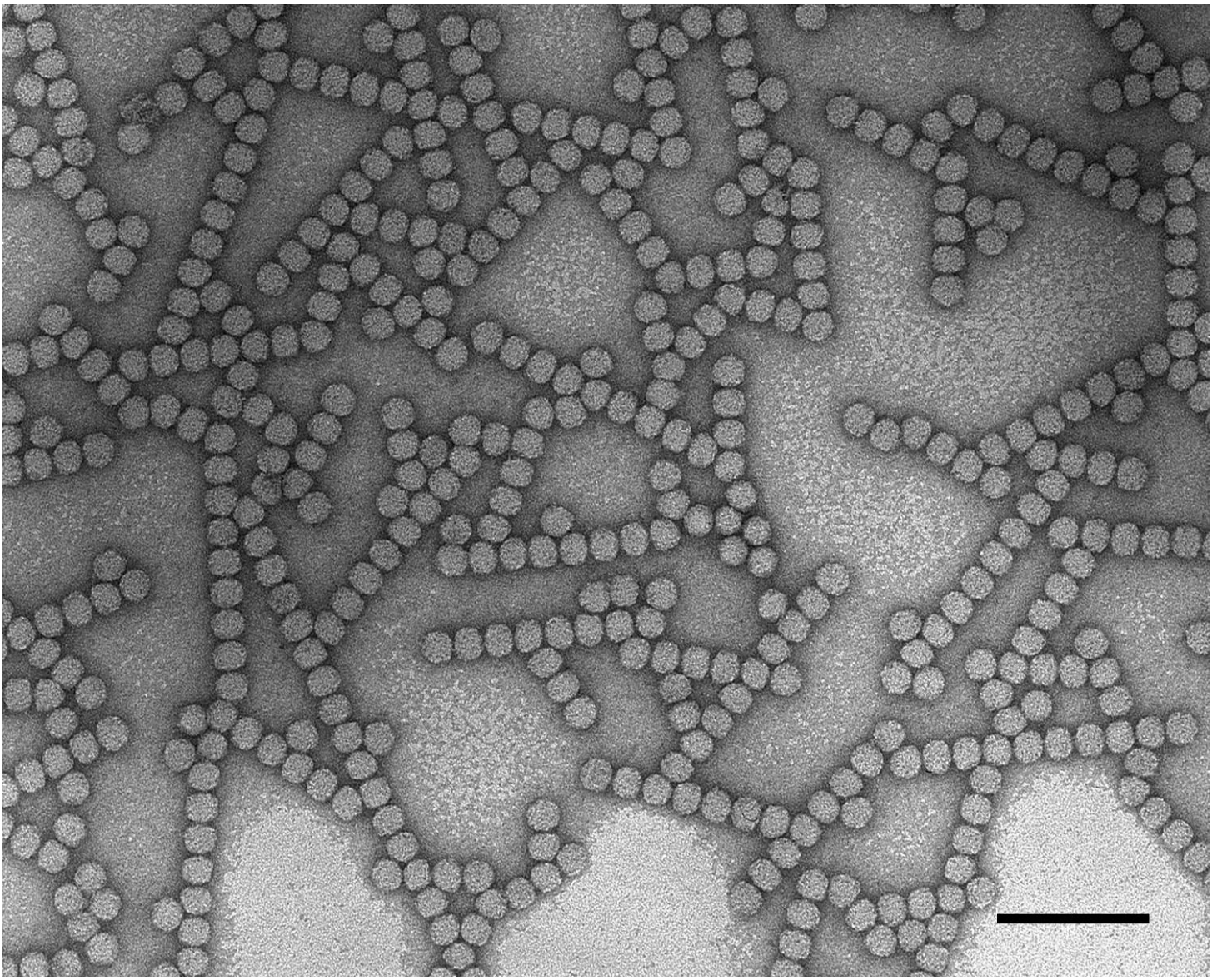
Circoviridae



Porcine circovirus (PCV). Genus: Circovirus. Negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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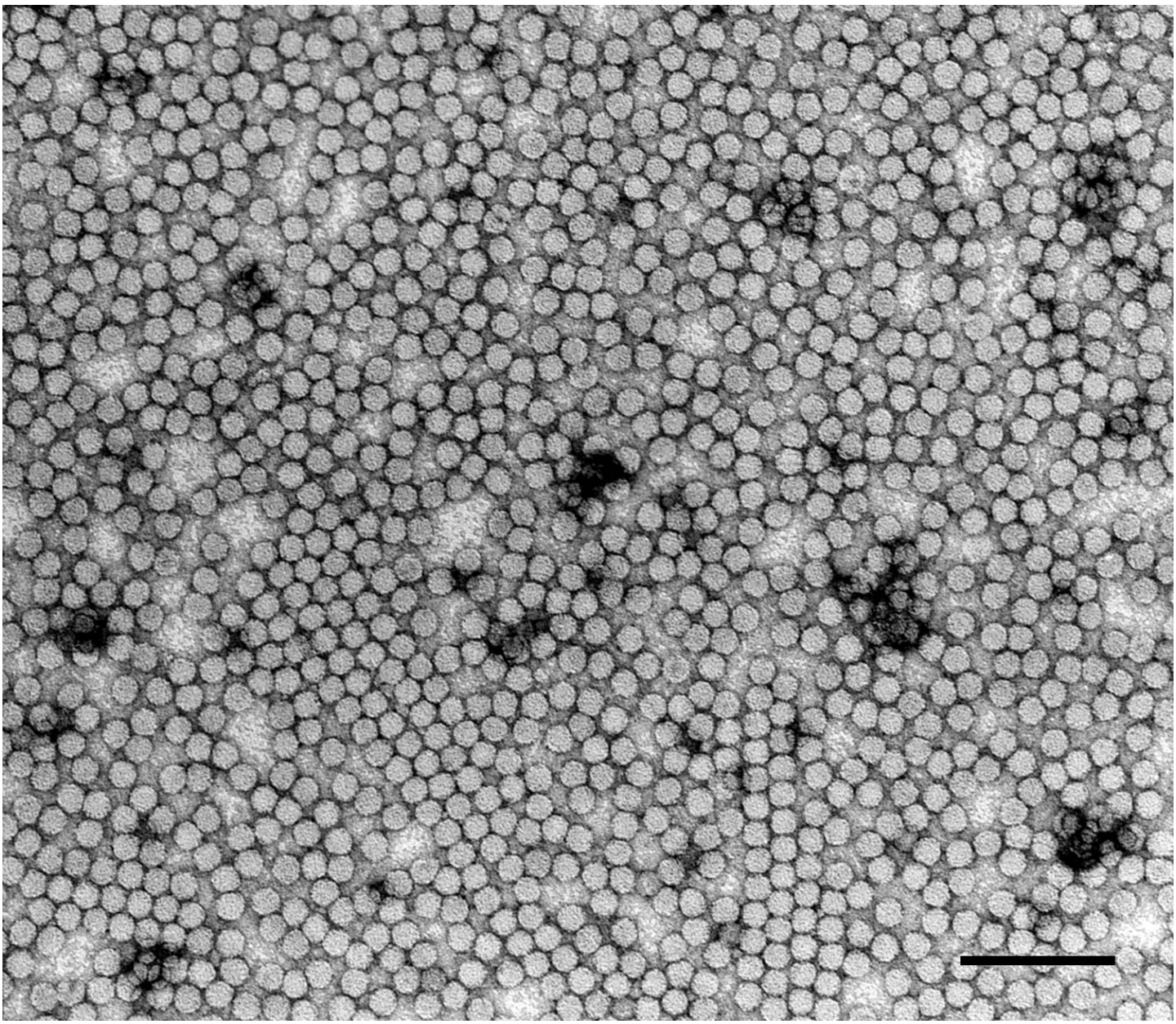
Circoviridae



Porcine circovirus (PCV). Genus: Circovirus. Negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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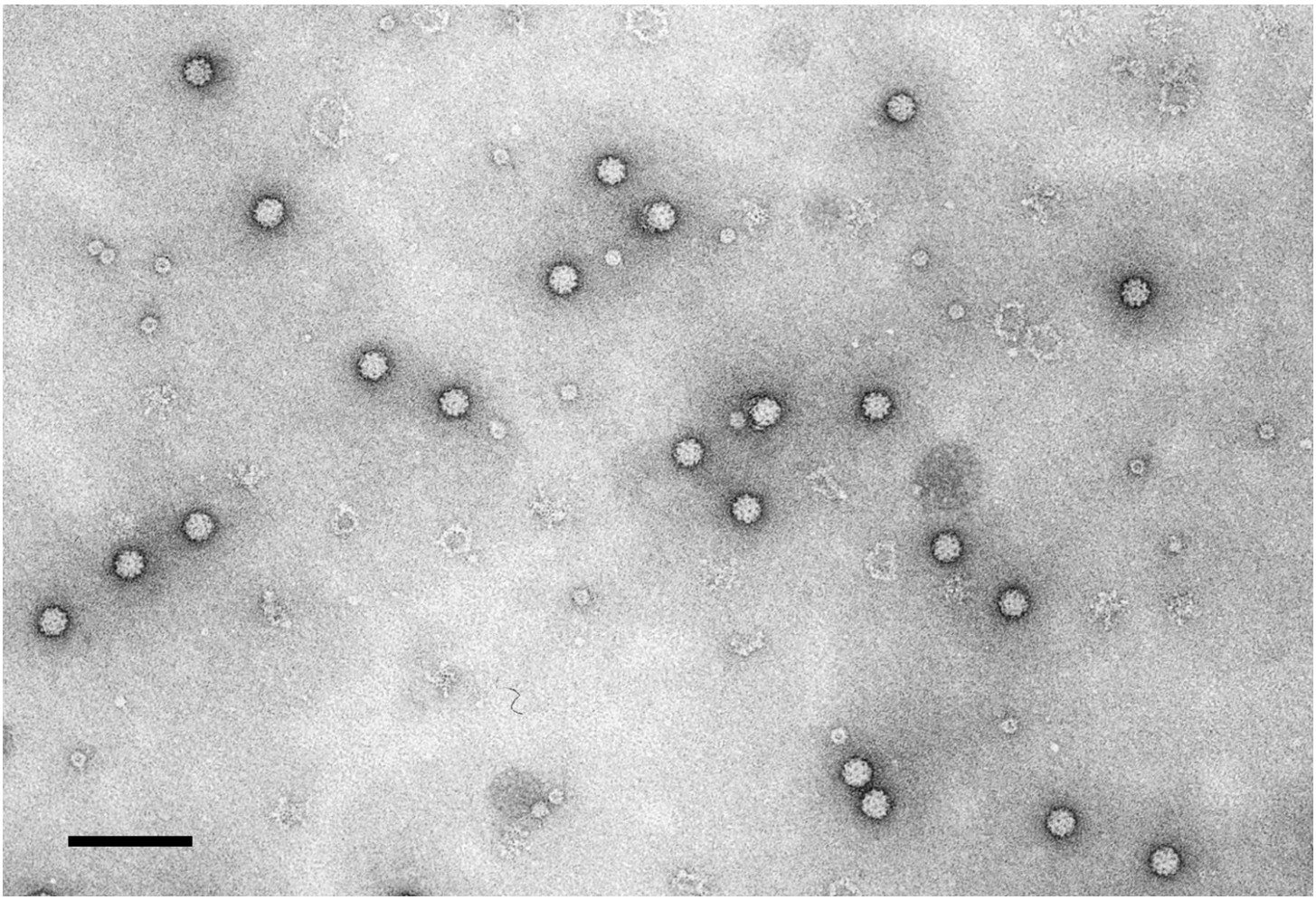
Circoviridae



Chicken anaemia virus (CAV). Genus: Gyrovirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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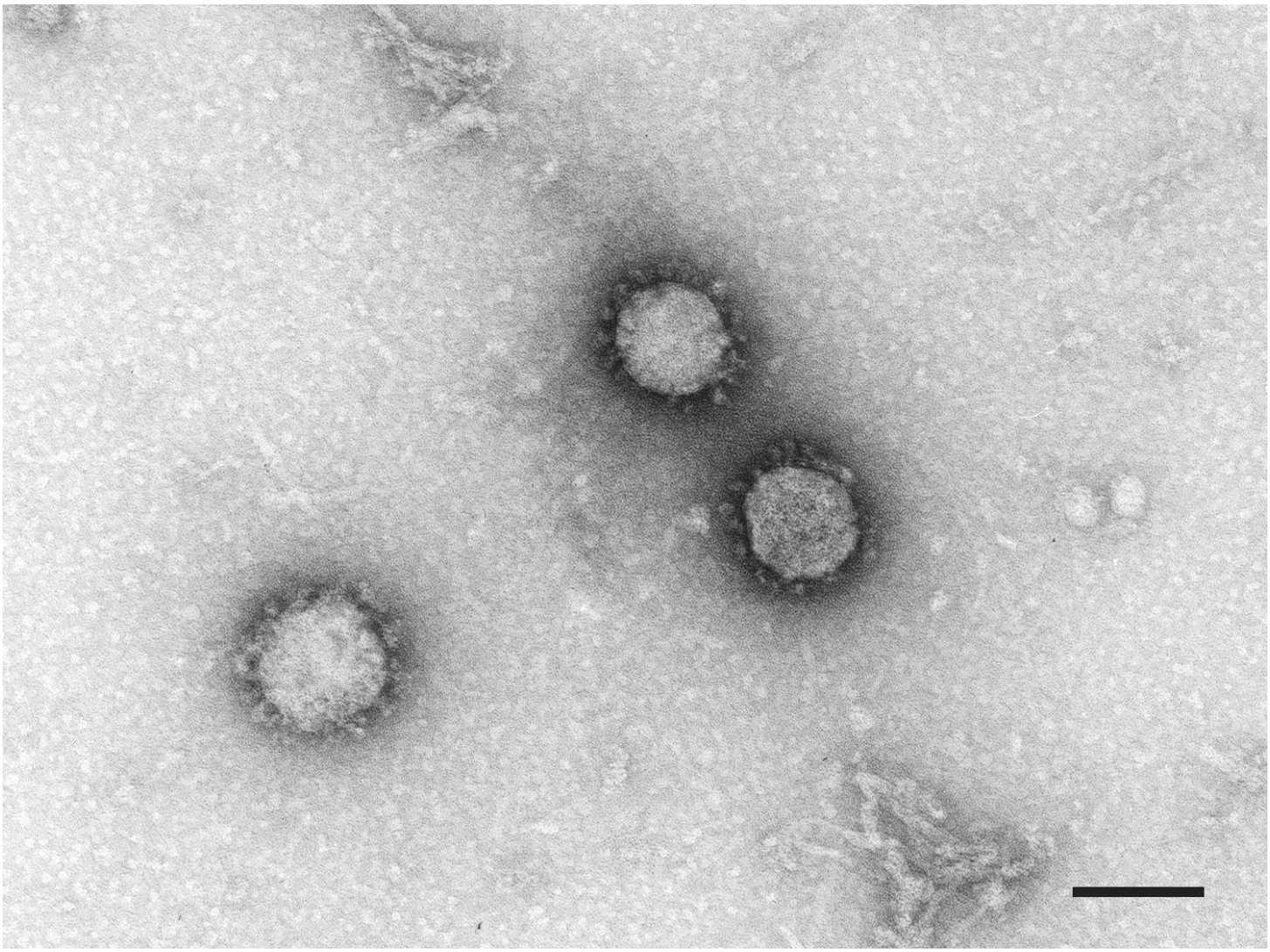
Coronaviridae



Severe acute respiratory syndrome-related coronavirus (SARS-CoV). Genus: Betacoronavirus. Negative staining of a supernatant from a diagnostic cell culture, UA.

Image source: Andrea Männel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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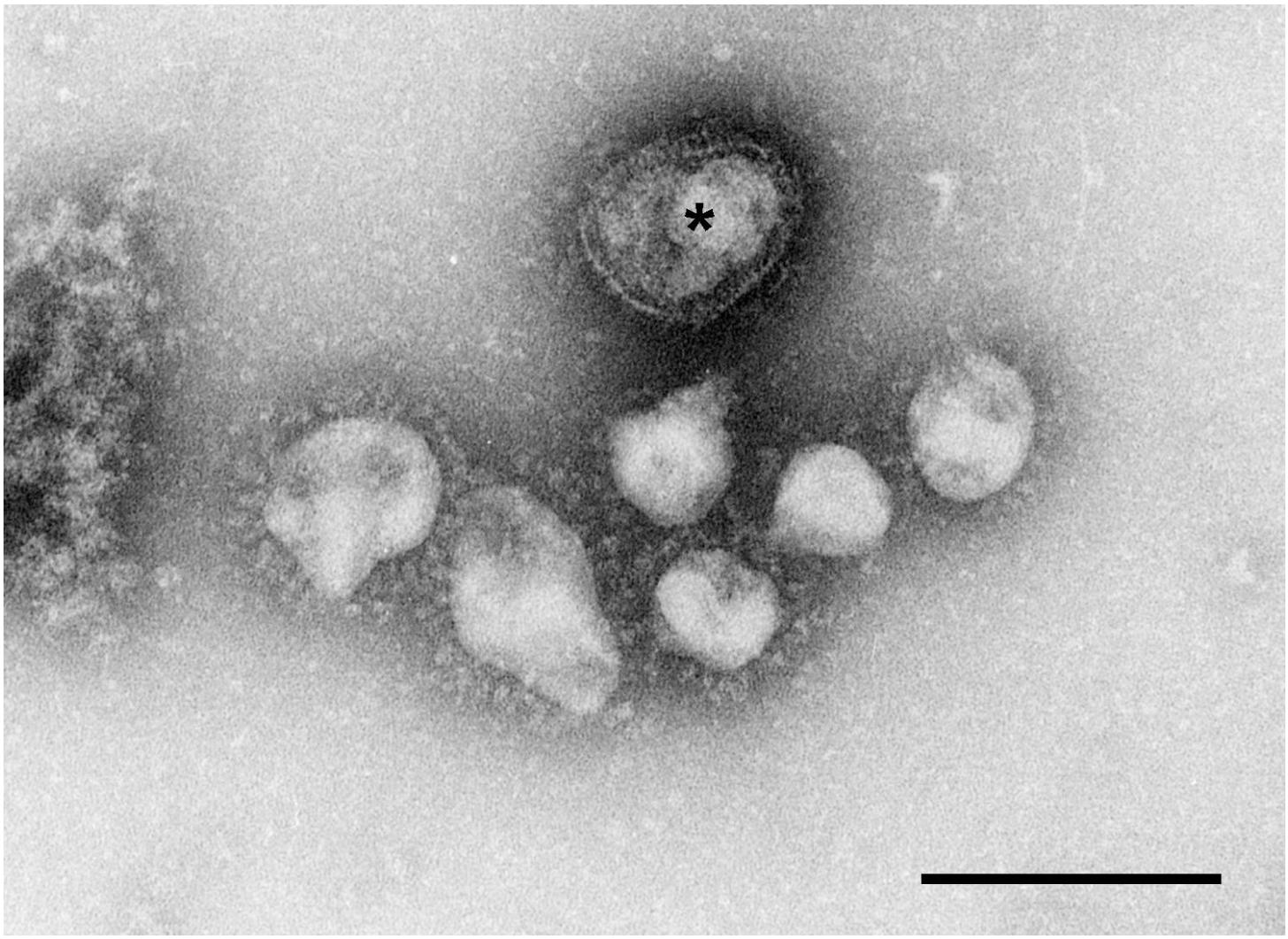
Coronaviridae



Severe acute respiratory syndrome-related coronavirus (SARS-CoV). Genus: Betacoronavirus. Negative staining of cell culture supernatant, PTA. Virus particles could be identified by their typical surface projections (peplomers) while other particles (*) remain unassigned.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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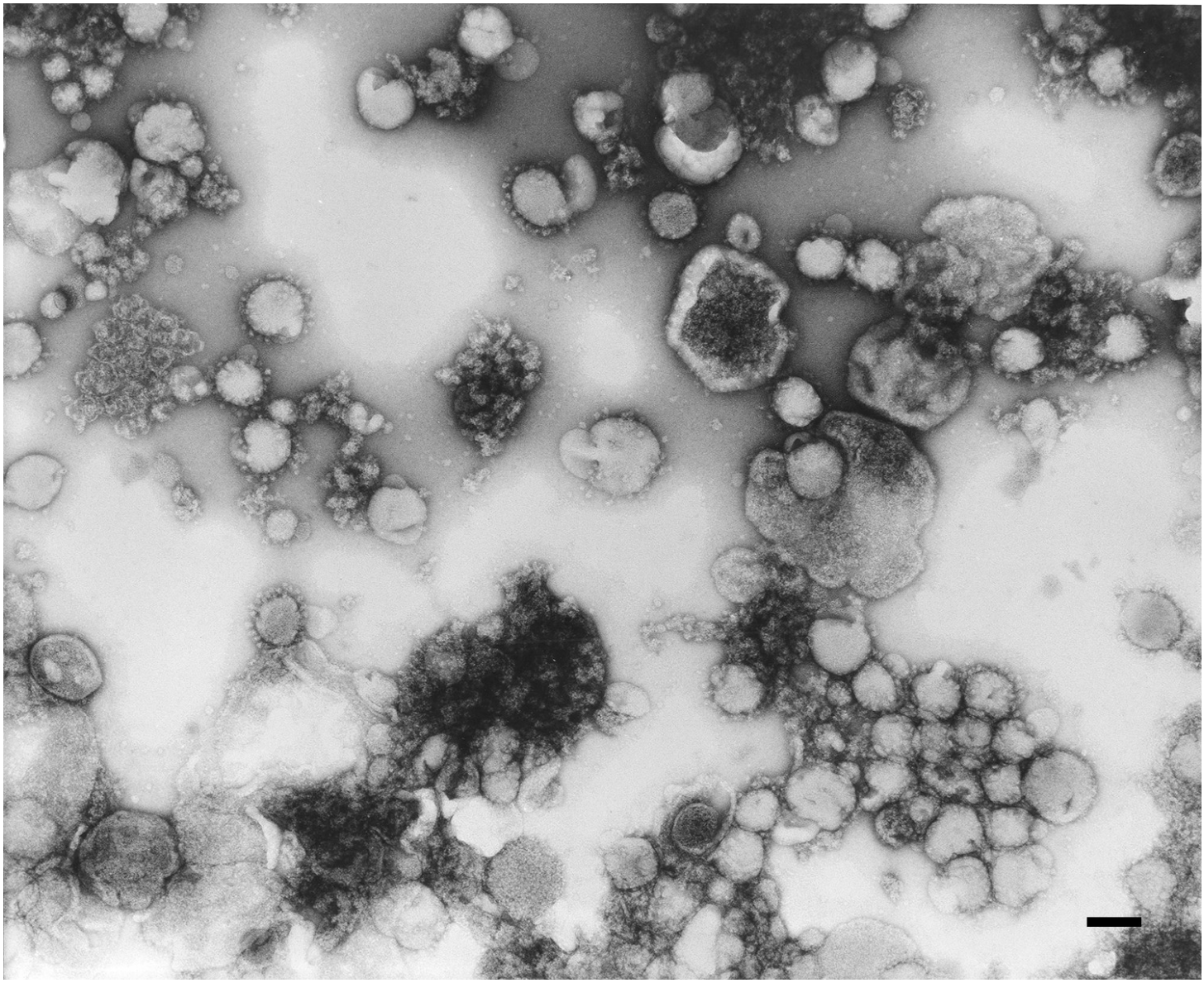
Coronaviridae



Human coronavirus 229E (HCoV 229E). Genus: Alphacoronavirus. Negative staining, UA. Virus particles are intermingled between cell culture debris.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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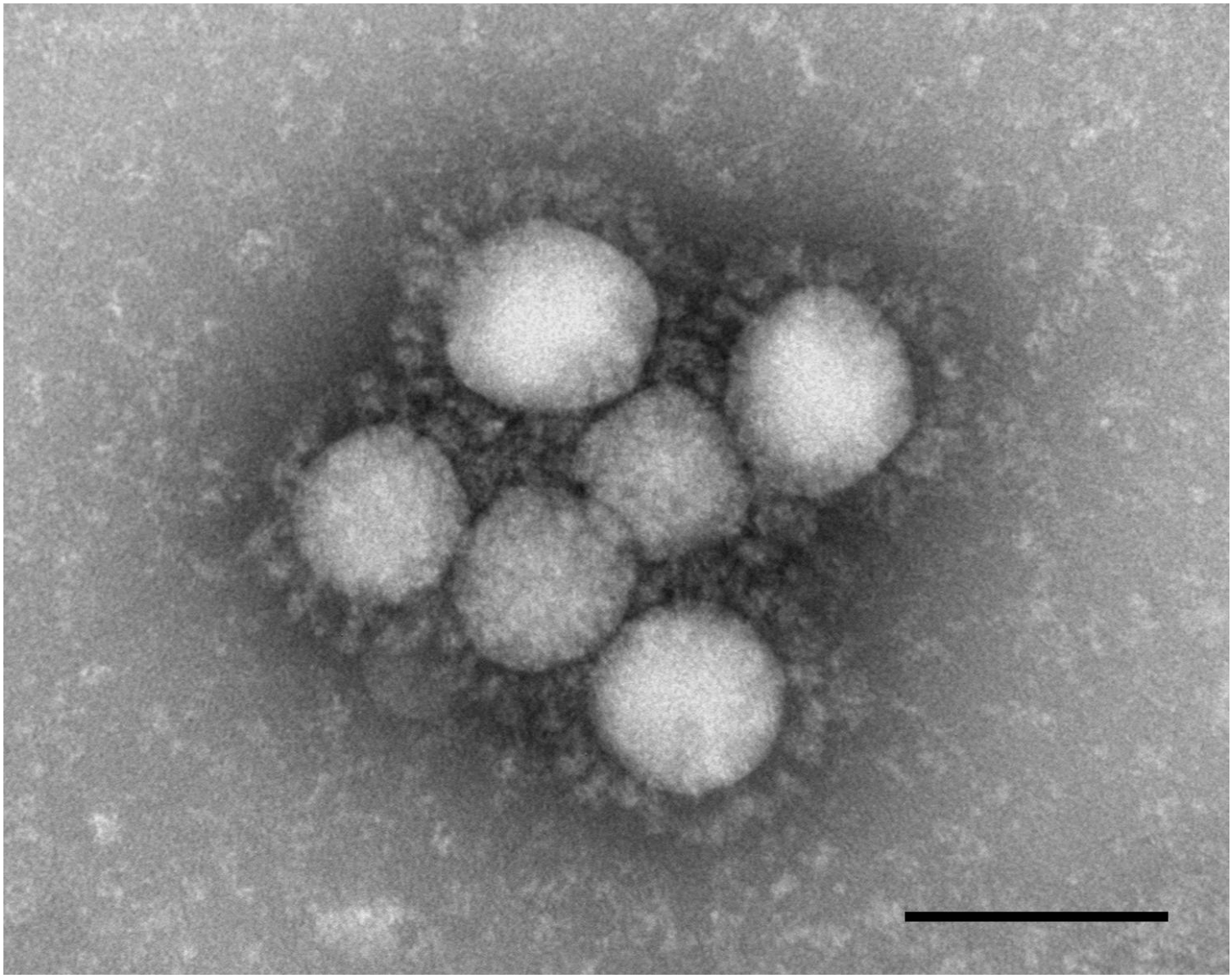
Coronaviridae



Middle East respiratory syndrome-related coronavirus (MERS-CoV). Genus: Betacoronavirus. Negative staining, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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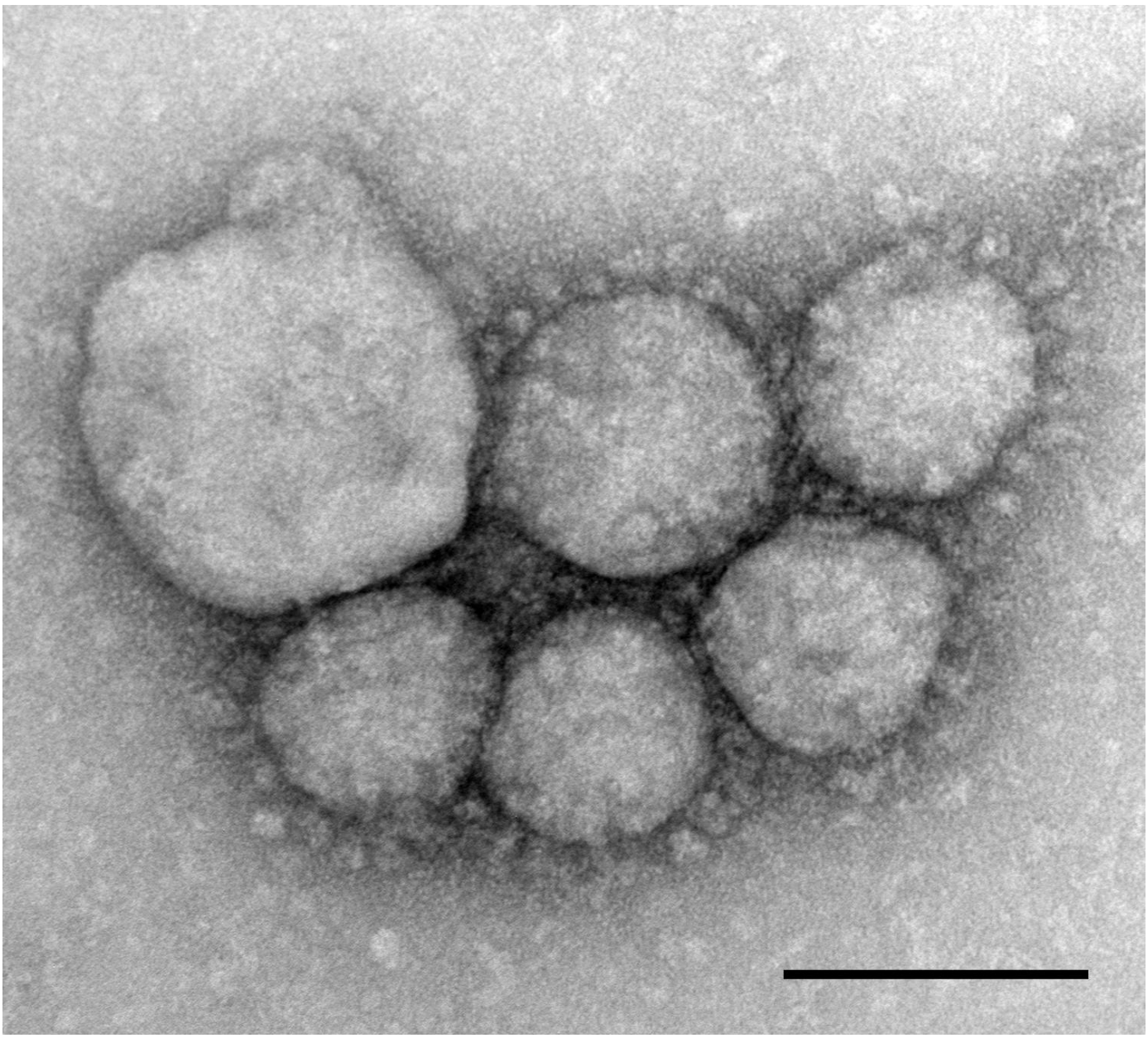
Coronaviridae



Middle East respiratory syndrome-related coronavirus (MERS-CoV). Genus: Betacoronavirus. Negative staining, UA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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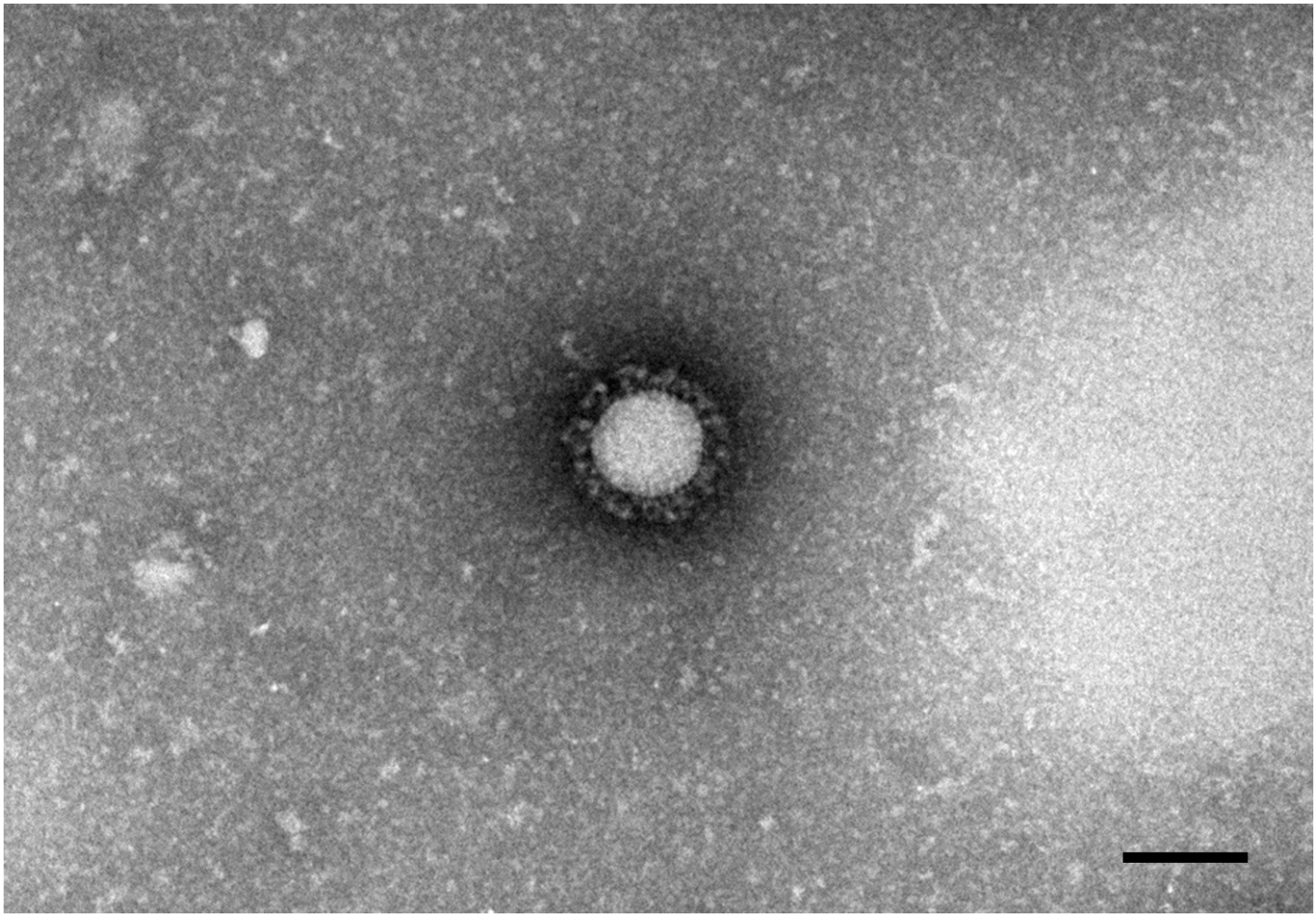
Coronaviridae



Coronavirus from wild boar. Negative staining, PTA.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

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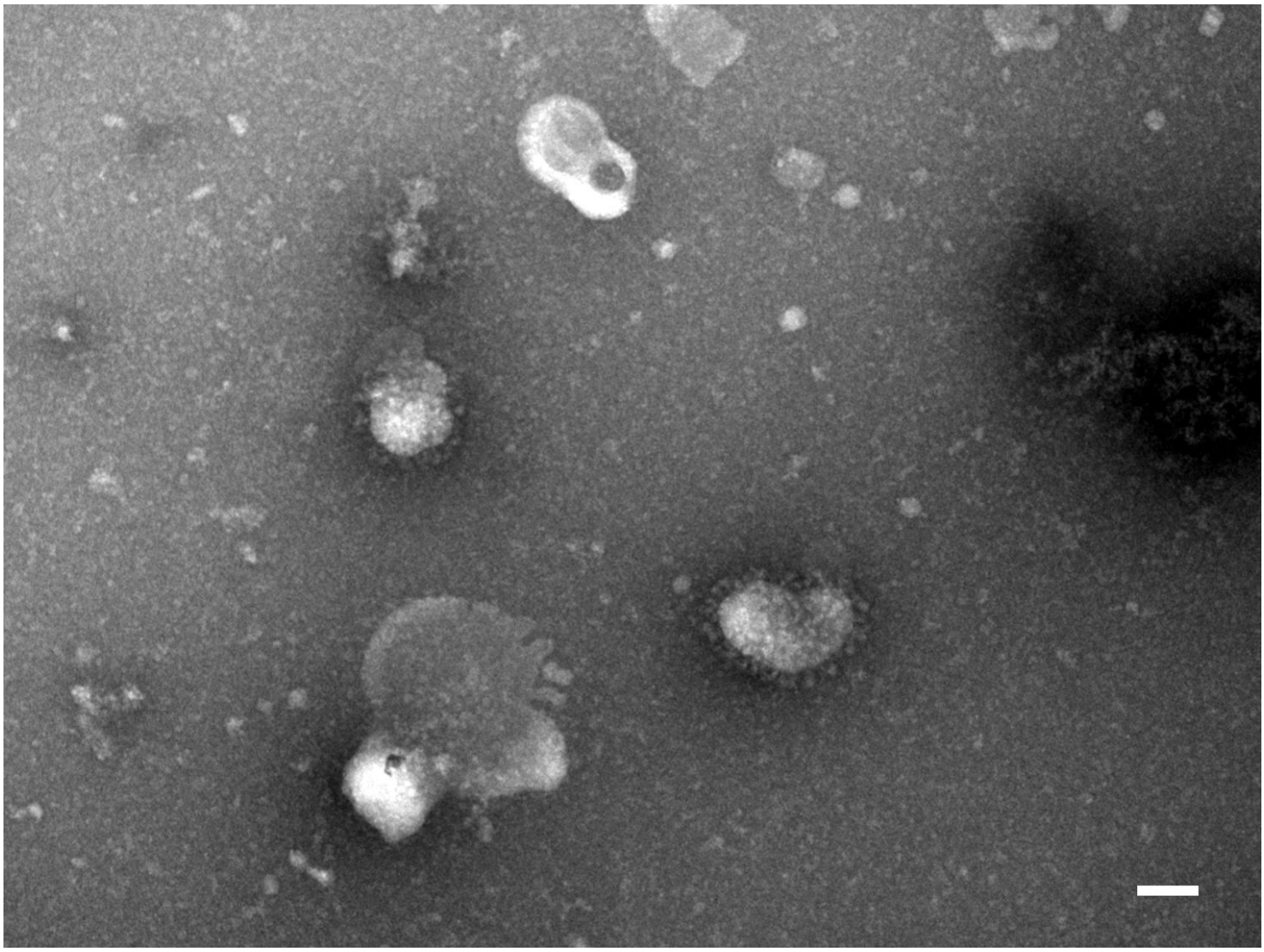
Coronaviridae



Coronavirus from wild boar. Negative staining, PTA. Three particles with distinct surface projections.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

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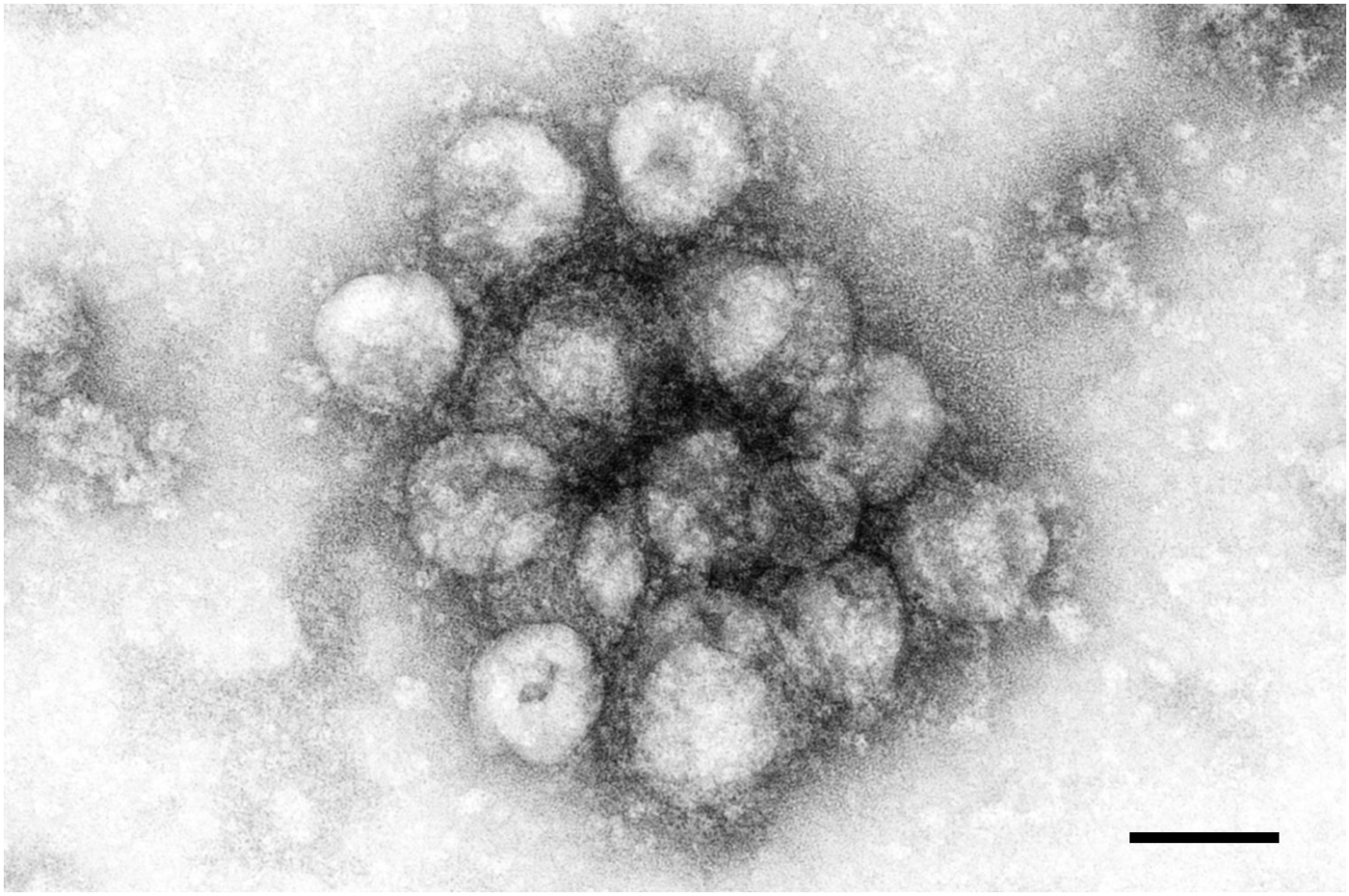
Coronaviridae



Severe acute respiratory syndrome coronavirus (SARS-CoV). Genus: Betacoronavirus. Negative staining, UA.

Image source: Andrea Männel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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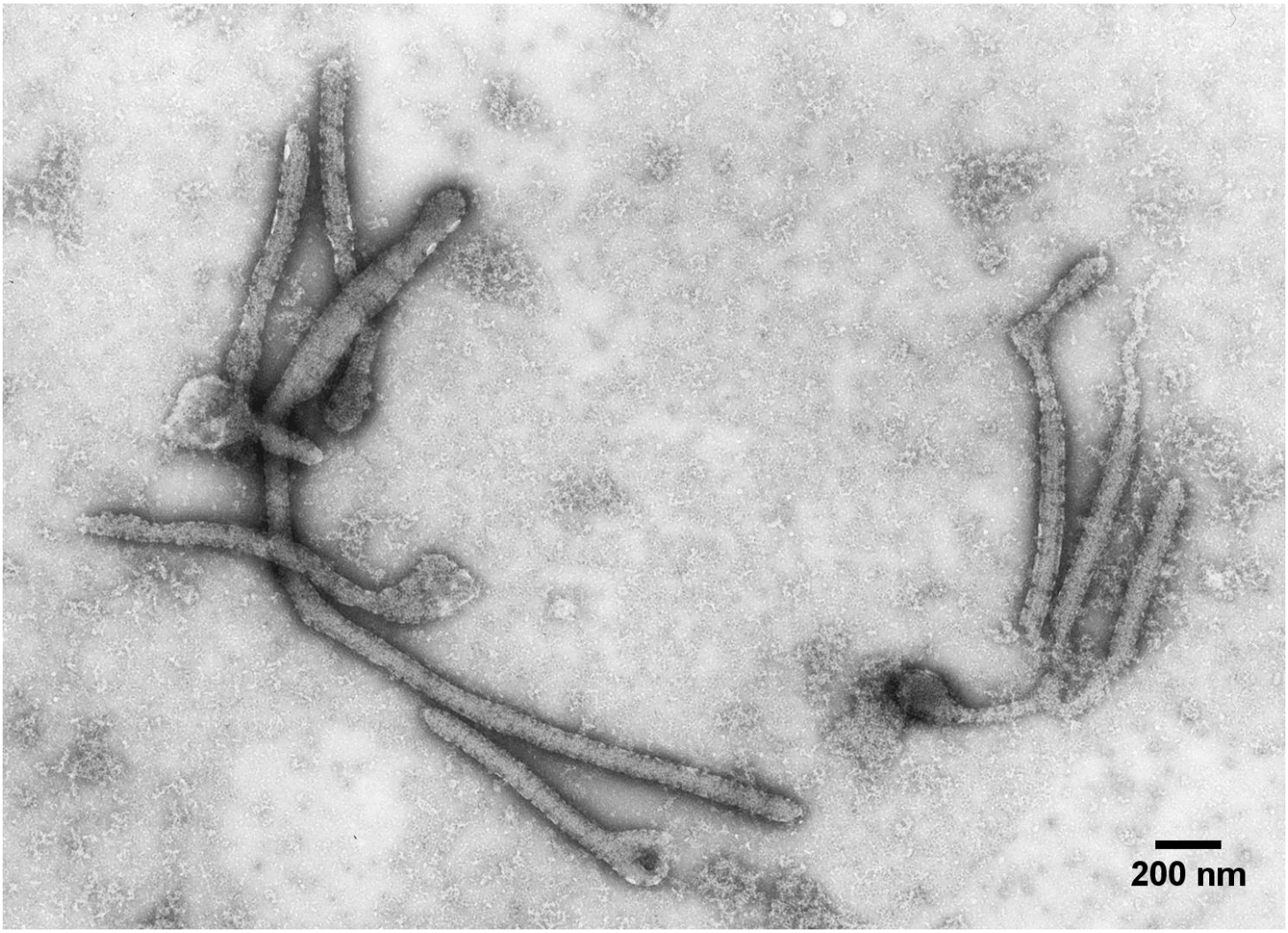
Filoviridae



Zaire ebolavirus (EBOV). Genus: Ebolavirus. Negative staining of viruses from cell culture, PTA. Virus particles possess a variable length and some of them show the typical hook-like or loop-like endings.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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Filoviridae

Zaire ebolavirus (EBOV). Genus: Ebolavirus. Negative staining of viruses from cell culture, UA. The core is visible as parallel stripes that are running along the filament length axis.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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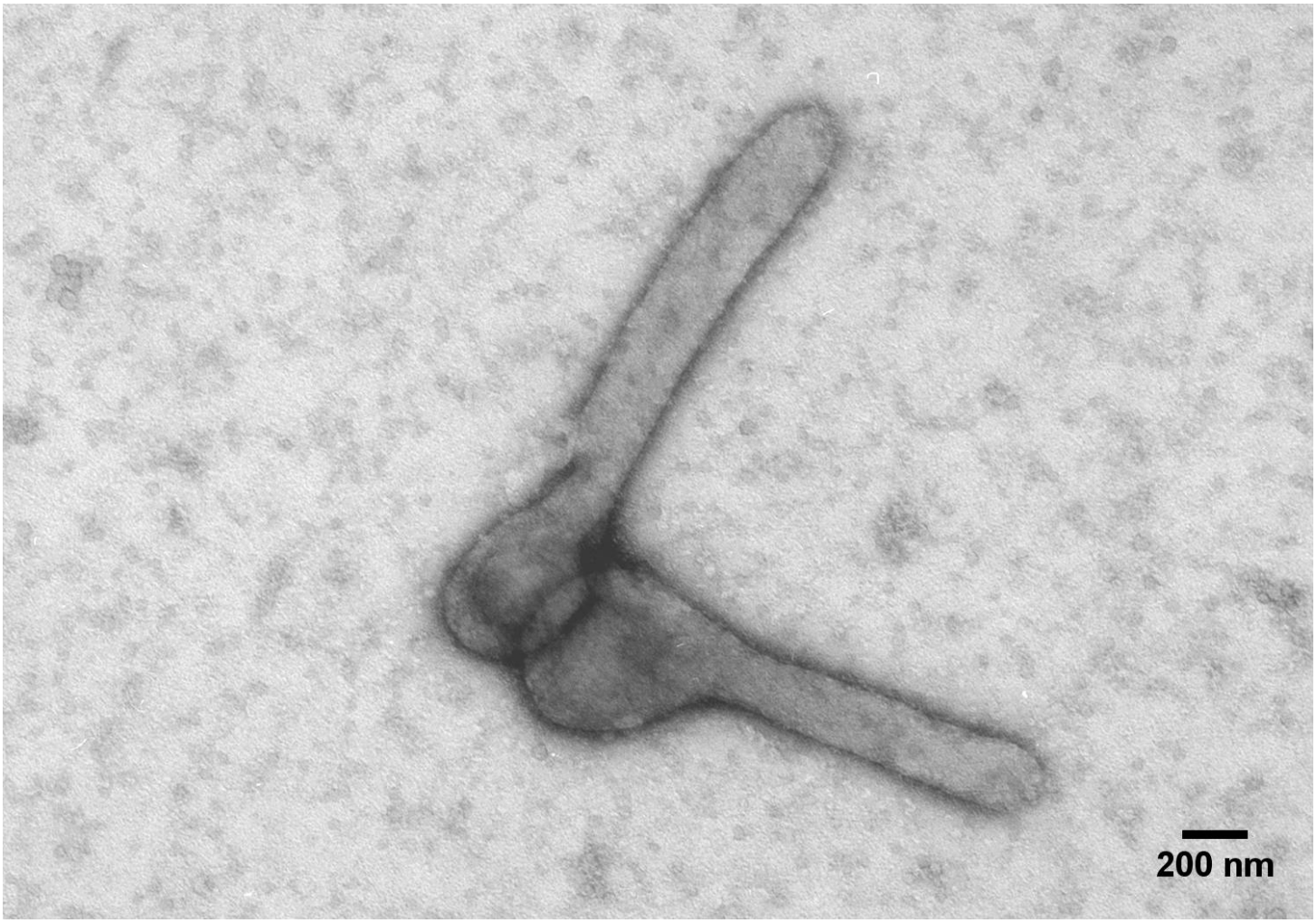
Filoviridae



Lake Victoria marburgvirus (MARV); Genus: Marburgvirus. Negative staining of viruses from cell culture, UA. Particles show the typical hook-like loops at one end of the filamentous particle.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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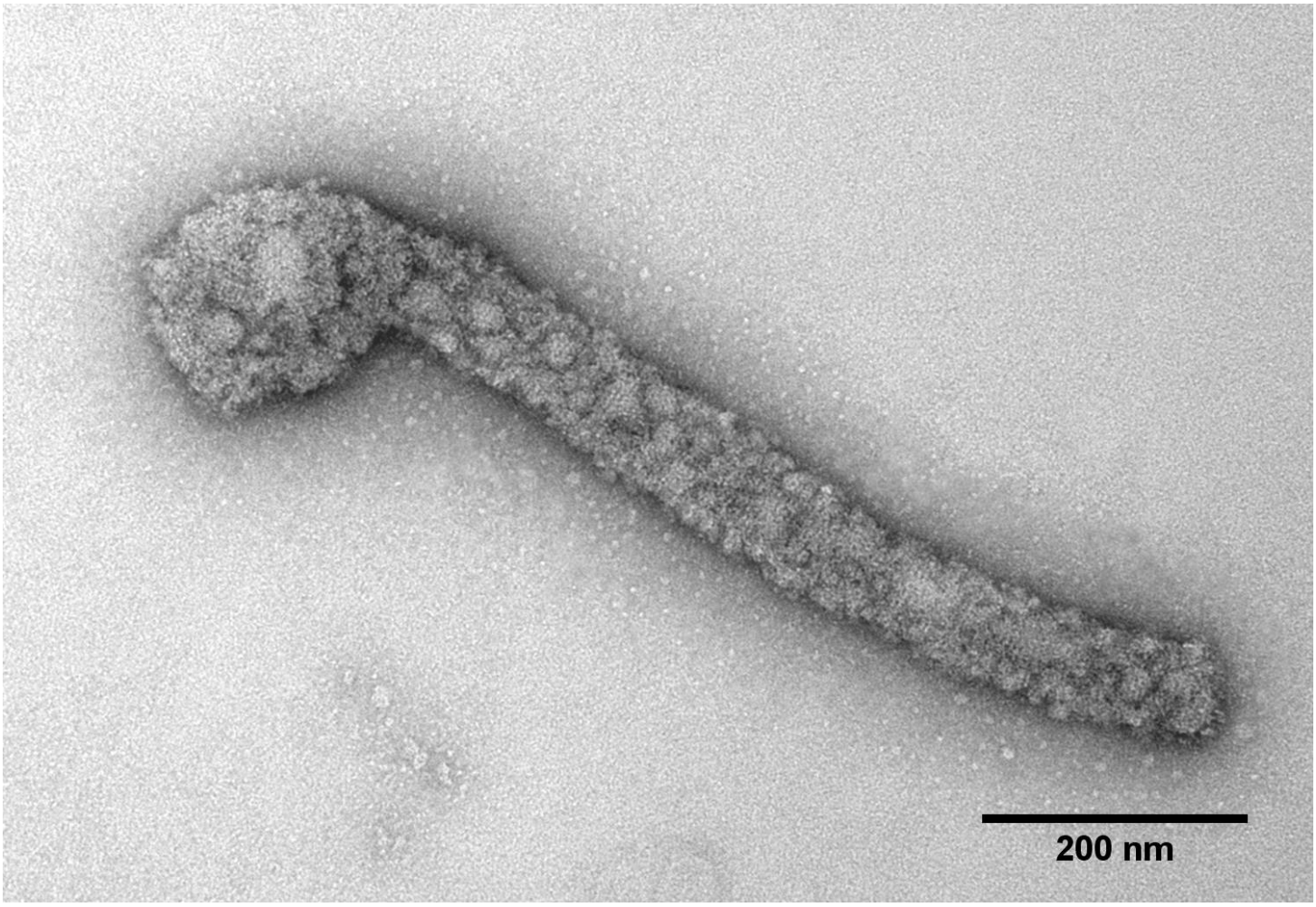
Filoviridae



Lake Victoria marburgvirus-like particle (MARV-VLP); Genus: Marburgvirus. Negative staining, UA. The particle shows the typical hook-like ending at one side.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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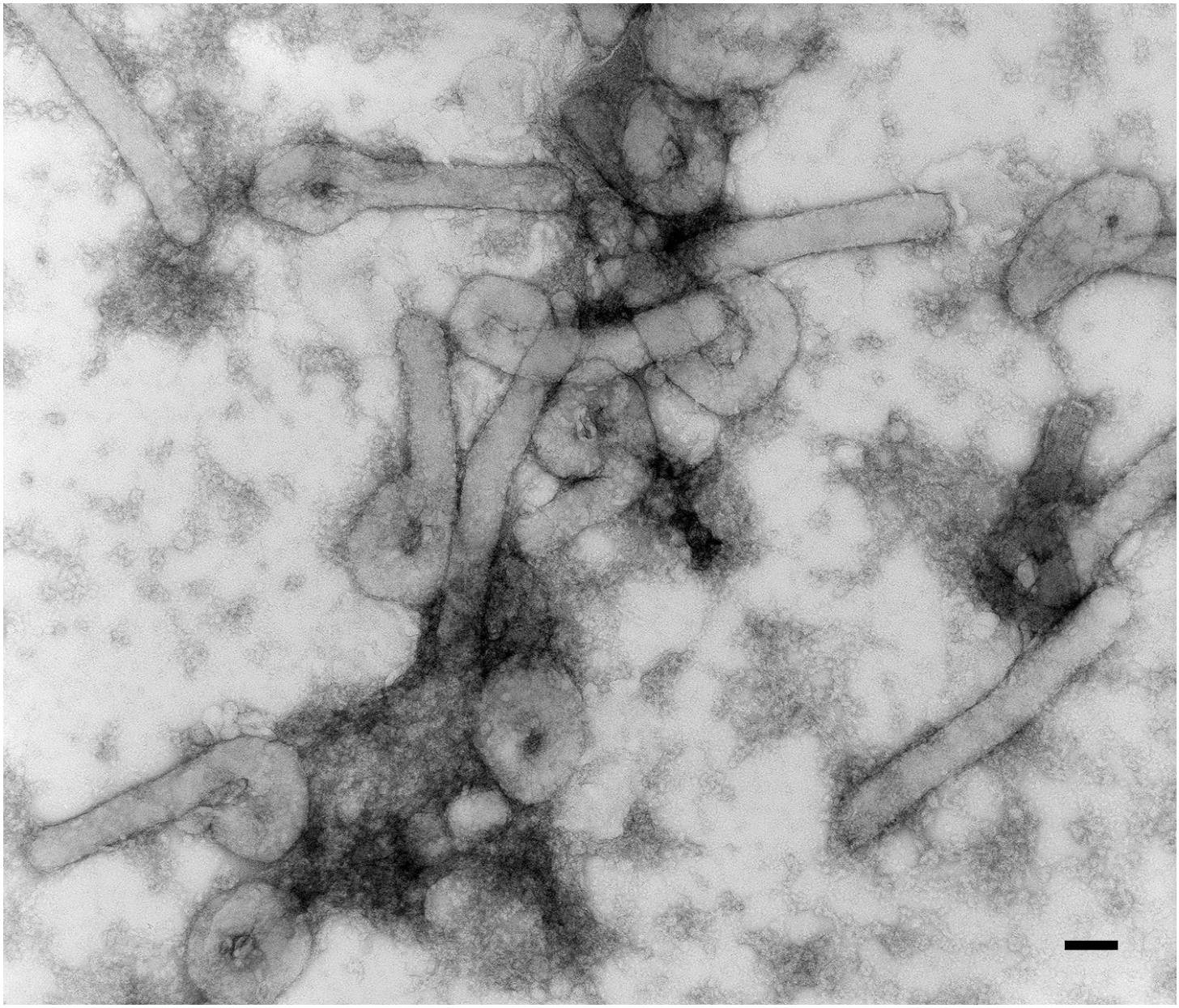
Filoviridae



Lake Victoria marburgvirus (MARV). Genus: Marburgvirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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Filoviridae

Lake Victoria marburgvirus (MARV). Genus: Marburgvirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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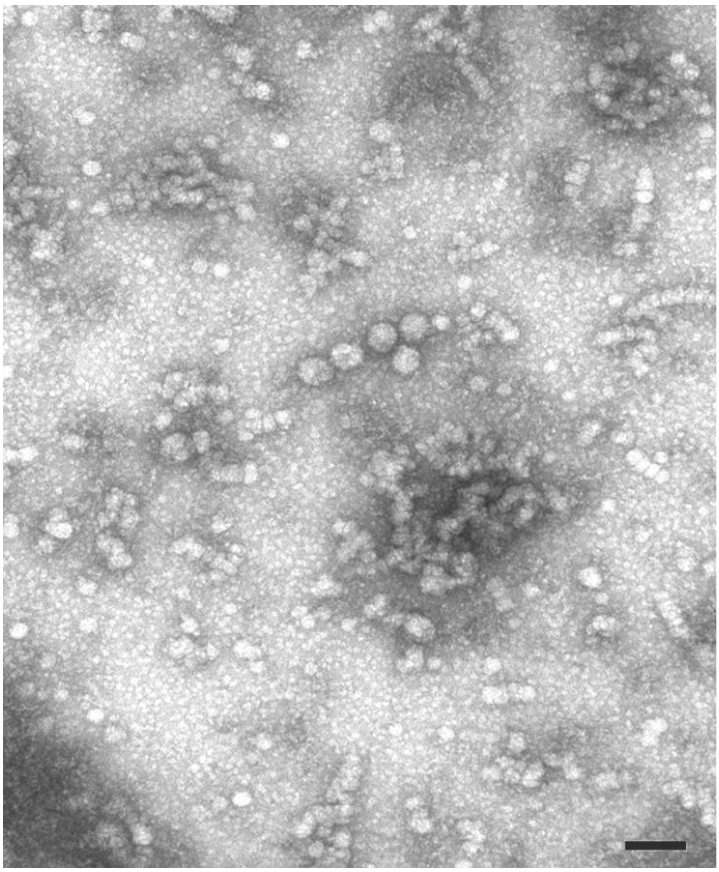
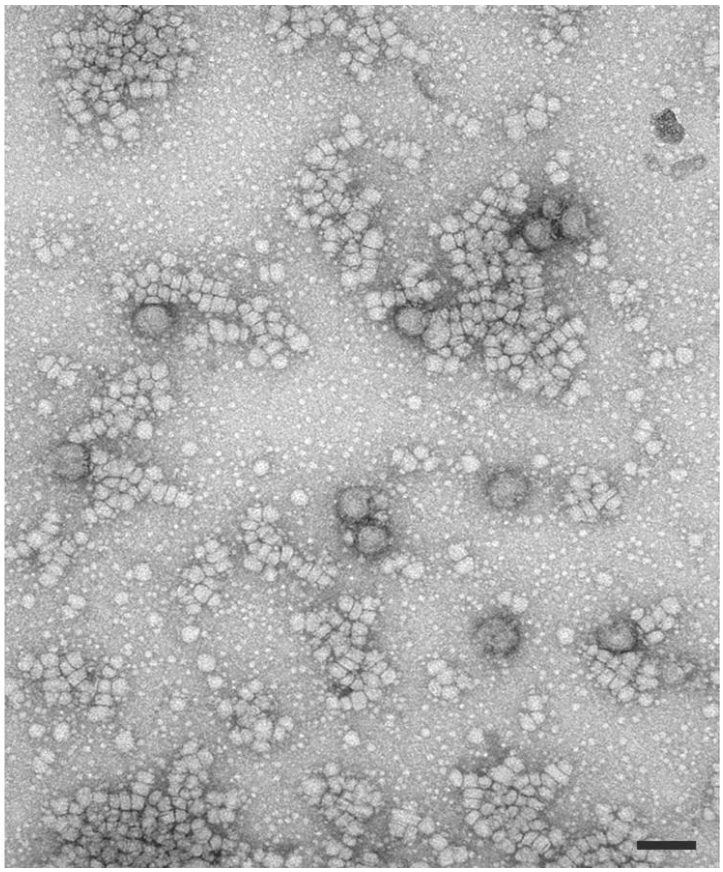
Flaviviridae





Tick-borne encephalitis virus (TBEV). Genus: Flavivirus. Comparison of different negative stains. Left: UA. Right: PTA. Staining with PTA highlights virus particles among the stacked lipid discs which are background from the cell culture.

Image source: Lars Möller & Michael Laue, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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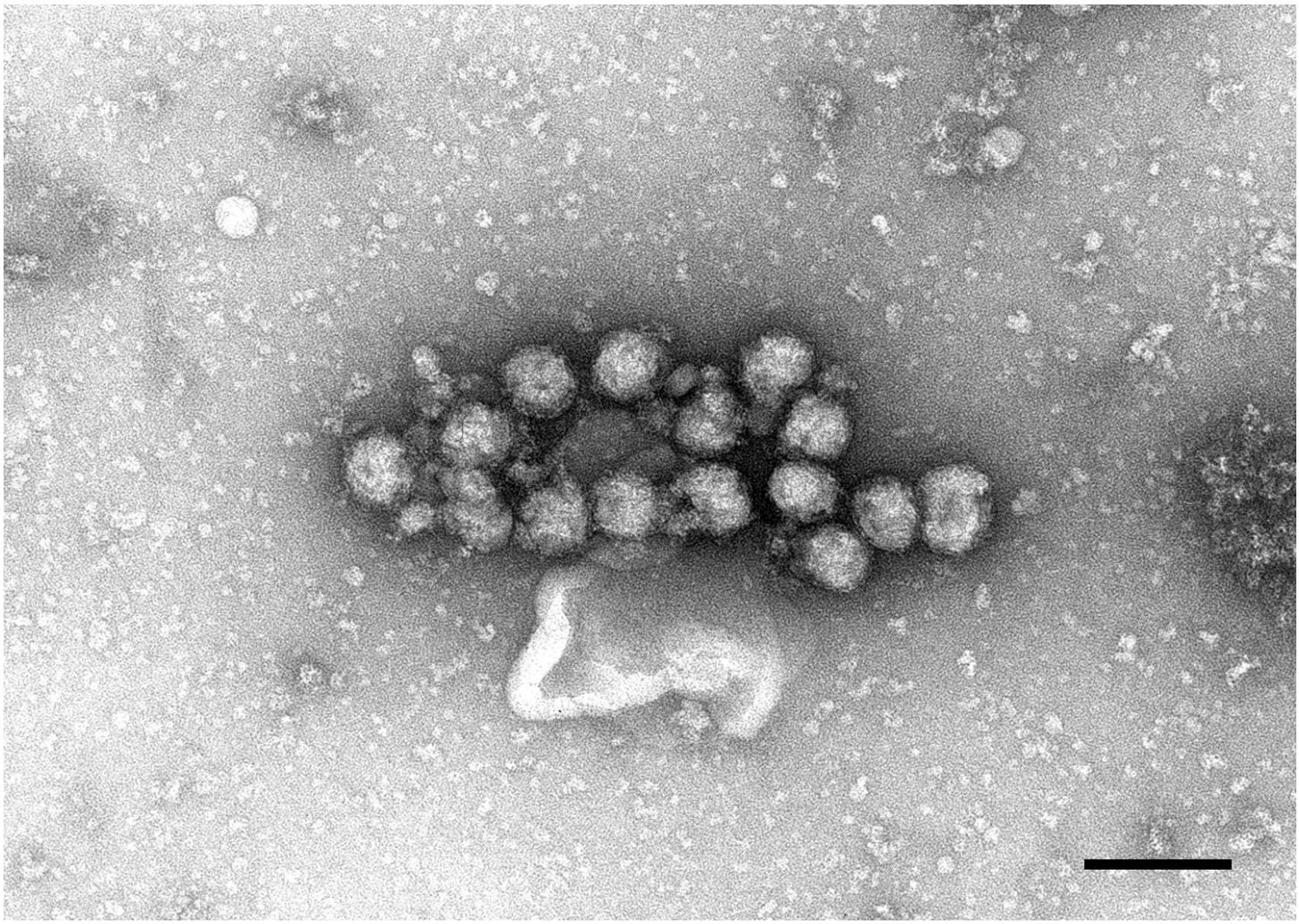
Flaviviridae



West Nile virus (WNV). Genus: Flavivirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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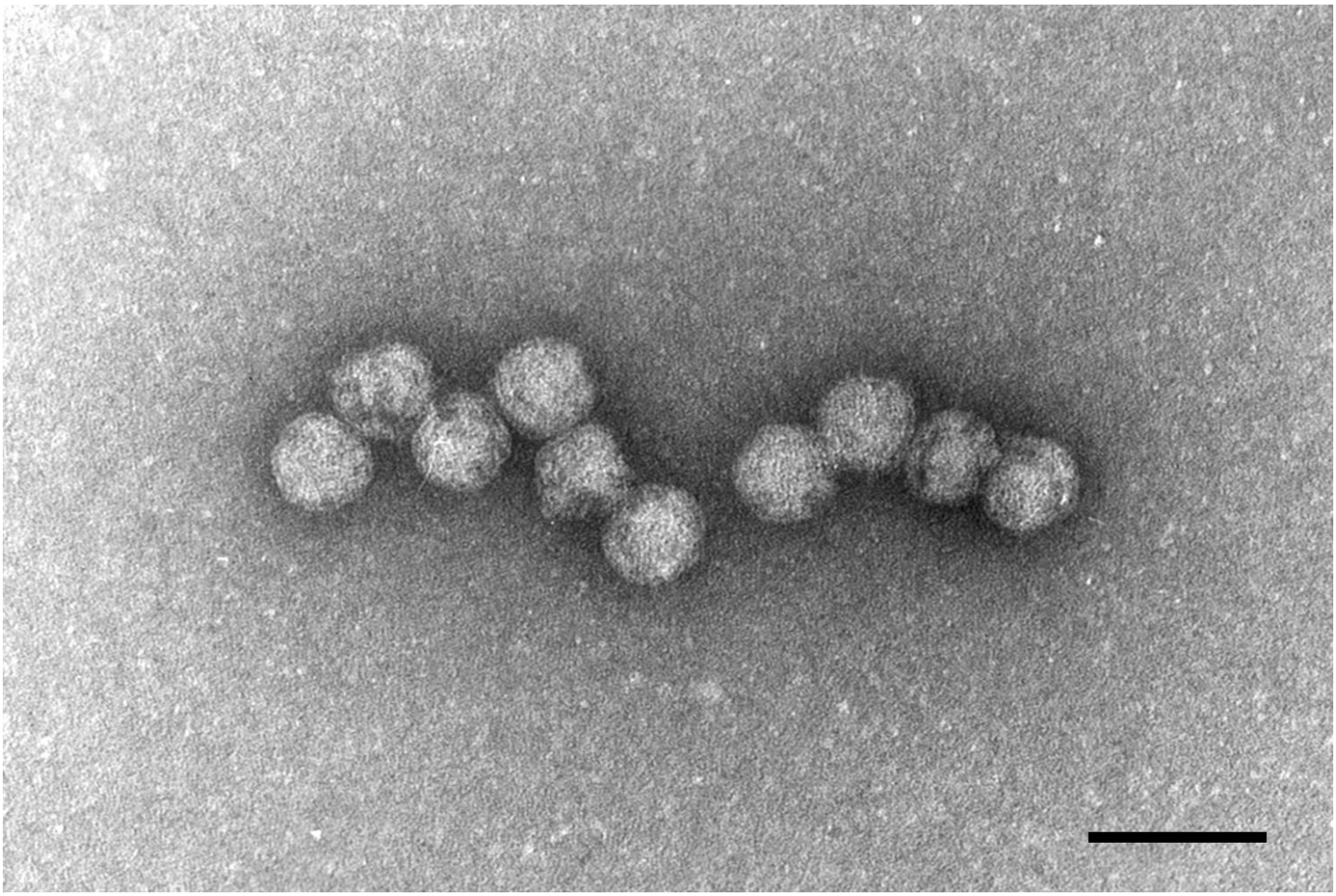
Flaviviridae



Tick-borne encephalitis virus (TBEV). Genus: Flavivirus. Negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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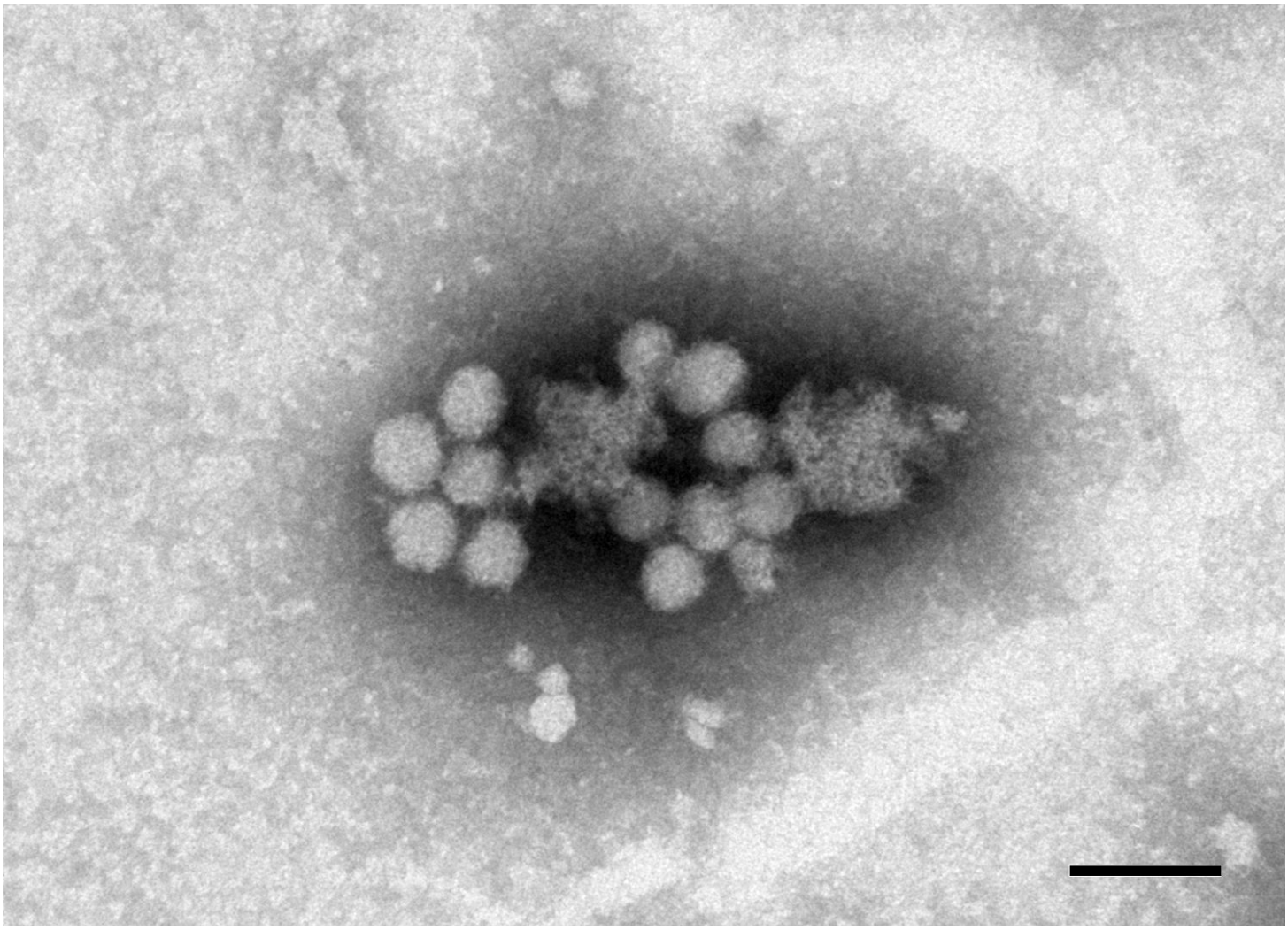
Flaviviridae



Portugal mosquito flavivirus Marim (PoMoFlav Marim). Genus: (unclassified) Flavivirus. Negative staining, PTA.

Image source: Janett Piesker, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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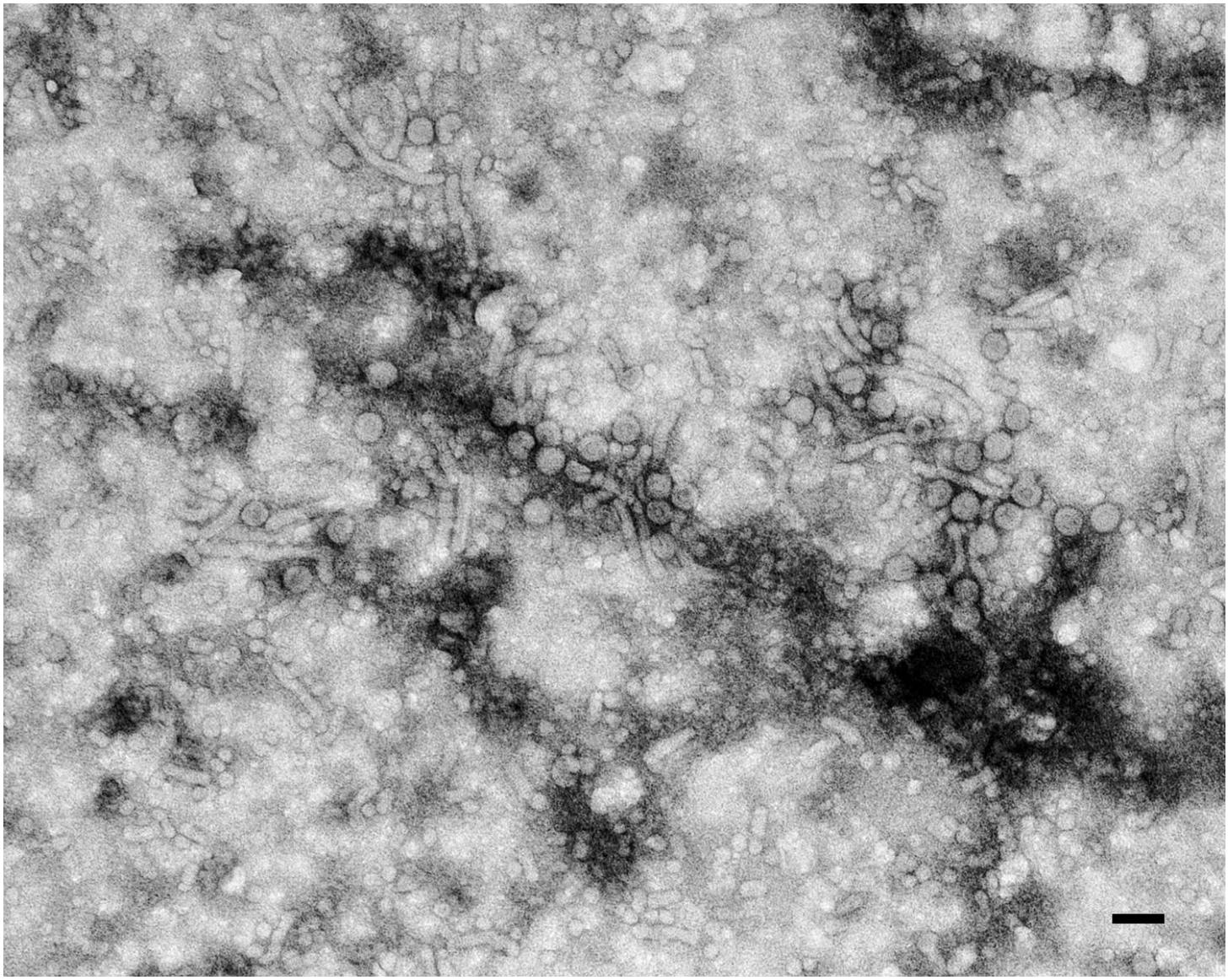
Hepadnaviridae



Hepatitis-B virus (HBV). Genus: Orthohepadnavirus. Immunoaggregation. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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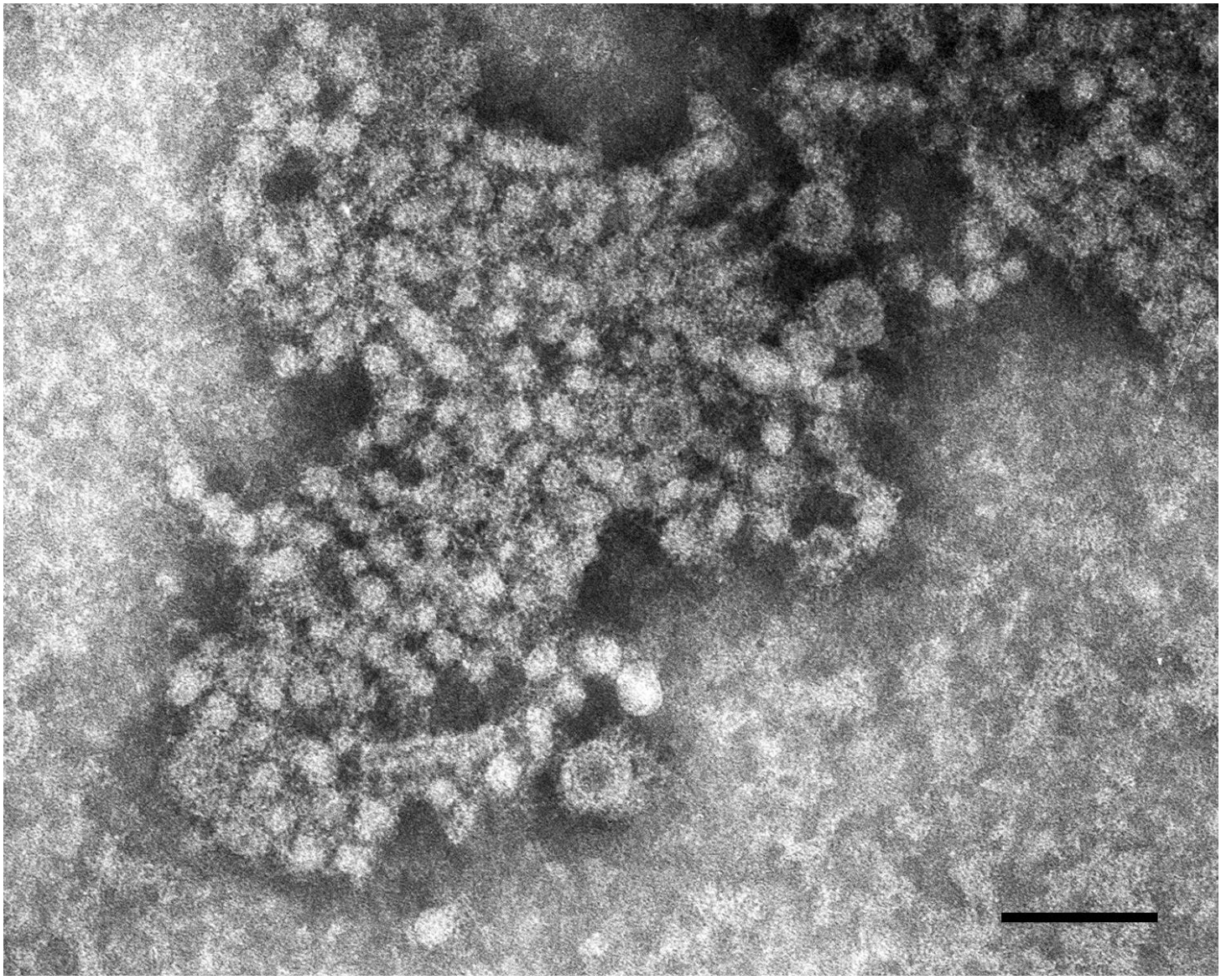
Hepadnaviridae



Hepatitis-B virus (HBV). Genus: Orthohepadnavirus. Immunoaggregation. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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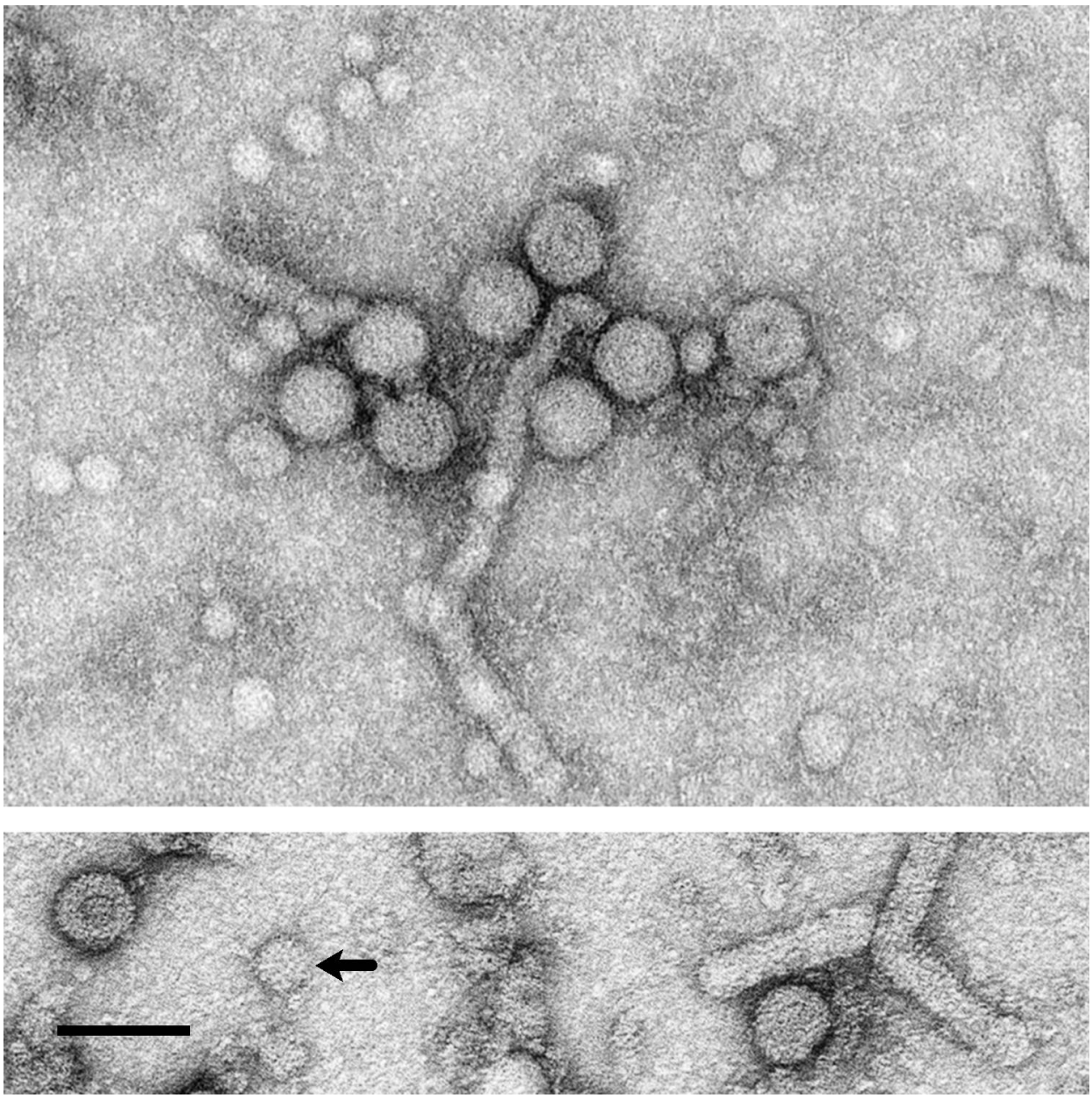
Hepadnaviridae



Hepatitis-B virus (HBV). Genus: Orthohepadnavirus. Negative staining, UA. Typical particle` forms found in cell culture supernatants. The upper image shows round infectious particles ("Dane-particles") and tubular forms (about 17-22 nm in width) while the lower image additionally shows a smaller spherical particle (arrow).

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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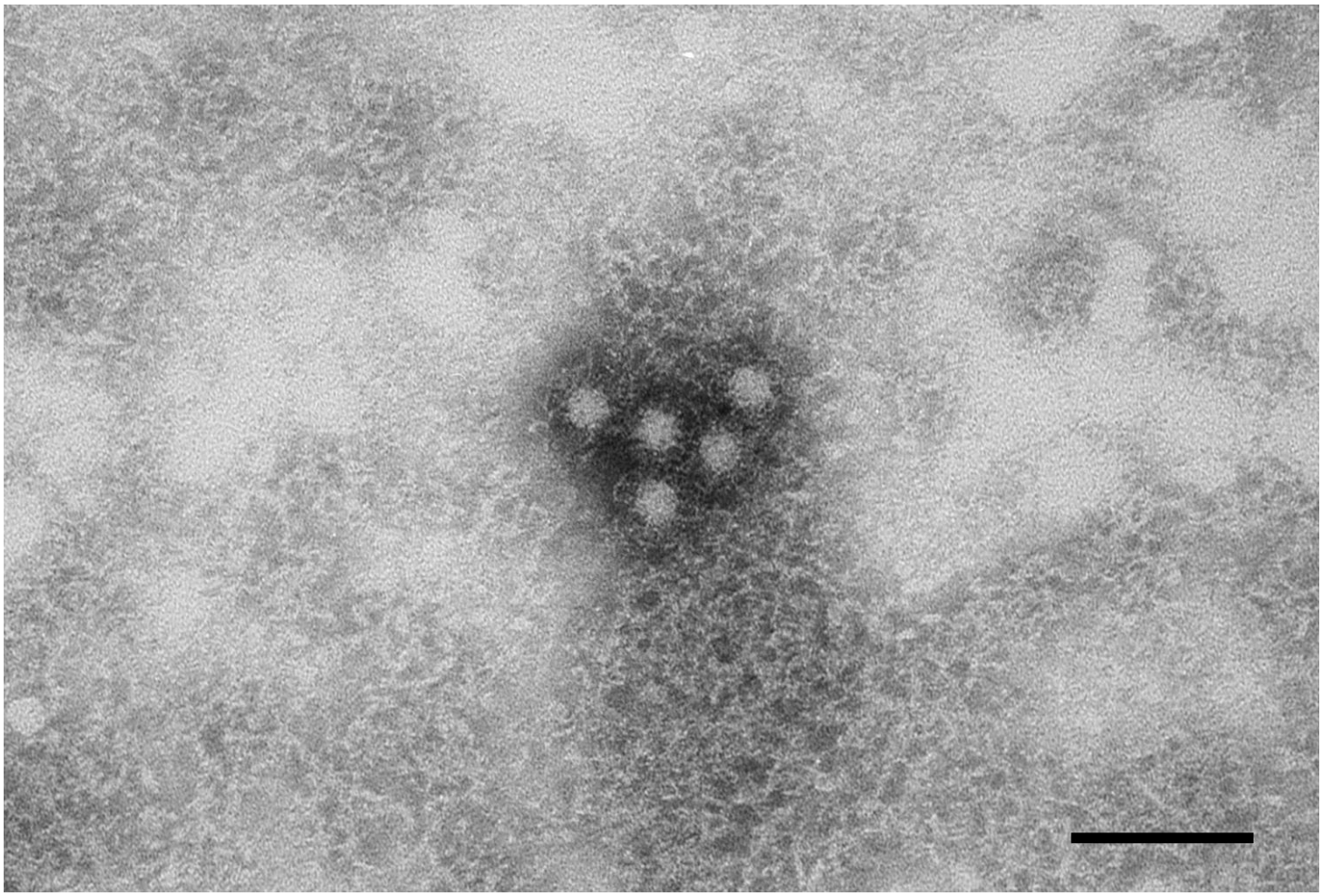
Hepeviridae



Hepatitis E virus (HEV). Genus: Orthohepevirus. Negative staining, PTA.

Image source: Barbara Hauröder, ZInstSanBw, Koblenz. Scale bar (if not stated otherwise): 100 nm

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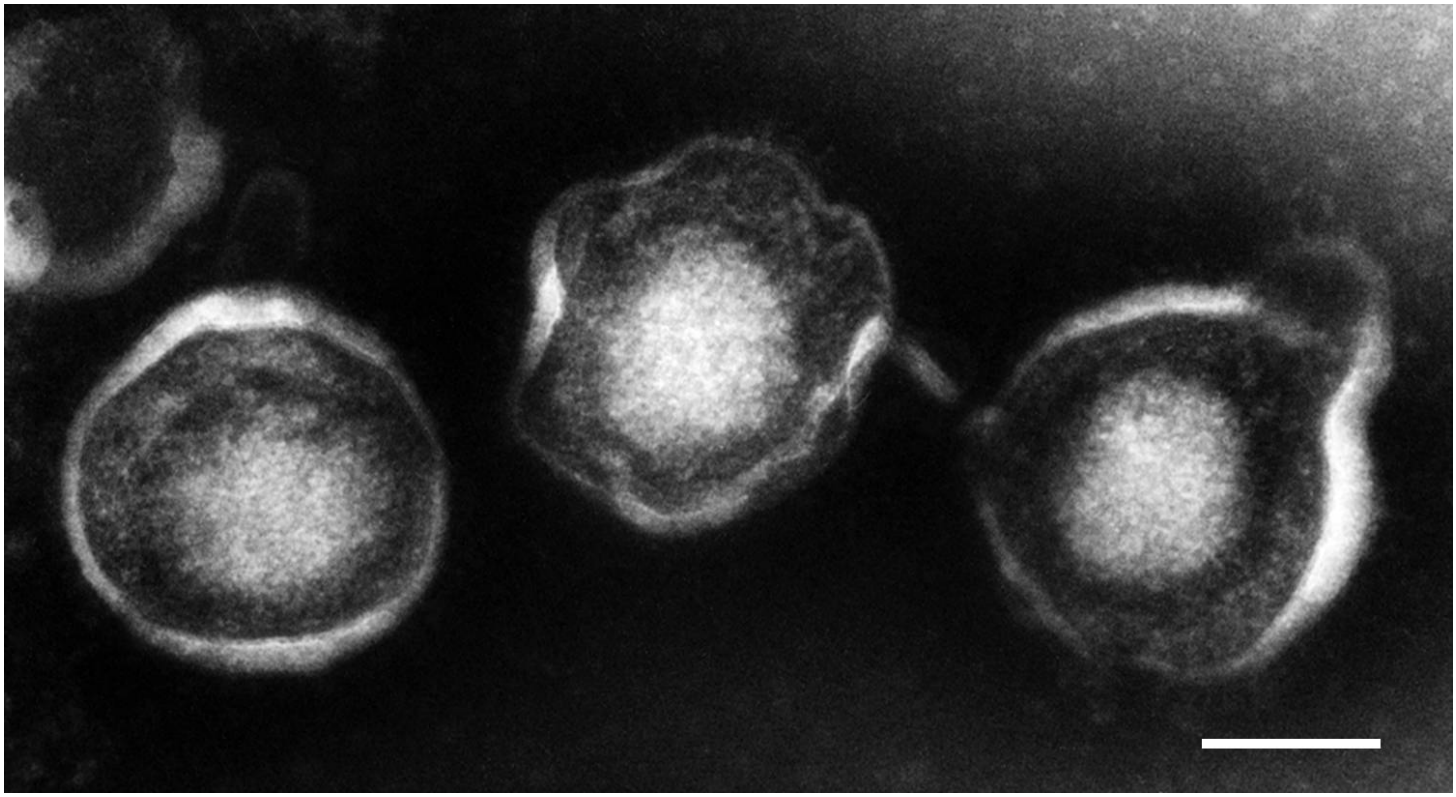
Herpesvirales



Human herpesvirus 1 (HHV-1), Herpes simplex virus (HSV). Genus: Simplexvirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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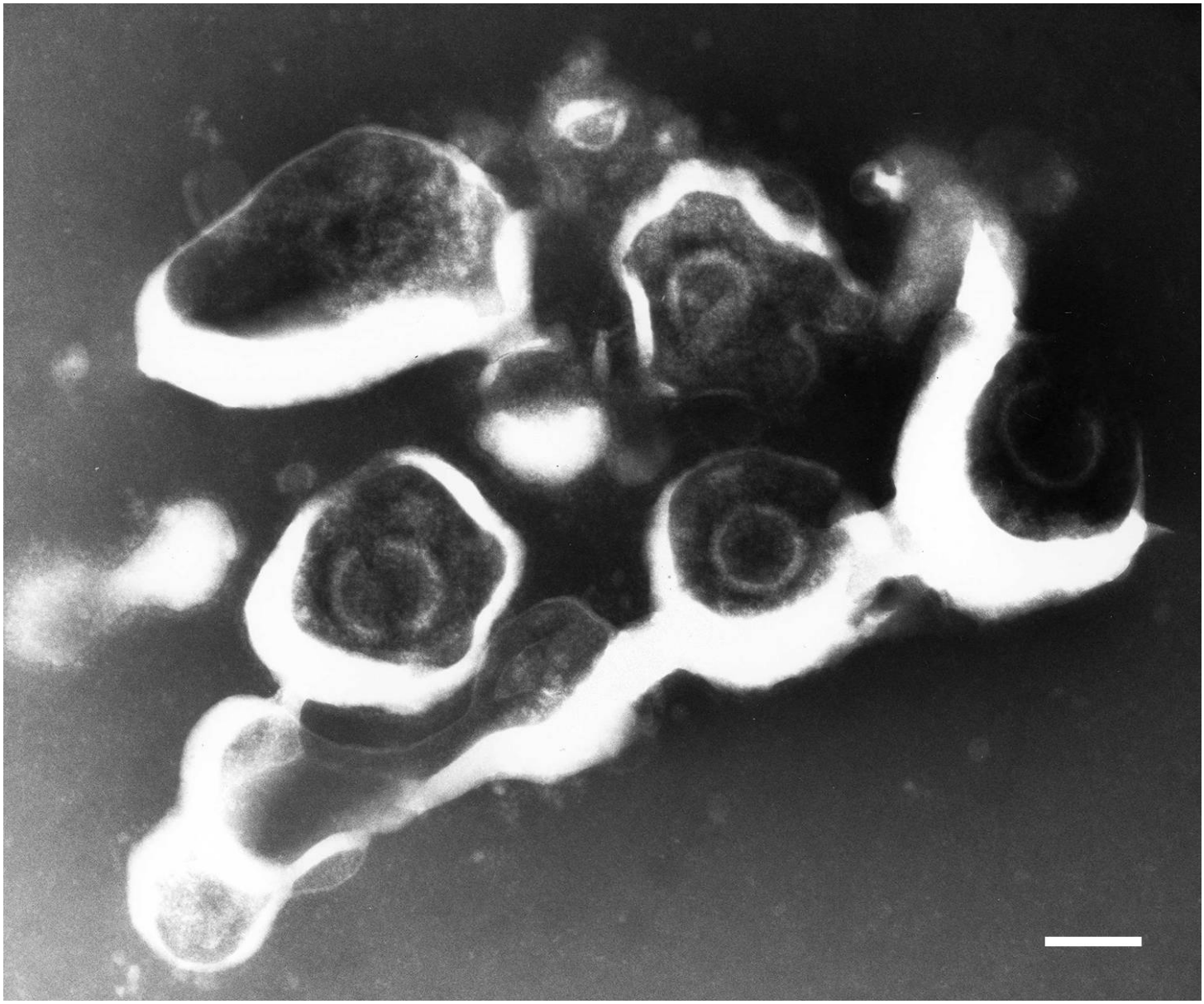
Herpesvirales



Human herpesvirus 3 (HHV-3), Varicella zoster virus (VZV). Genus: Varicellovirus. Negative` staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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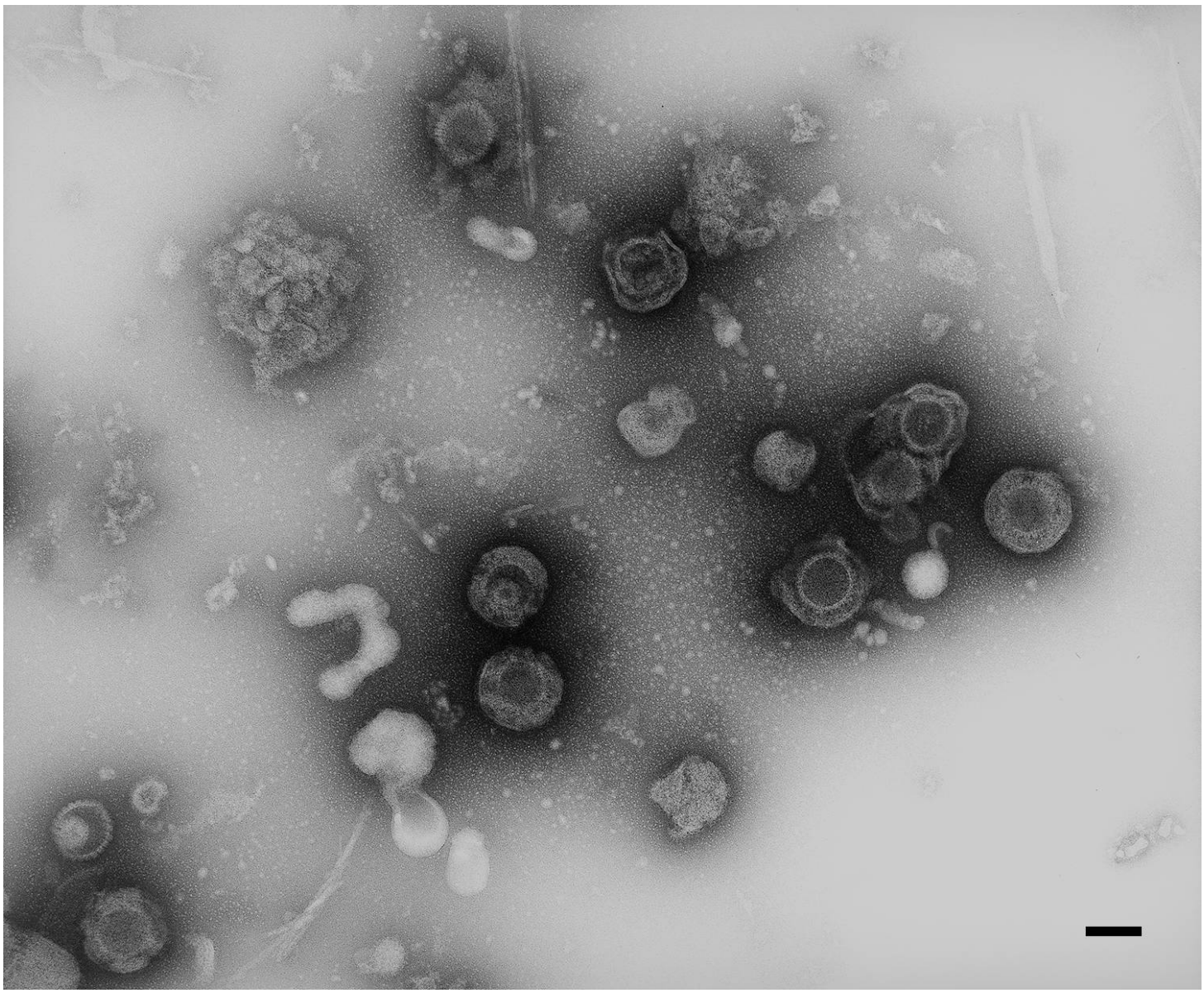
Herpesvirales



Bovine herpesvirus 1 (BoHV-1). Genus: Varicellovirus. Negative staining, AM. Virus particles with different grade of membrane preservation, from intact, enveloped viruses to naked nucleocapsids.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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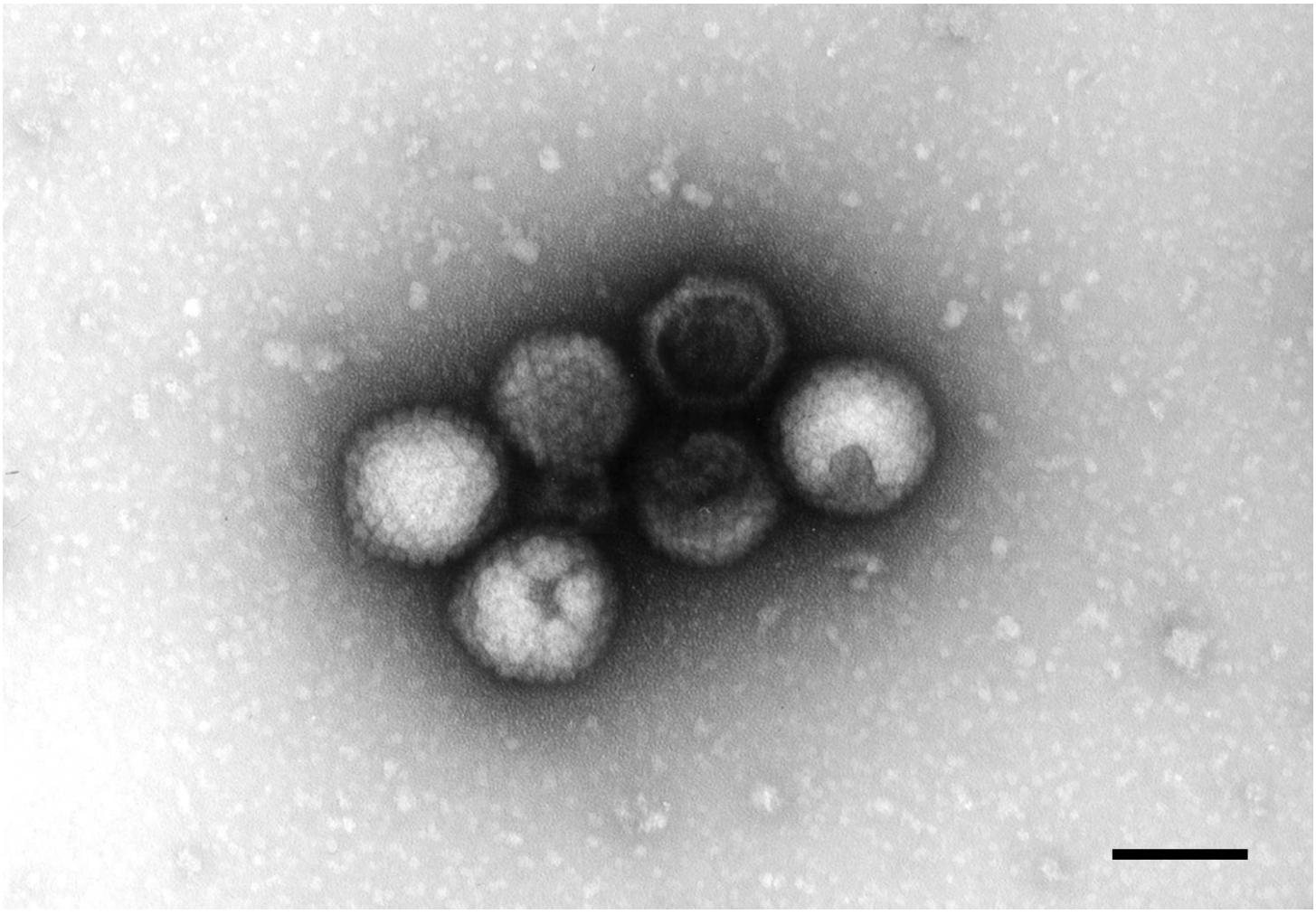
Herpesvirales



Isolated nucleocapsids of Bovine herpesvirus 1 (BoHV-1). Genus: Varicellovirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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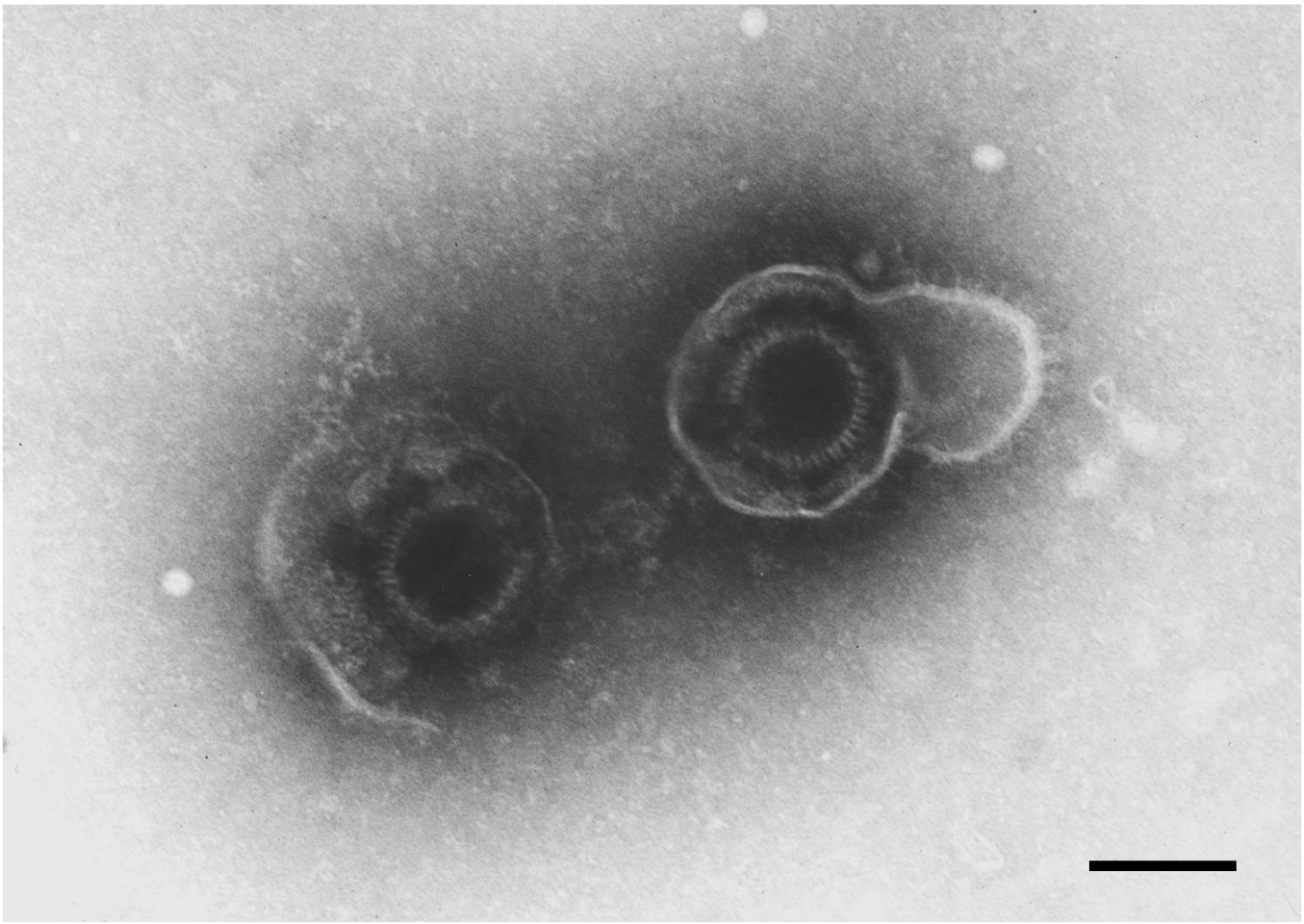
Herpesvirales



Human herpesvirus 3 (HHV-3), Varicella zoster virus (VZV). Genus: Varicellovirus. Negative staining, PTA. Stain has penetrated the membrane and visualizes the nucleocapsid. Note that the membrane is studded with projections in some regions.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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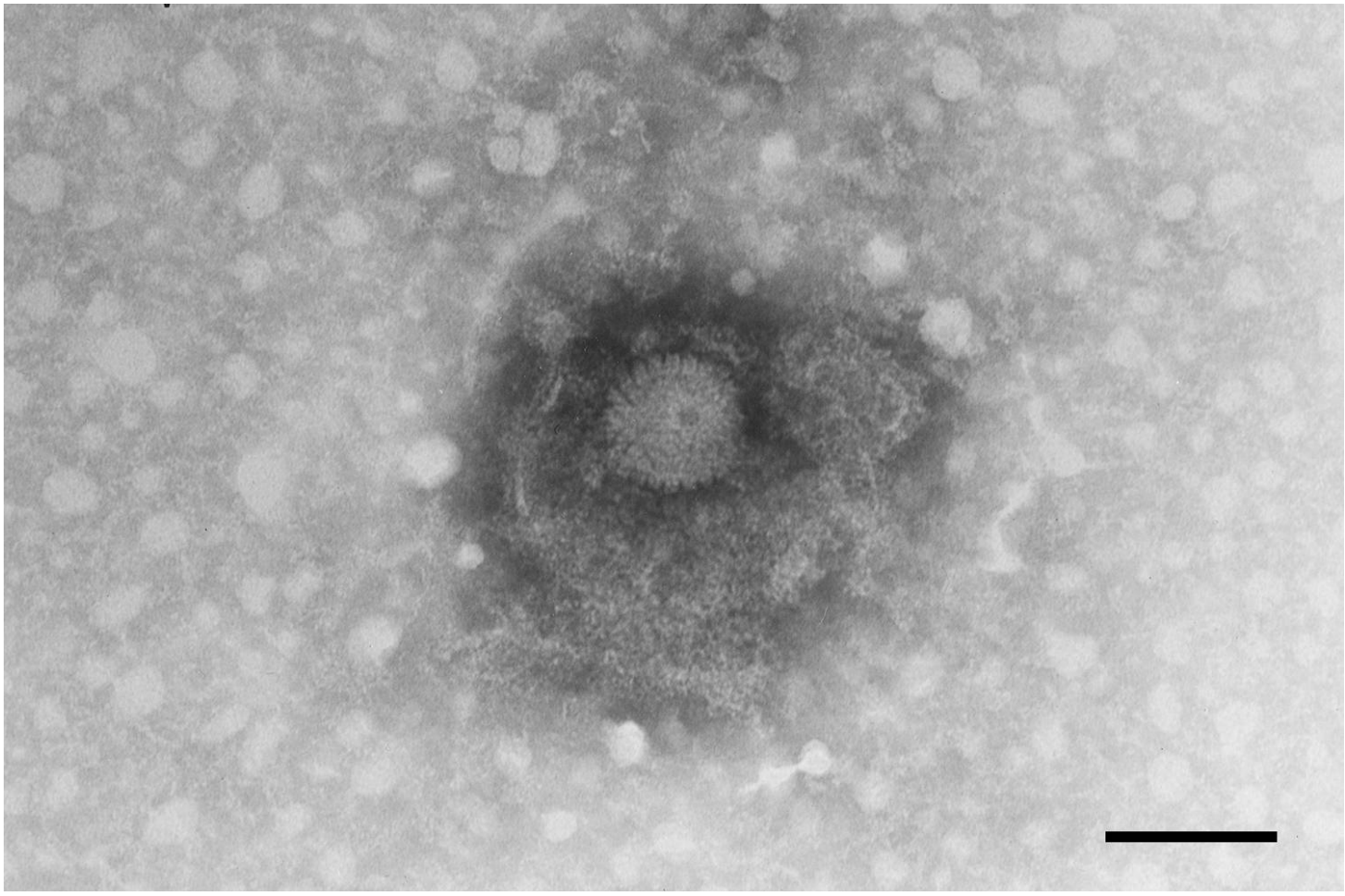
Herpesvirales



Nucleocapsid of a herpesvirus in a diagnostic sample. Negative staining, PTA. Fragments of the residual enveloping membrane are visible around the nucleocapsid.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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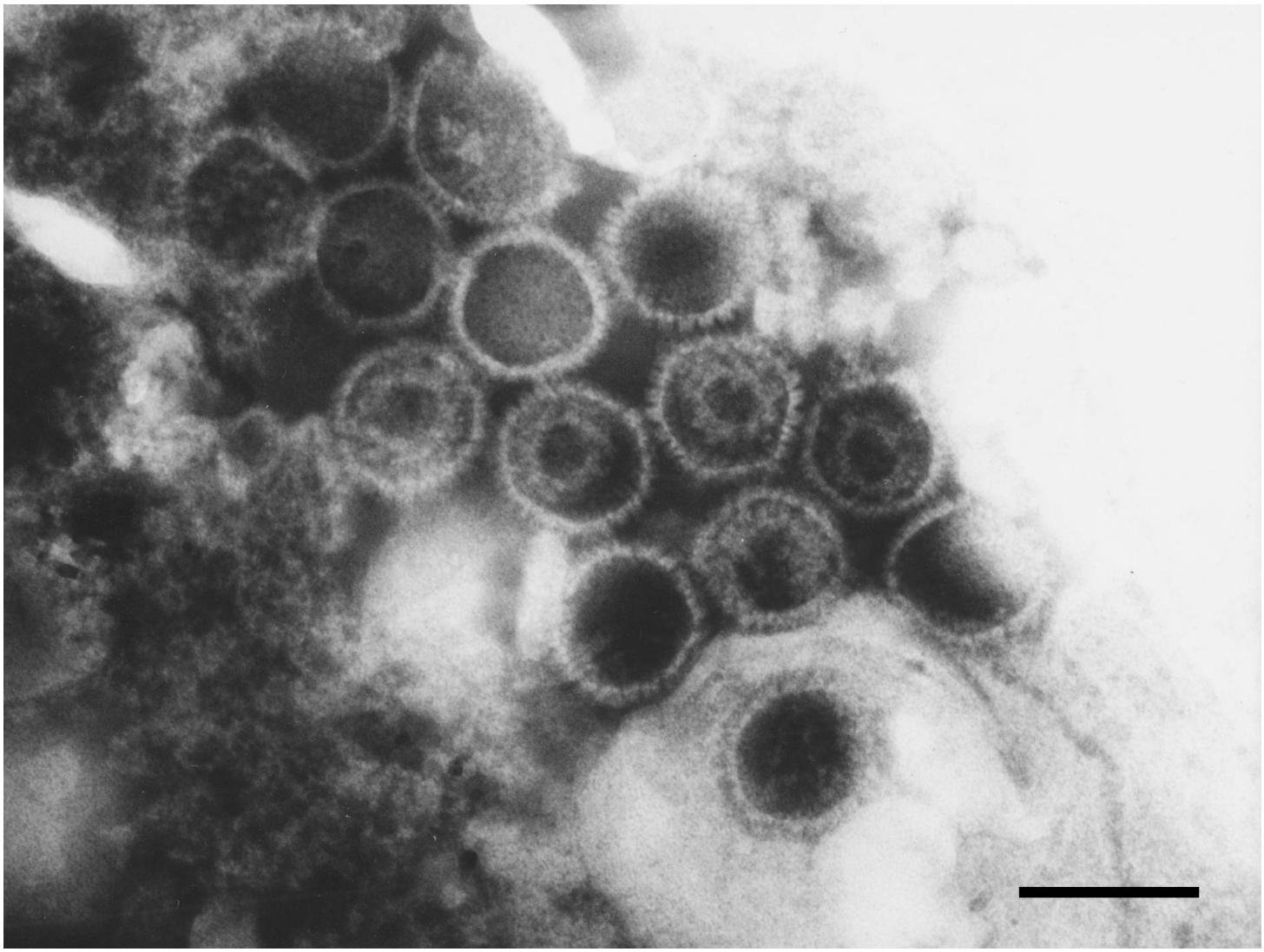
Herpesvirales



Nucleocapsids of Human herpesvirus 4 (HHV-4), Epstein-Barr virus (EBV). Genus: Lymphocryptovirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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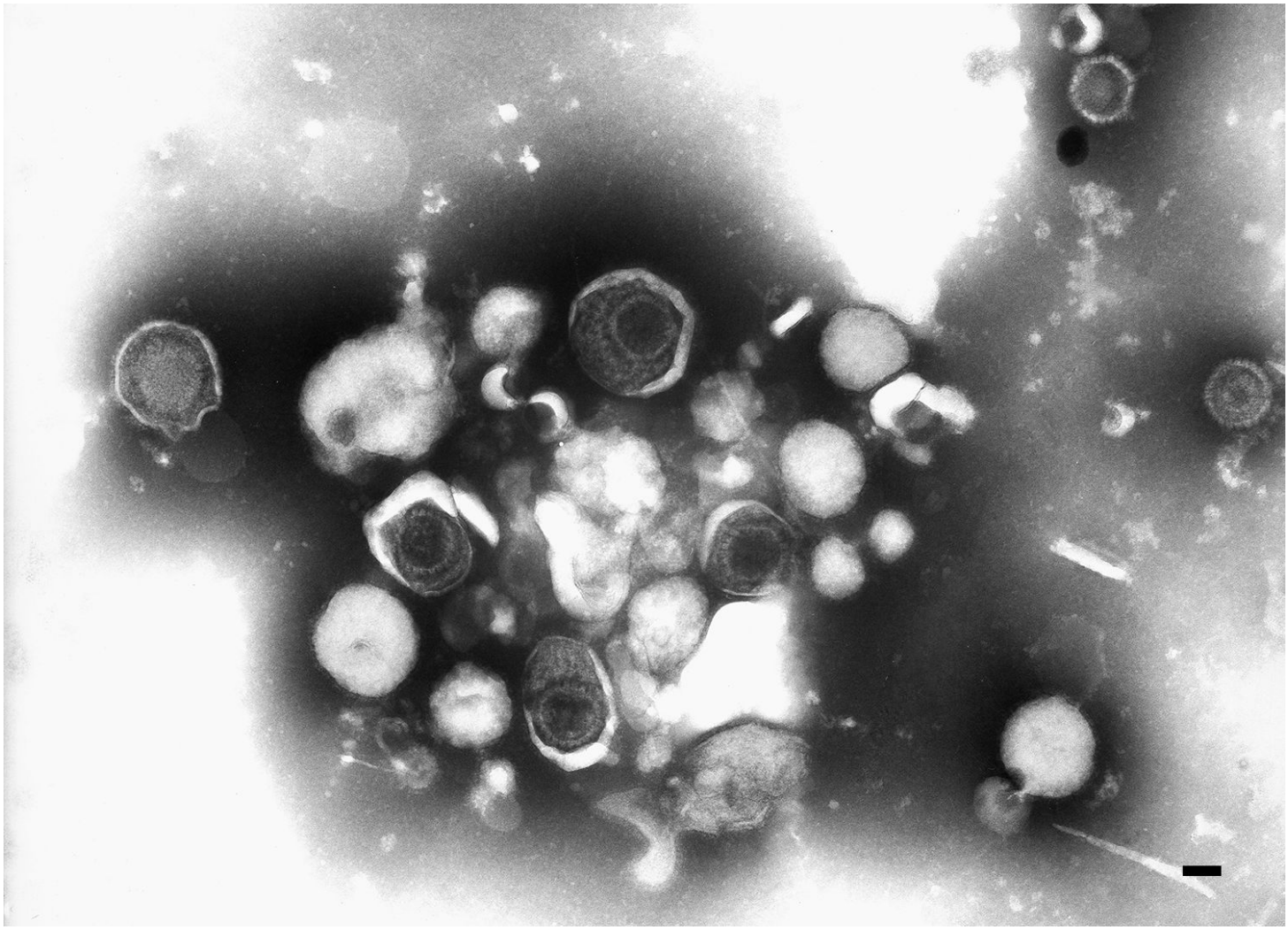
Herpesvirales



Bovine herpesvirus 1 (BoHV-1). Genus: Varicellovirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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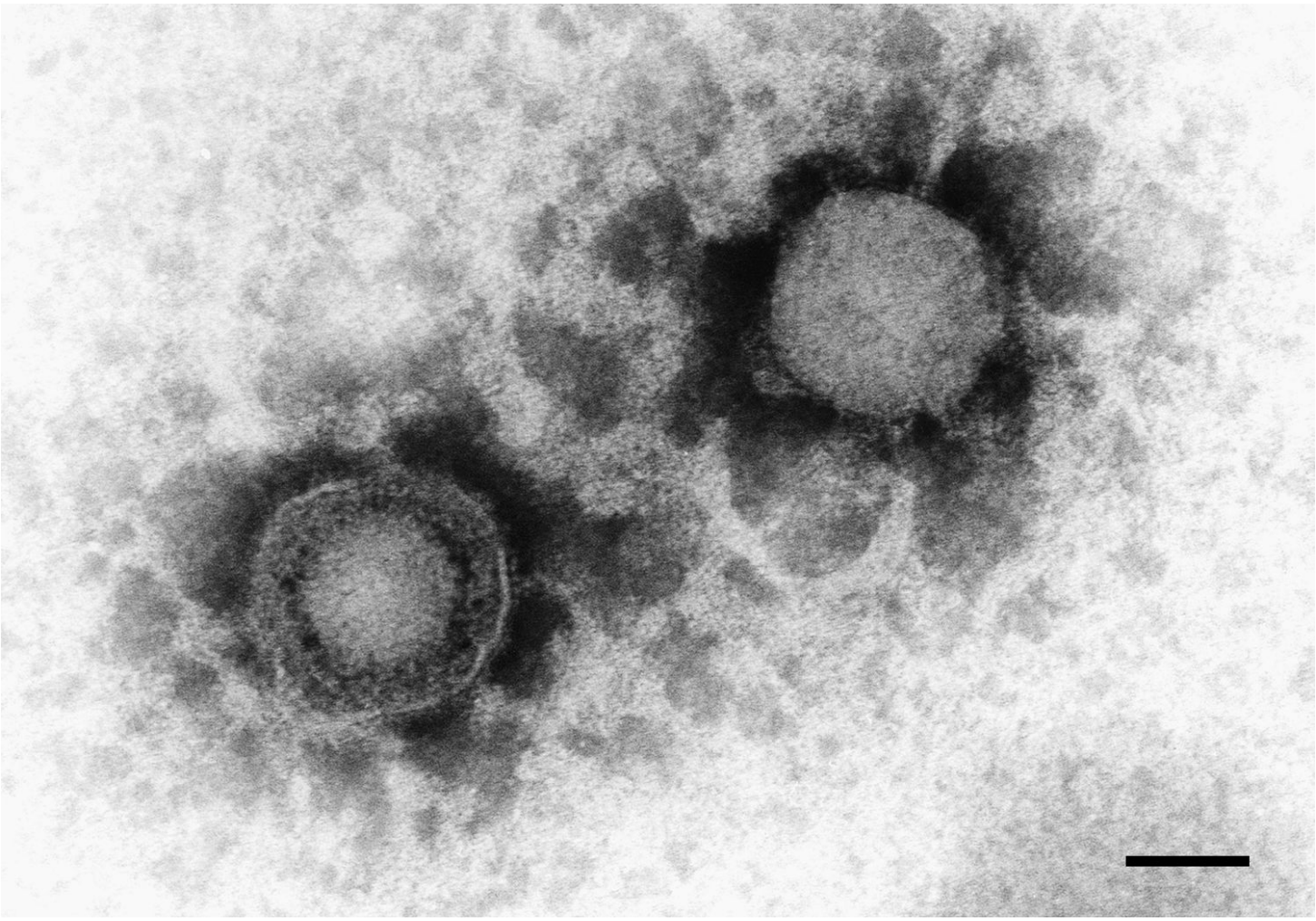
Herpesvirales



Human herpes virus-5 (HHV-5). Genus: Cytomegalovirus. Negative staining, PTA. One of the two particles is penetrated by the stain and reveals the core.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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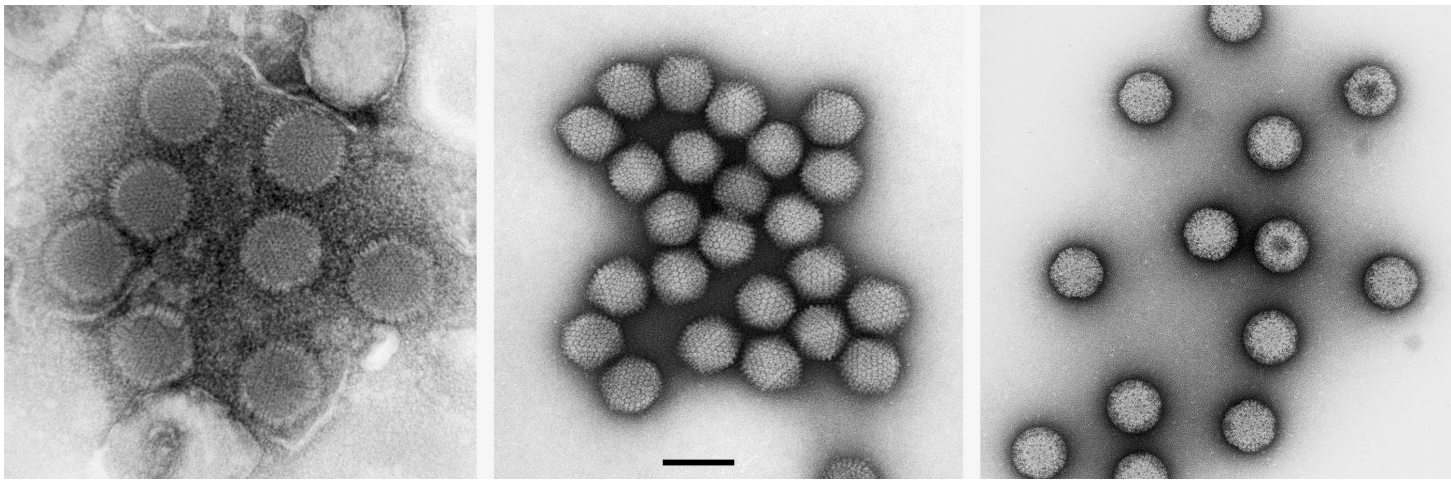
Herpesvirales



Comparison of three virus particle morphotypes (from left to right): Herpesvirales (naked capsids of Murine herpesvirus 8), Adenoviridae (Genus: Aviadenovirus) and Reoviridae (Genus: Orthoreovirus).Negative staining, UA. Isolated Herpesvirus capsids are bigger than` Adenovirus or Reovirus particles. In addition, all particles clearly differ in their ultrastructure. For more details please refer to the virus group descriptions.

Image source: Lars Möller & Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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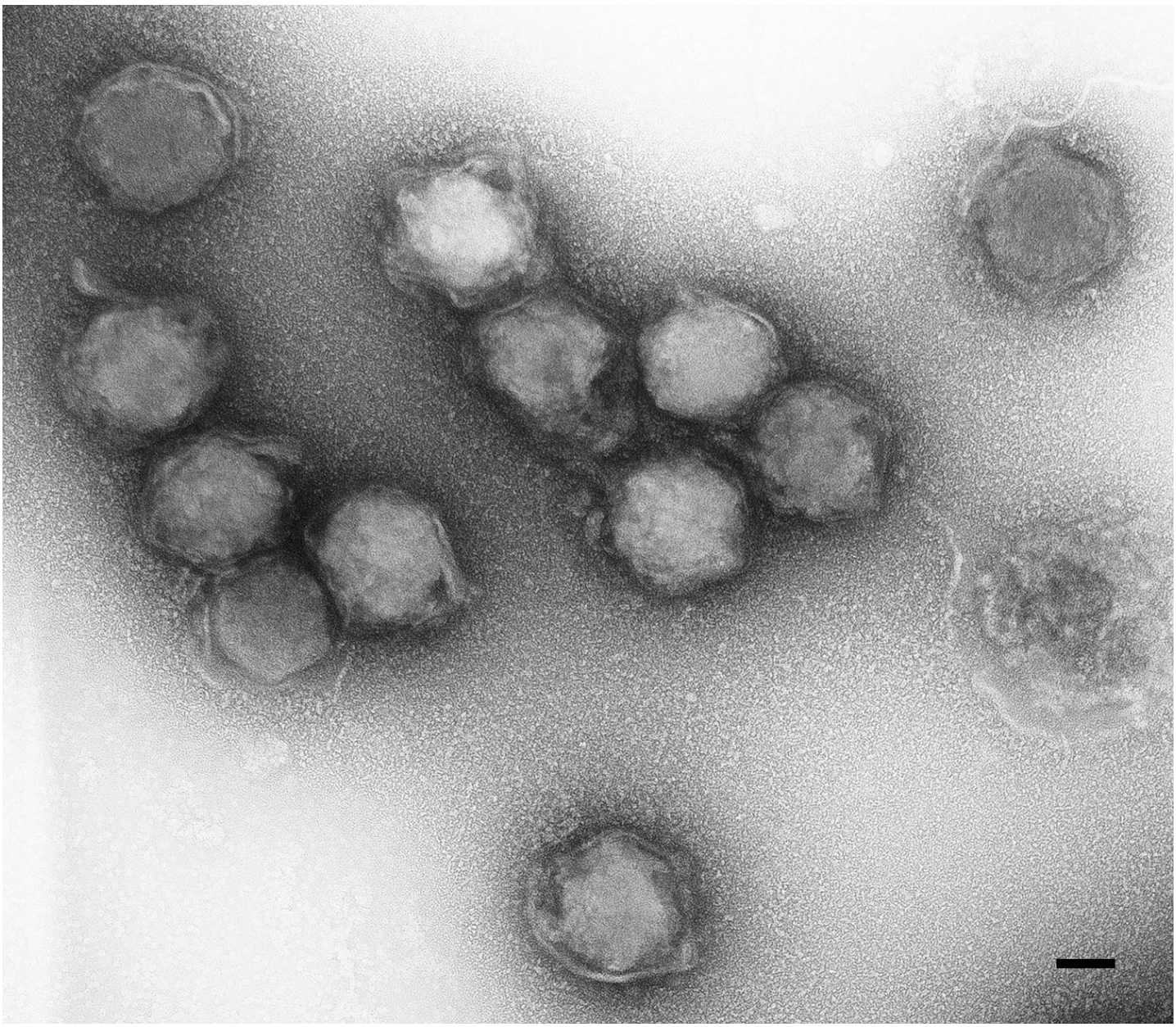
Iridoviridae



Lymphocystis disease virus (LCDV). Genus: Lymphocystivirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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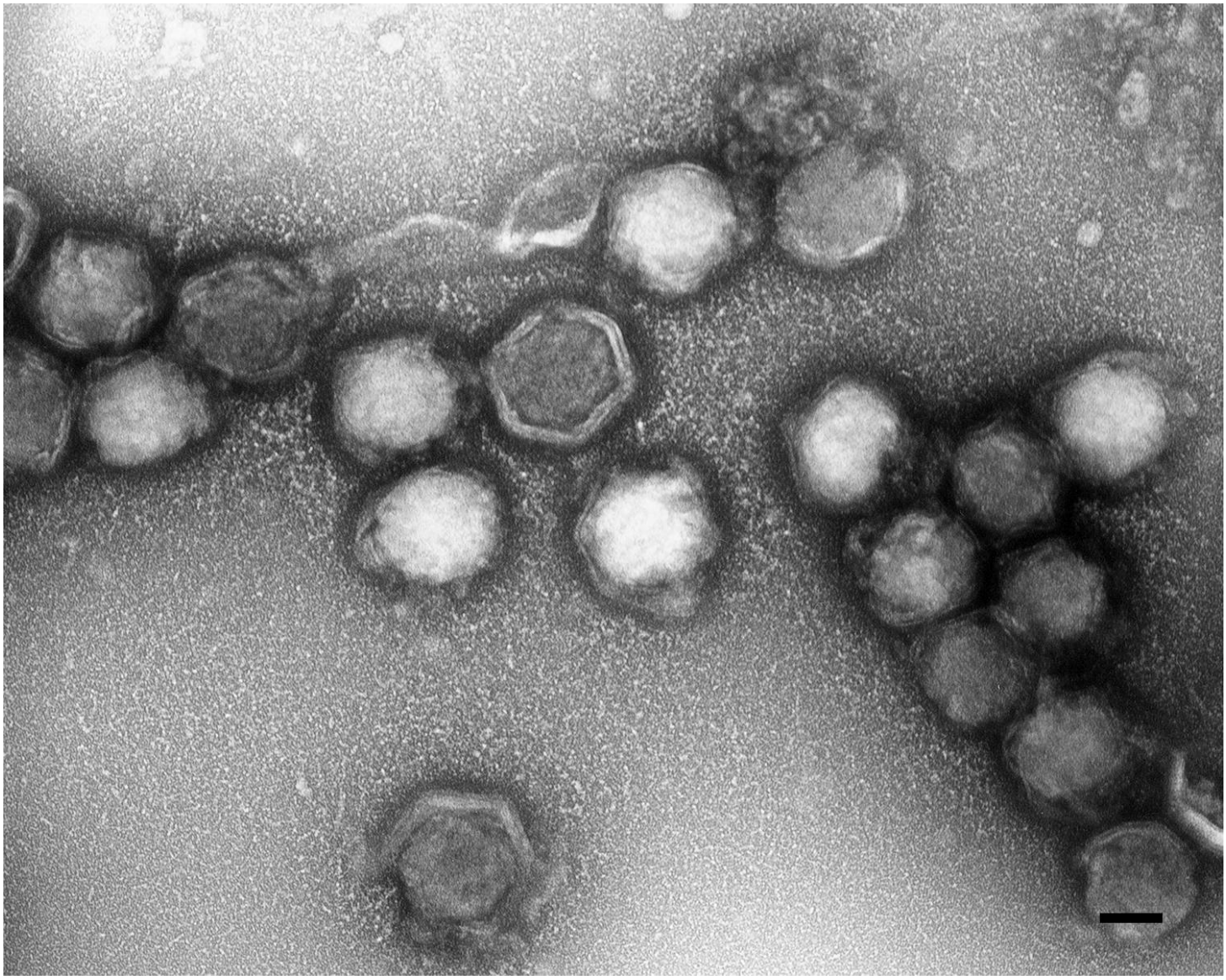
Iridoviridae



Lymphocystis disease virus (LCDV). Genus: Lymphocystivirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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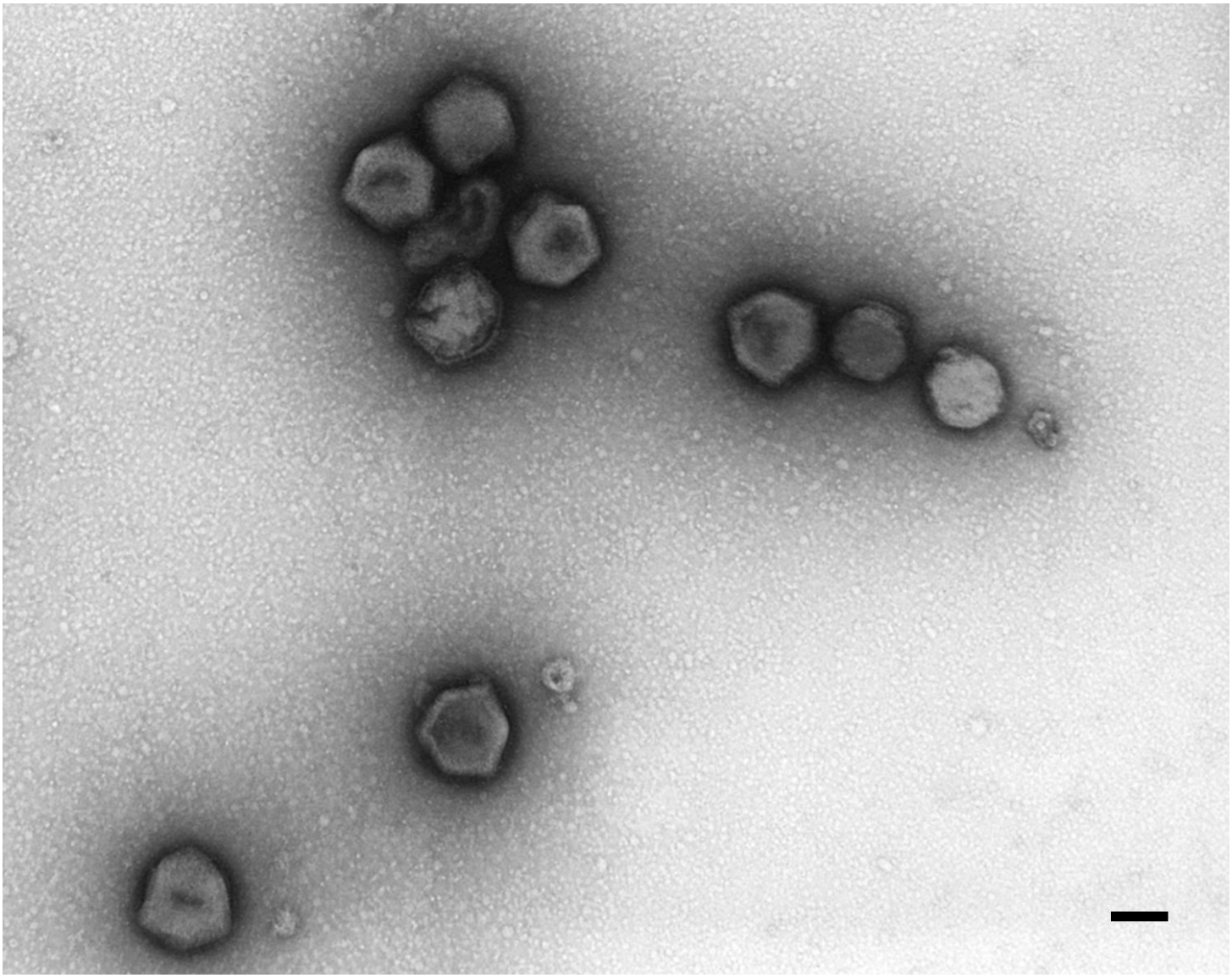
Iridoviridae



Invertebrate iridescent virus (IIV). Genus: Iridovirus. Negative staining. UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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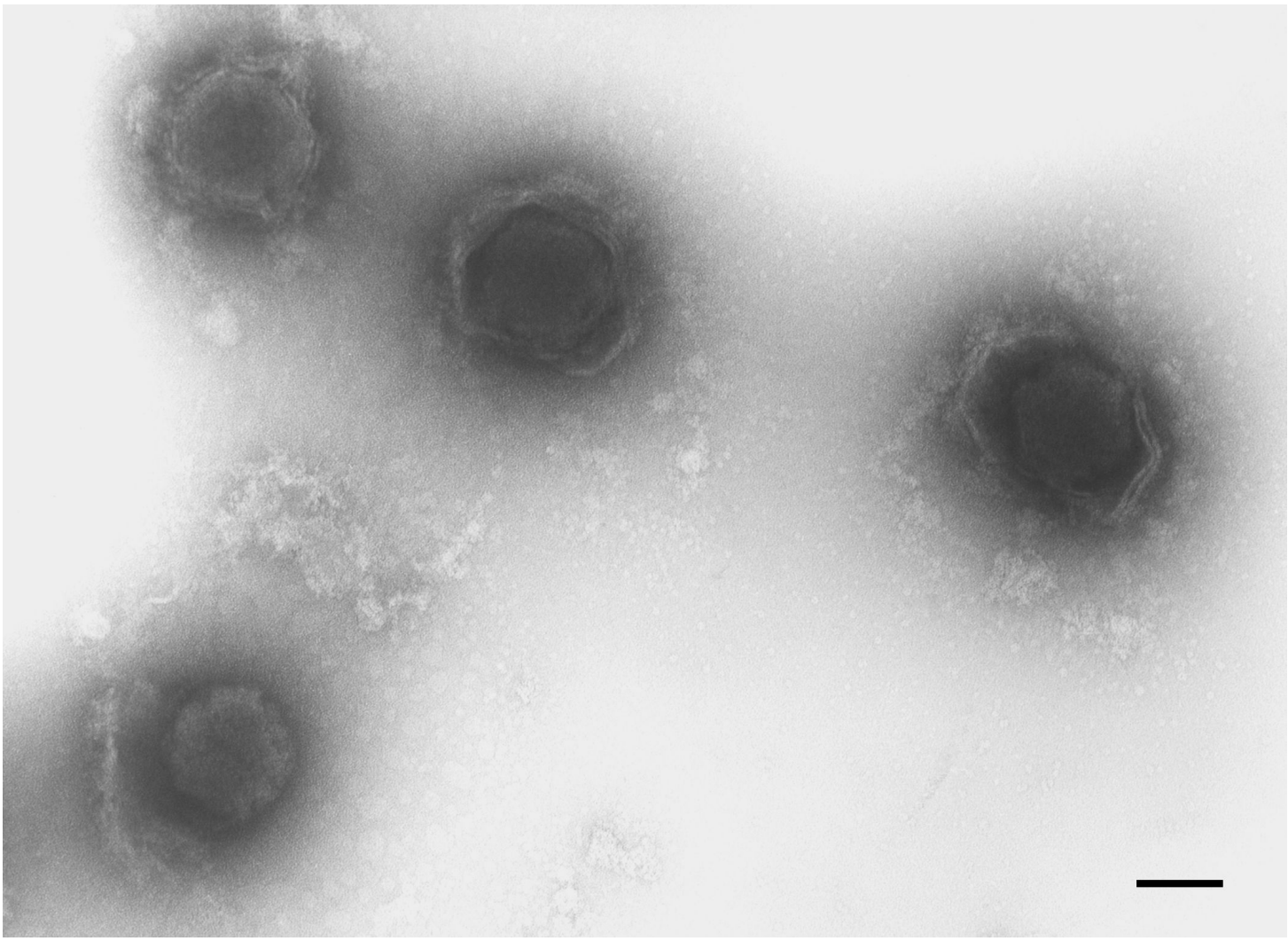
Iridoviridae



Lymphocystis disease virus (LCDV). Genus: Lymphocystivirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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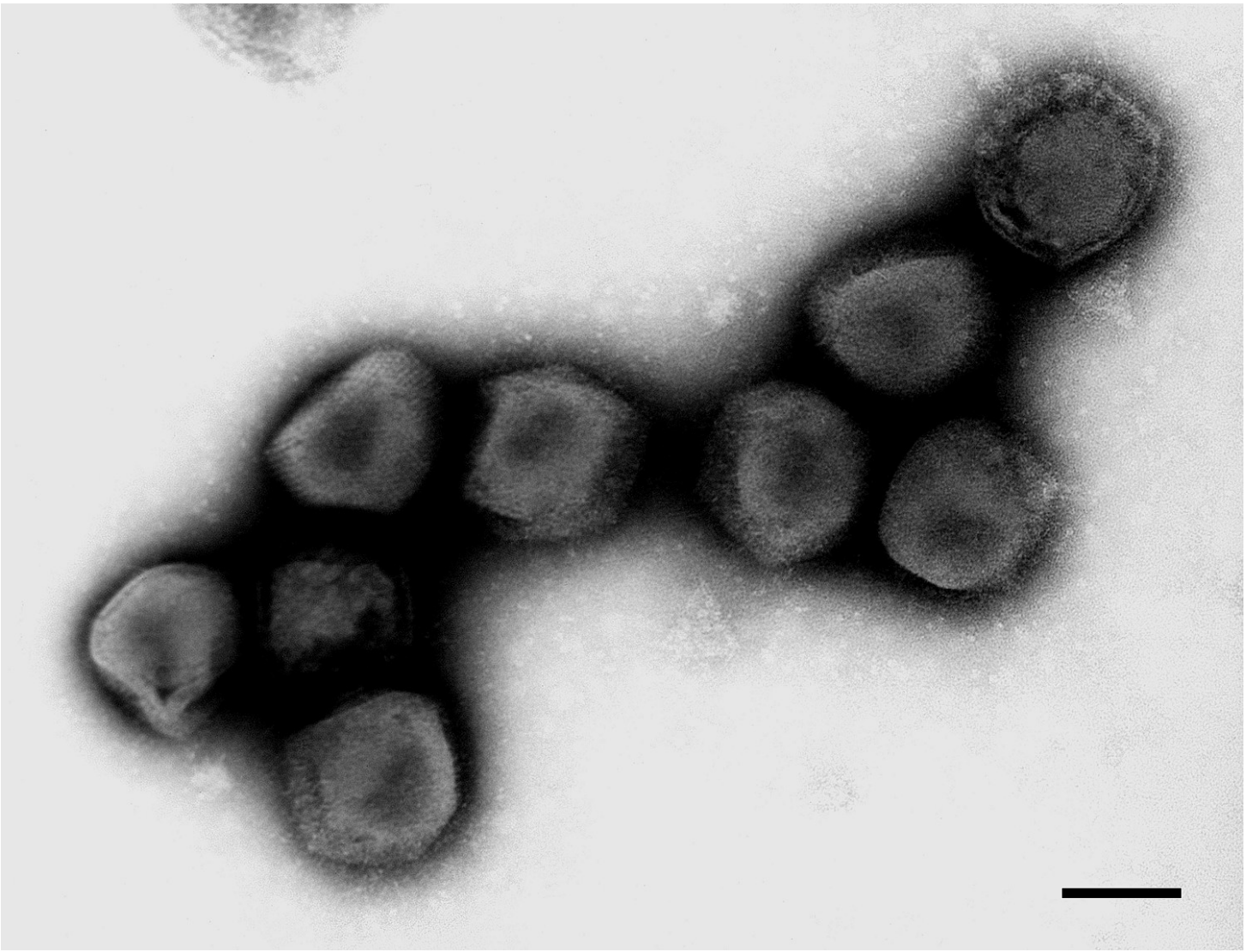
Iridoviridae



Lymphocystis disease virus-1 (LCDV-1). Genus: Lymphocystivirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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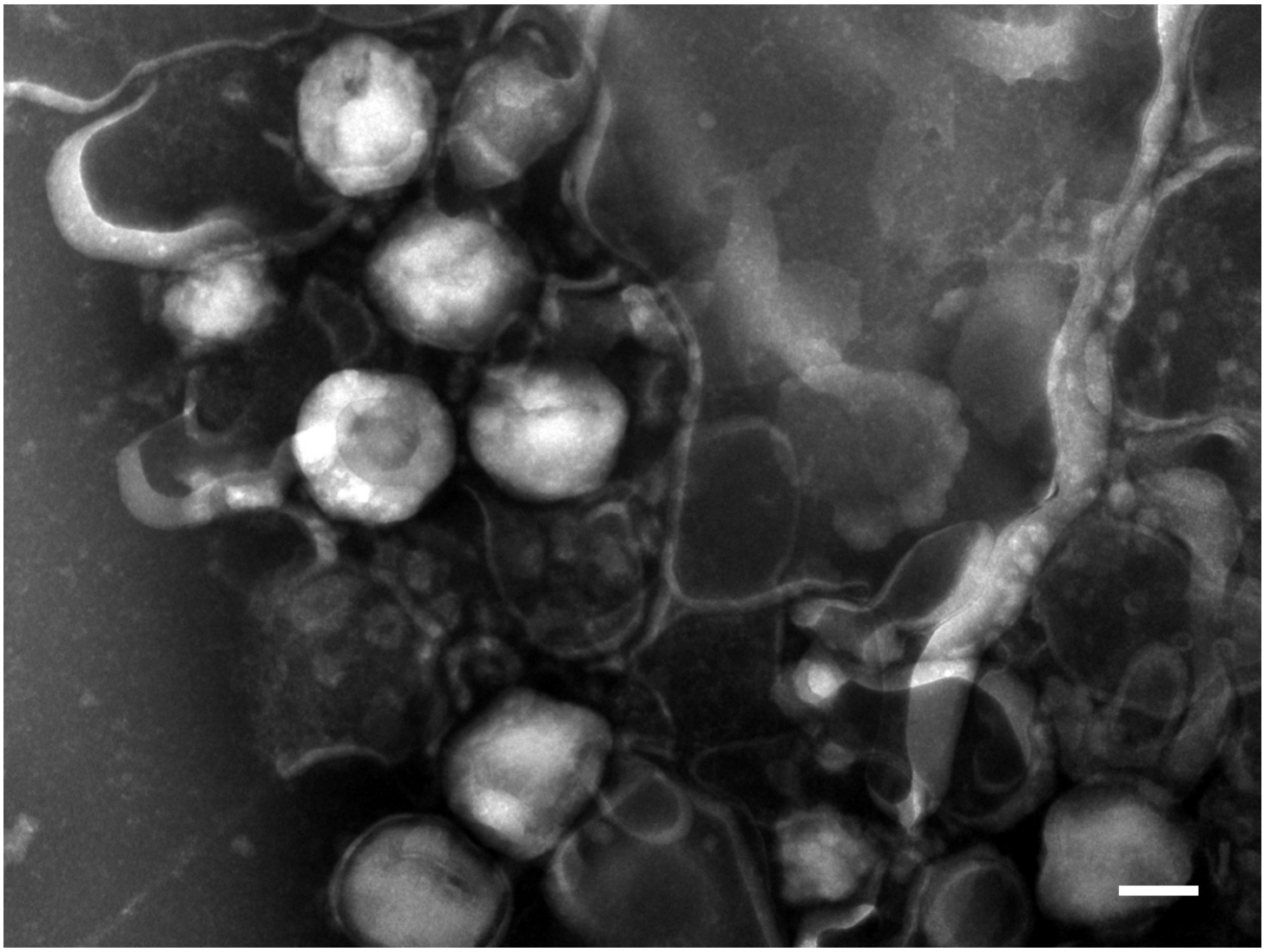
Iridoviridae



Fish iridovirus. Genus: not confirmed by PCR. Negative staining, PTA.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

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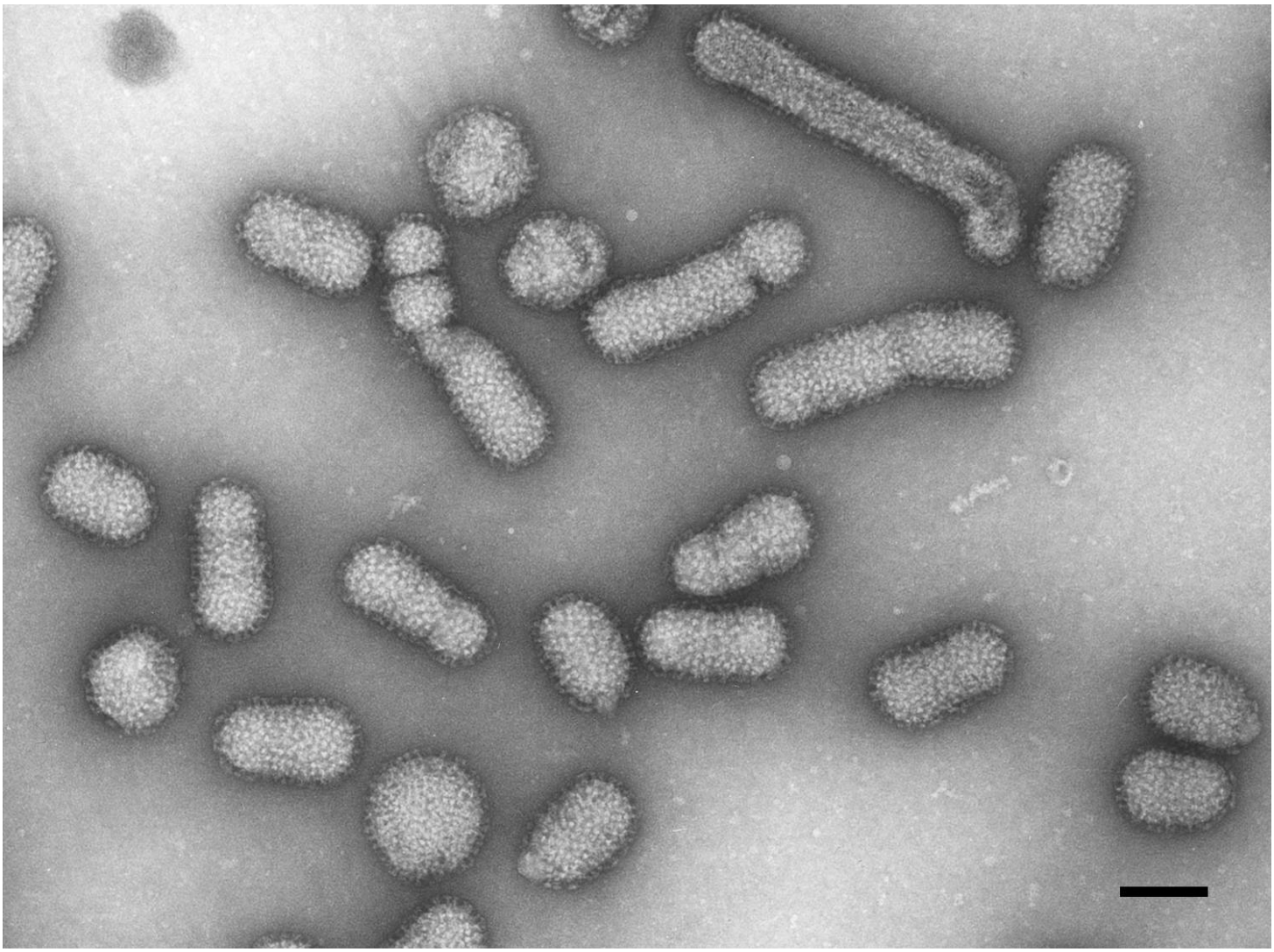
Orthomyxoviridae



Influenza A virus (FLUAV), Wyoming strain. Genus: Influenzavirus A. Negative staining, UA.

Image source: Gabriele Schlier, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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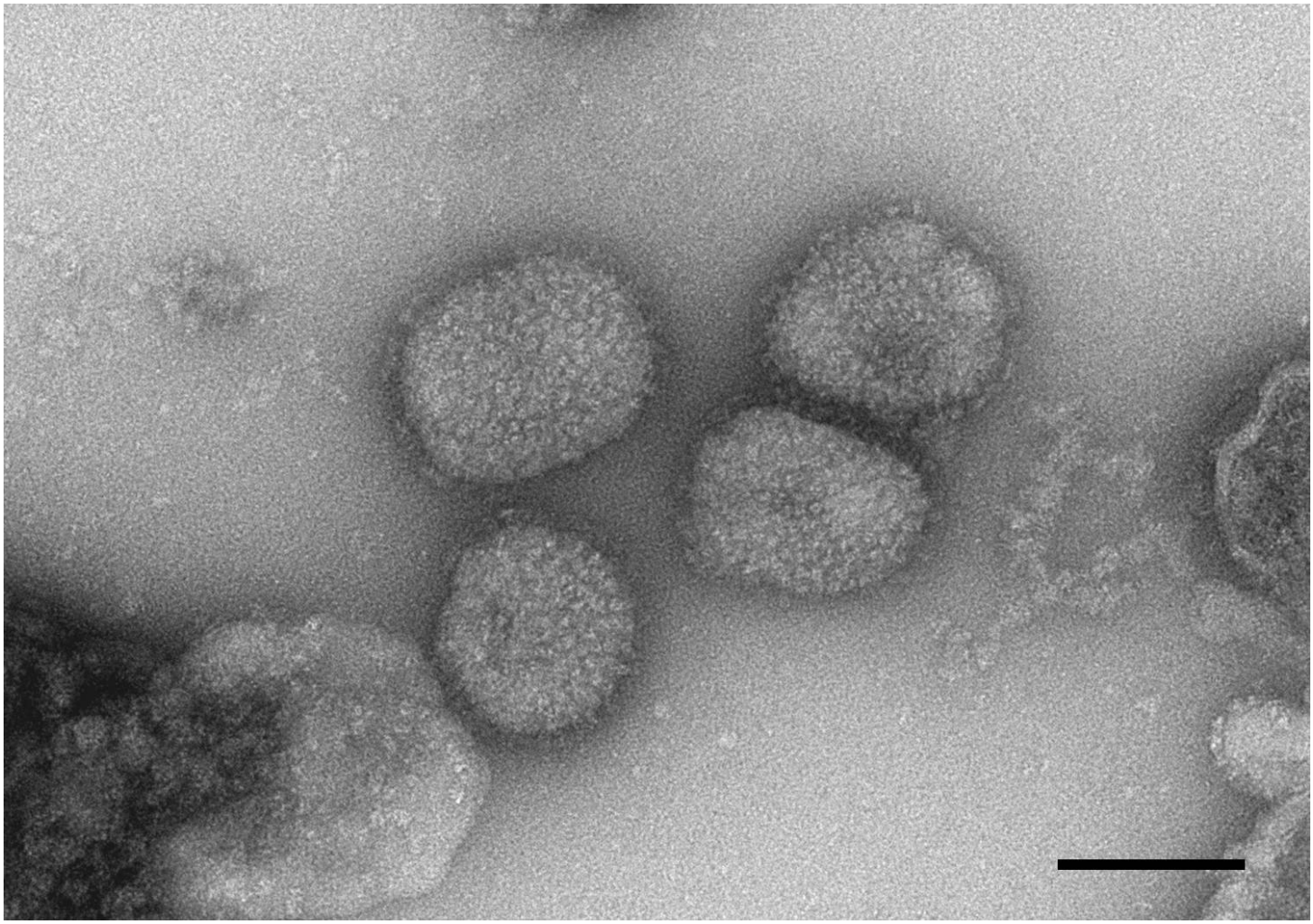
Orthomyxoviridae



Influenza A virus (FLUAV-H1N1, pandemic strain 2009). Genus: Influenzavirus A. Negative staining, UA.

Image source: Michael Laue, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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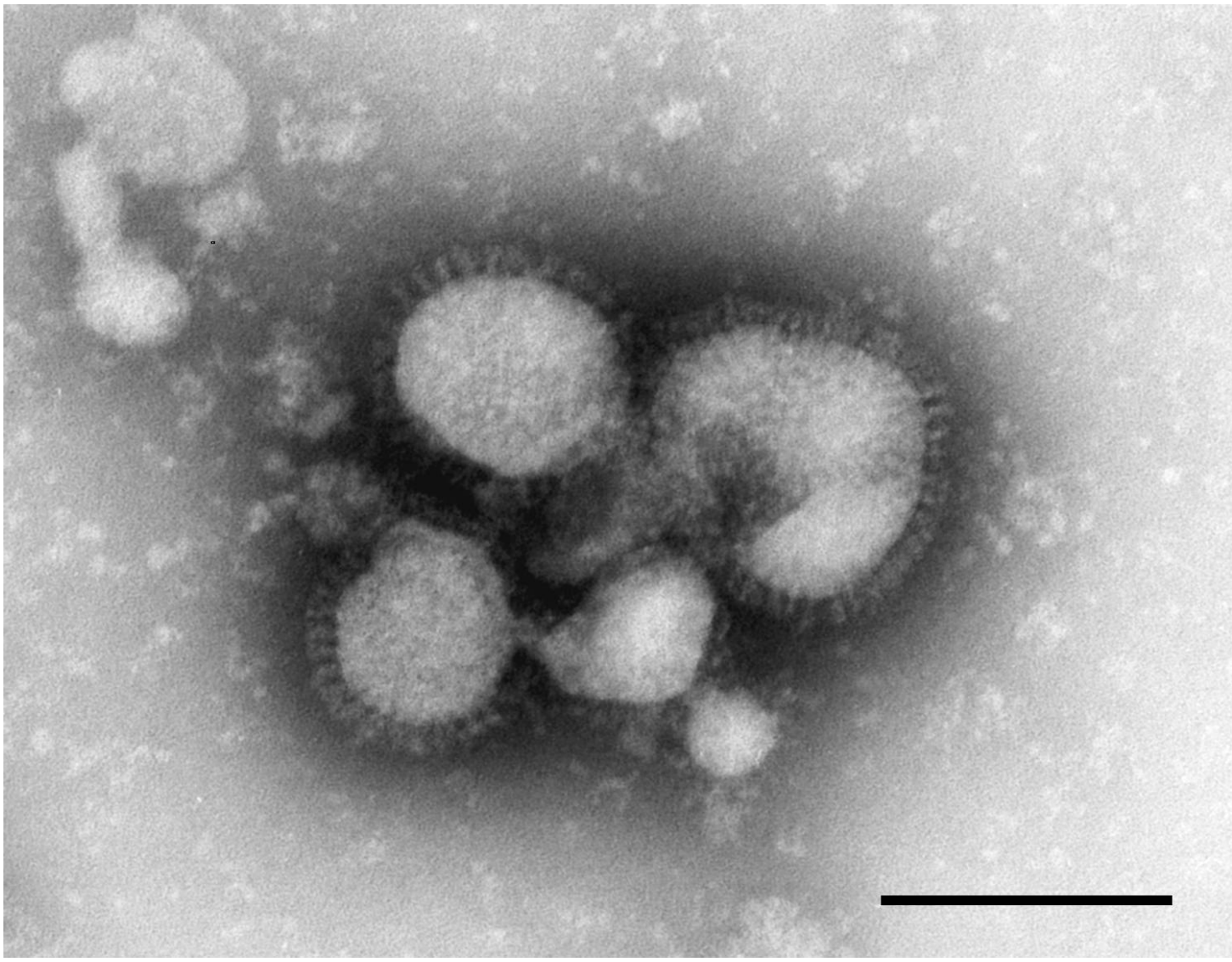
Orthomyxoviridae



Influenza A virus (FLUAV-H5N1, Avian Flu). Genus: Influenzavirus A. Negative staining. PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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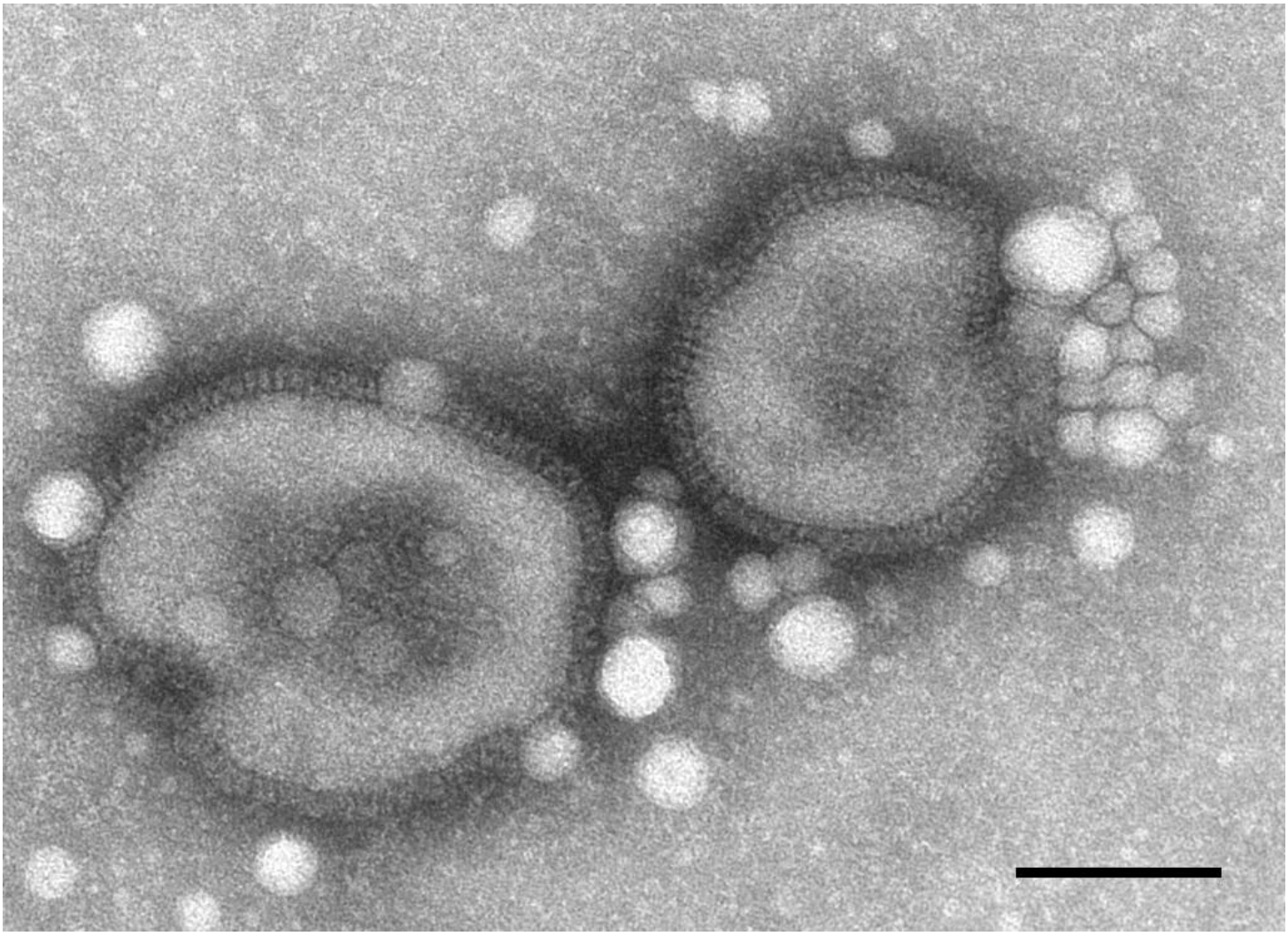
Orthomyxoviridae



Influenza A virus (FLUAV-H5N1, Avian Flu). Genus: Influenzavirus A. Negative staining. UA. Virus particles from egg culture. Bright spheres surrounding the virus particles are typical structures found in such samples.

Image source: Gudrun Holland, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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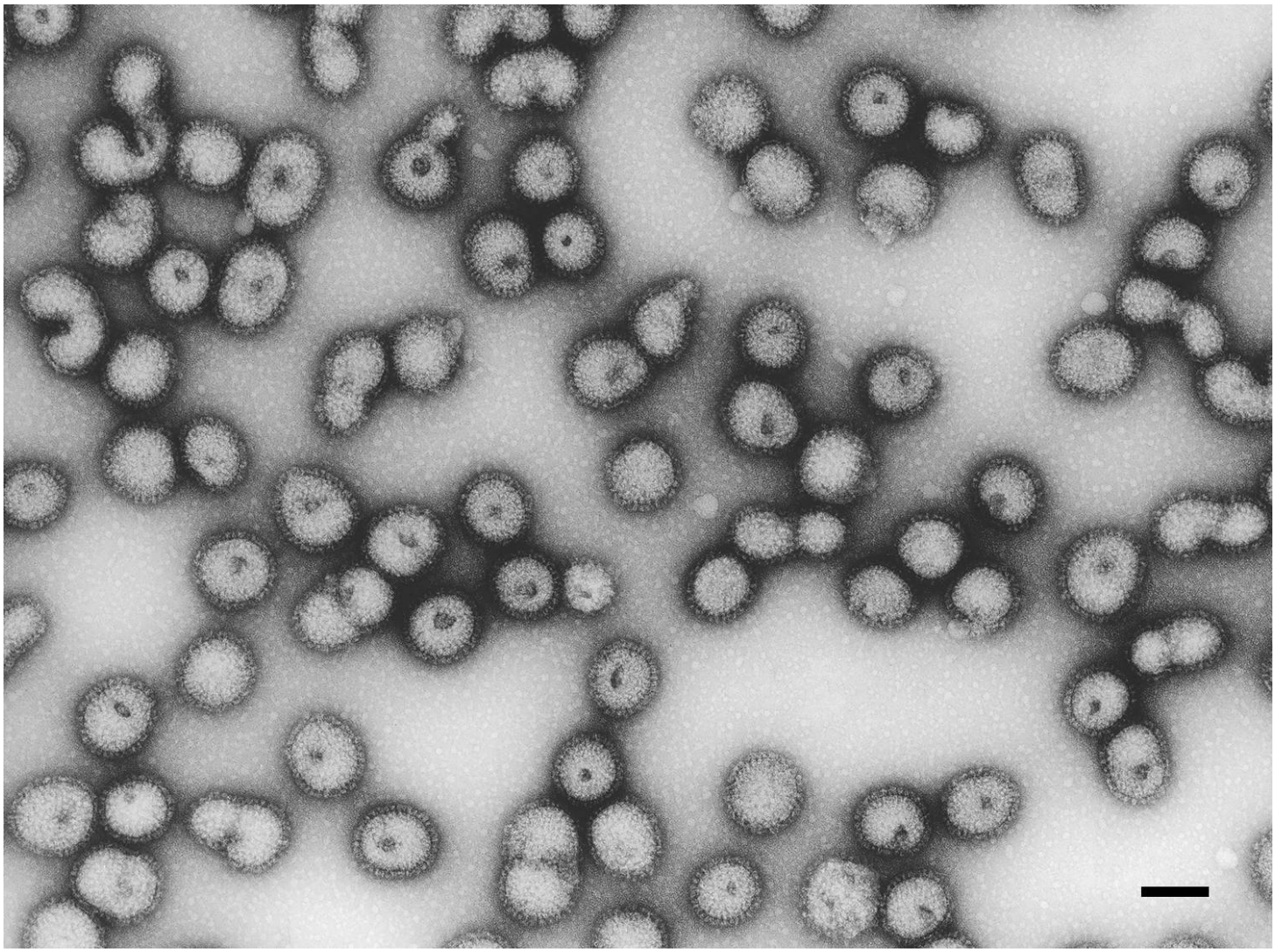
Orthomyxoviridae



Influenza B virus (FLUBV). Genus: Influenzavirus B. Negative staining. UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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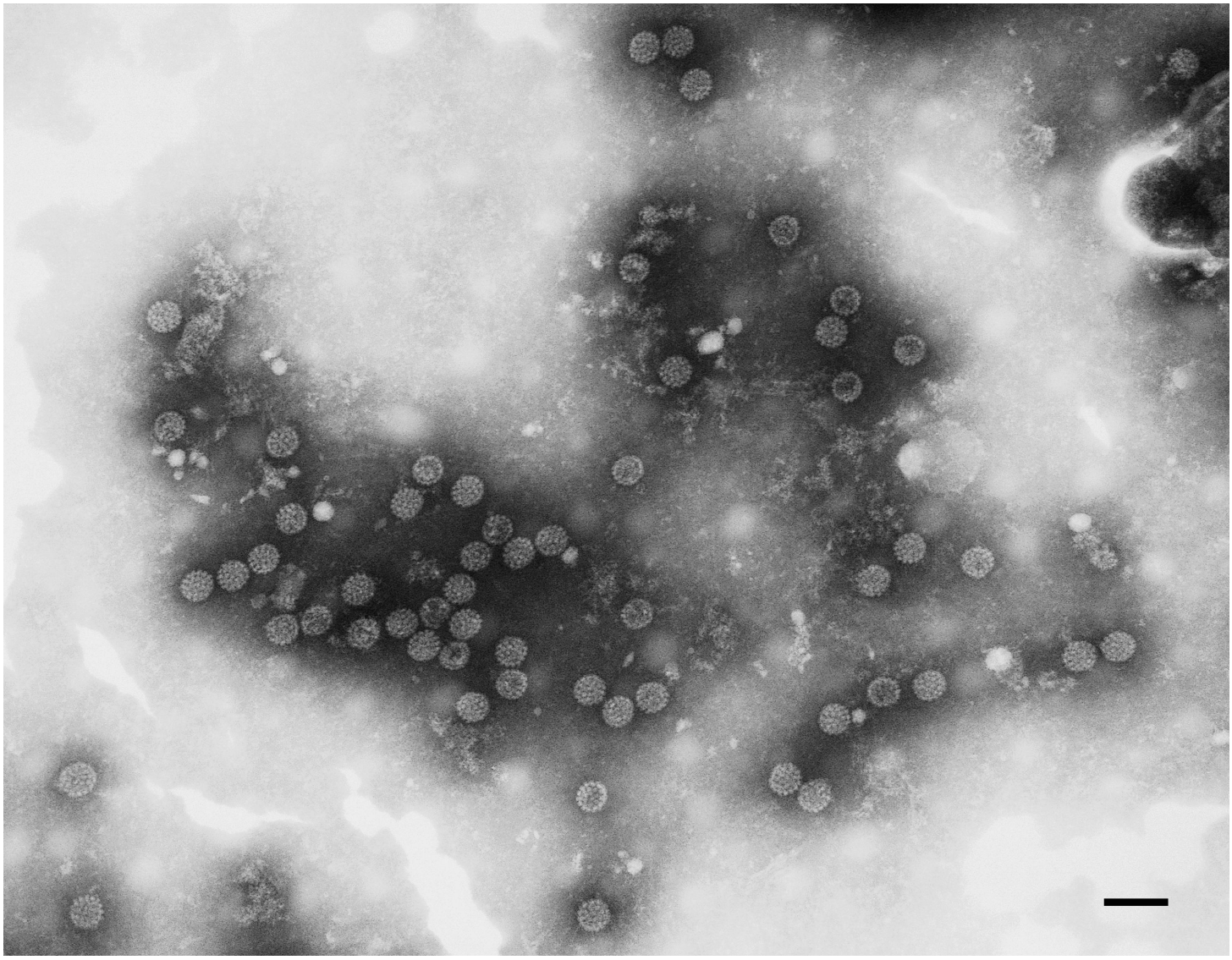
Papillomaviridae



Fringilla coelebs papillomavirus (FcPV). Genus: Etapapillomavirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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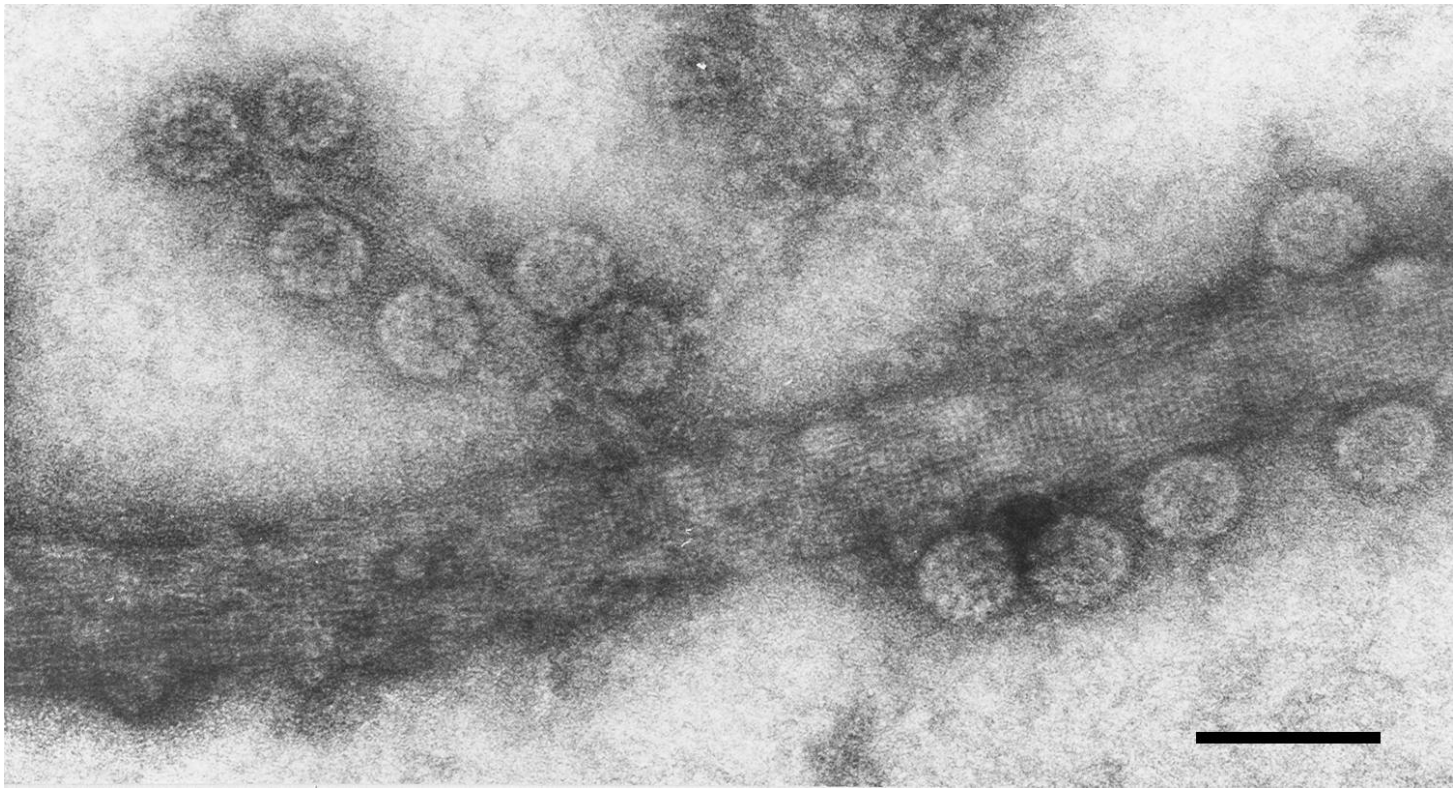
Papillomaviridae



Human papillomavirus (HPV). Negative staining (UA) of a suspension generated from a wart.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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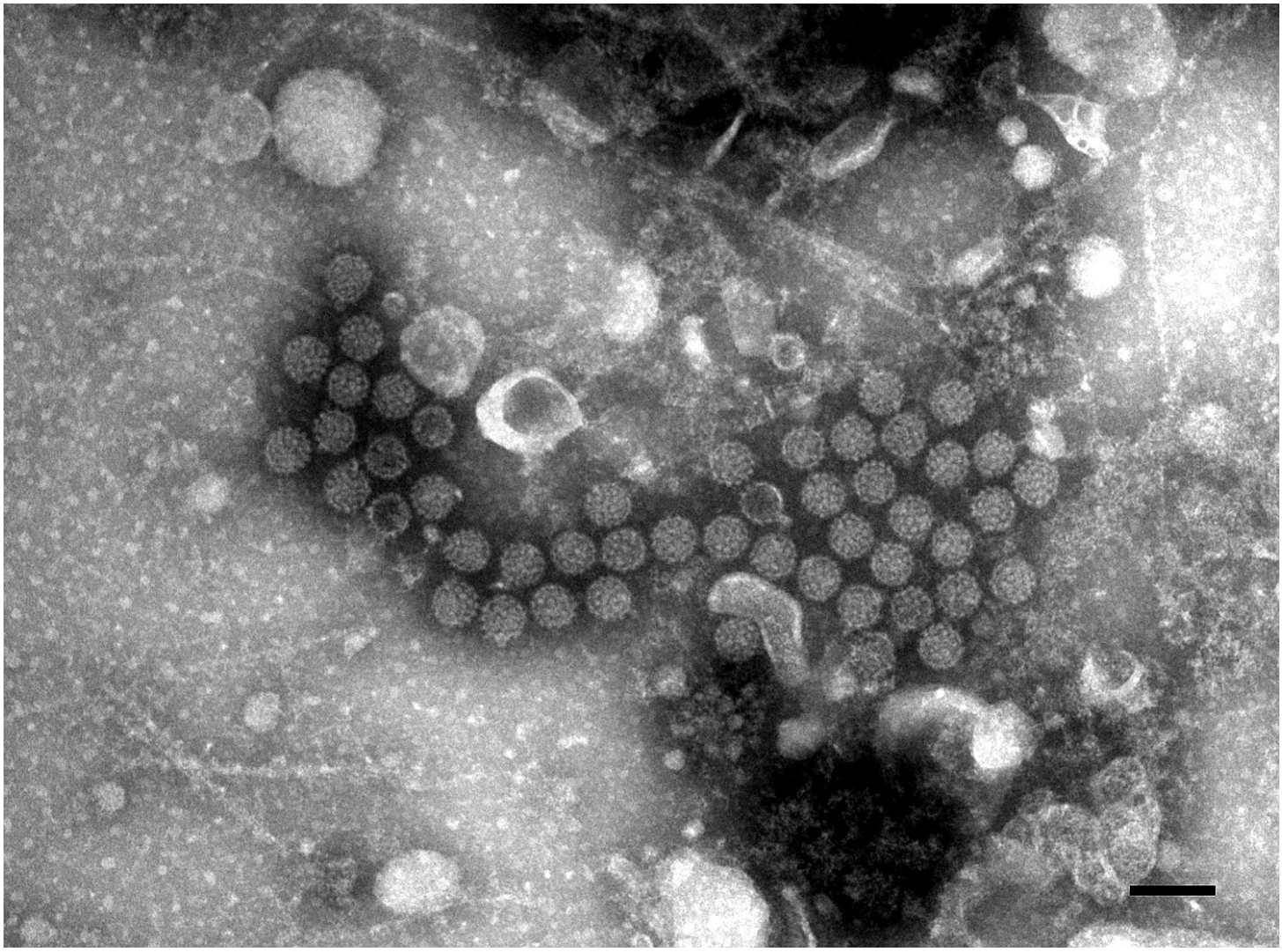
Papillomaviridae



Bovine papillomavirus (BPV). Negative staining, PTA.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

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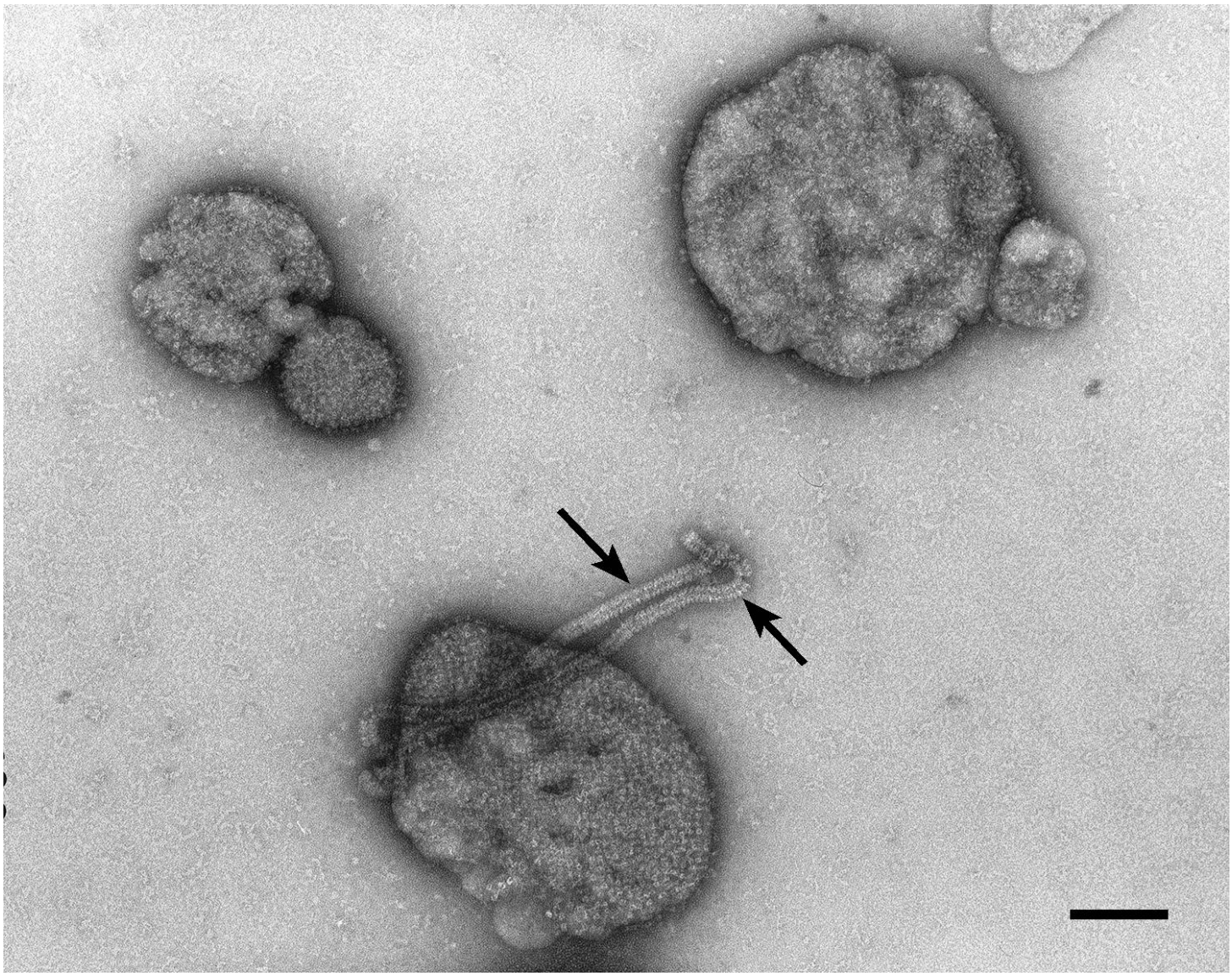
Paramyxoviridae



Paramyxovirus. Negative staining, UA. Pleomorphic virus particles with surface spikes and released ribonucleoprotein (RNP; arrows).

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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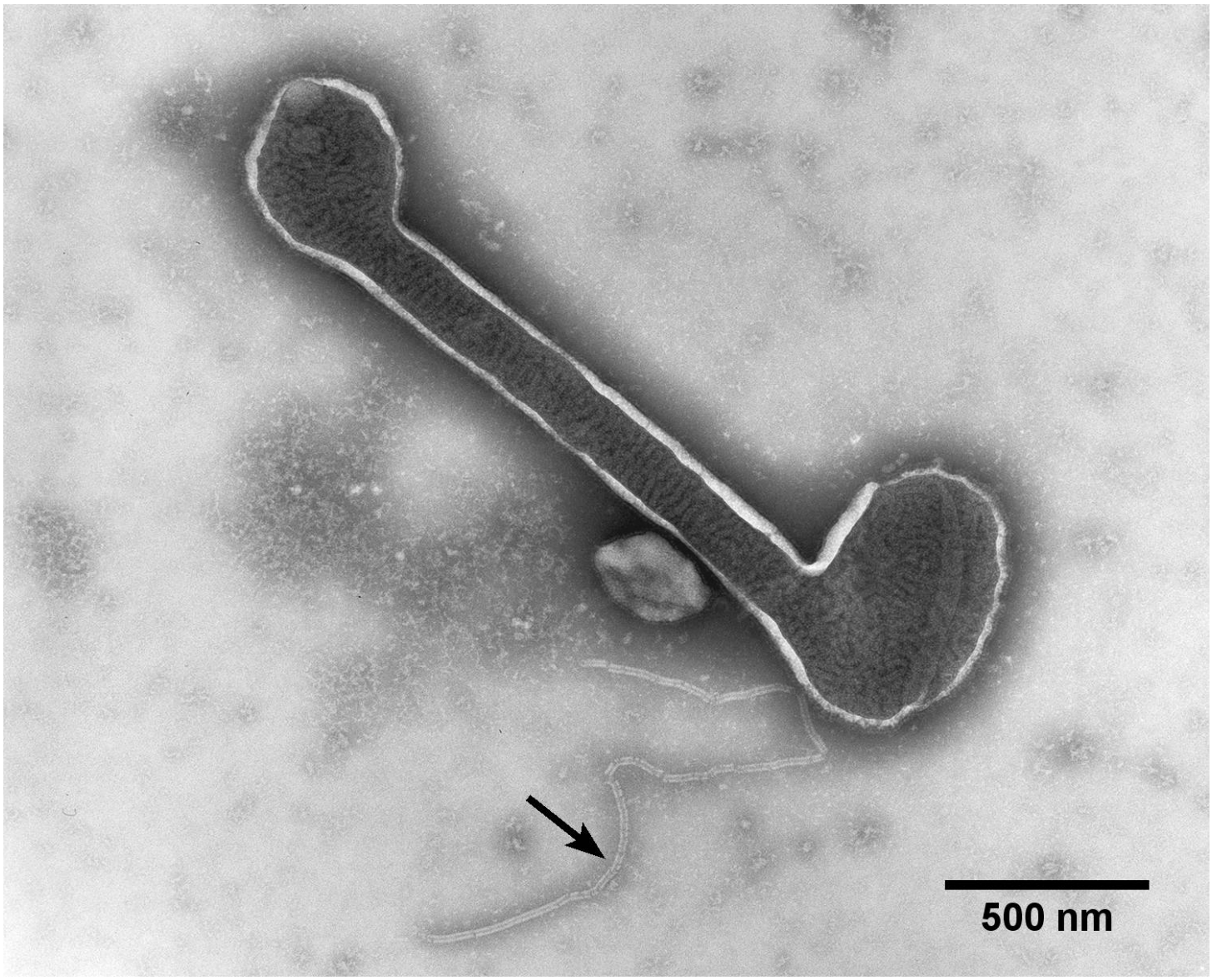
Paramyxoviridae



Paramyxovirus. Negative staining, UA. A giant virus particle which reveals strands of ribonucleoprotein (RNP) in its interior. Extracted RNP (arrow) is also visible in close vicinity of the particle.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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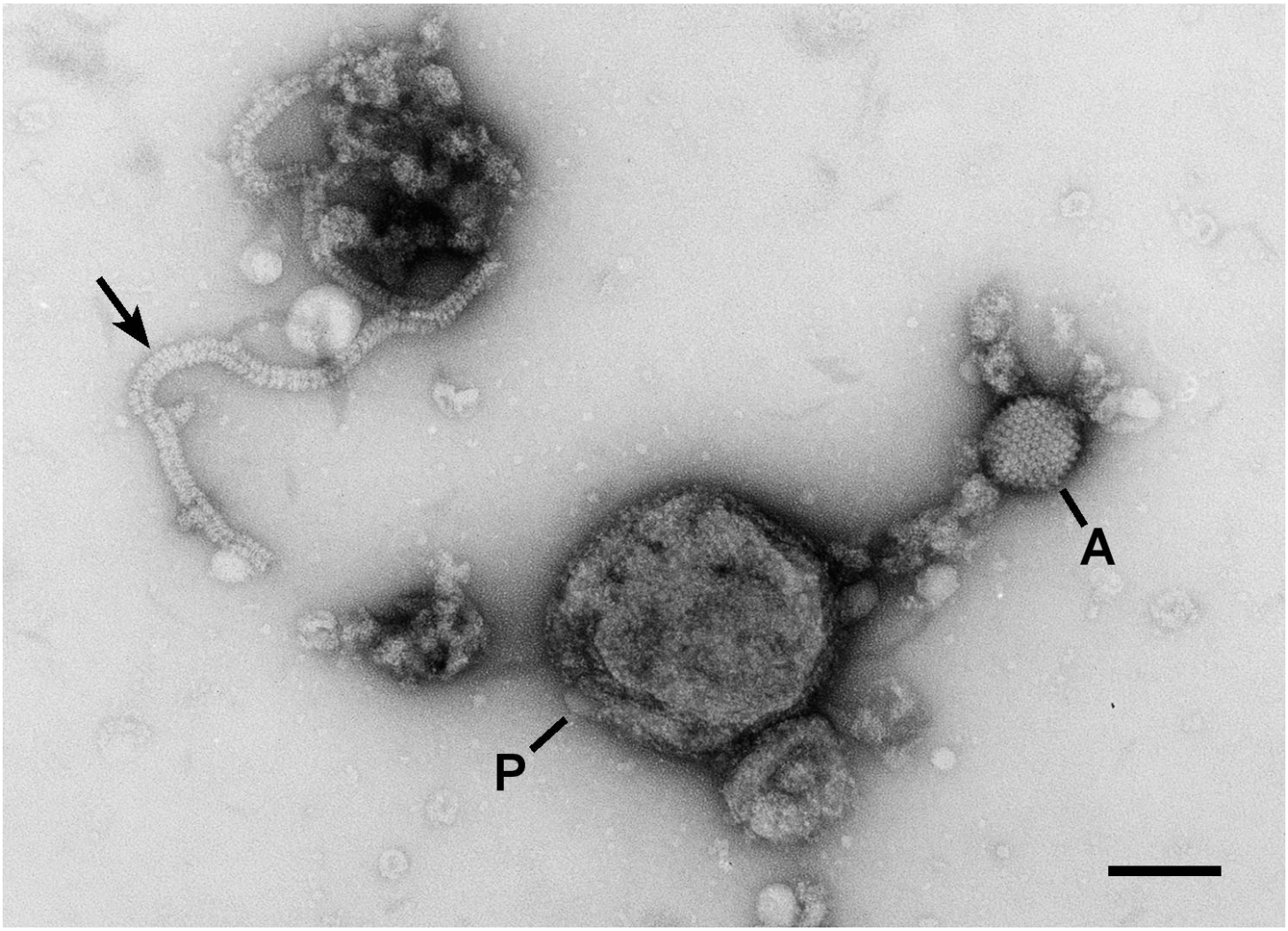
Paramyxoviridae



Paramyxovirus (P) and Adenovirus (A) particles. Negative staining, UA. Cell cultures are sometimes contaminated with Paramyxovirus. While intact particles are rarely seen, ribonucleoprotein (RNP; arrow) is a clear indication for a contamination with Paramyxovirus.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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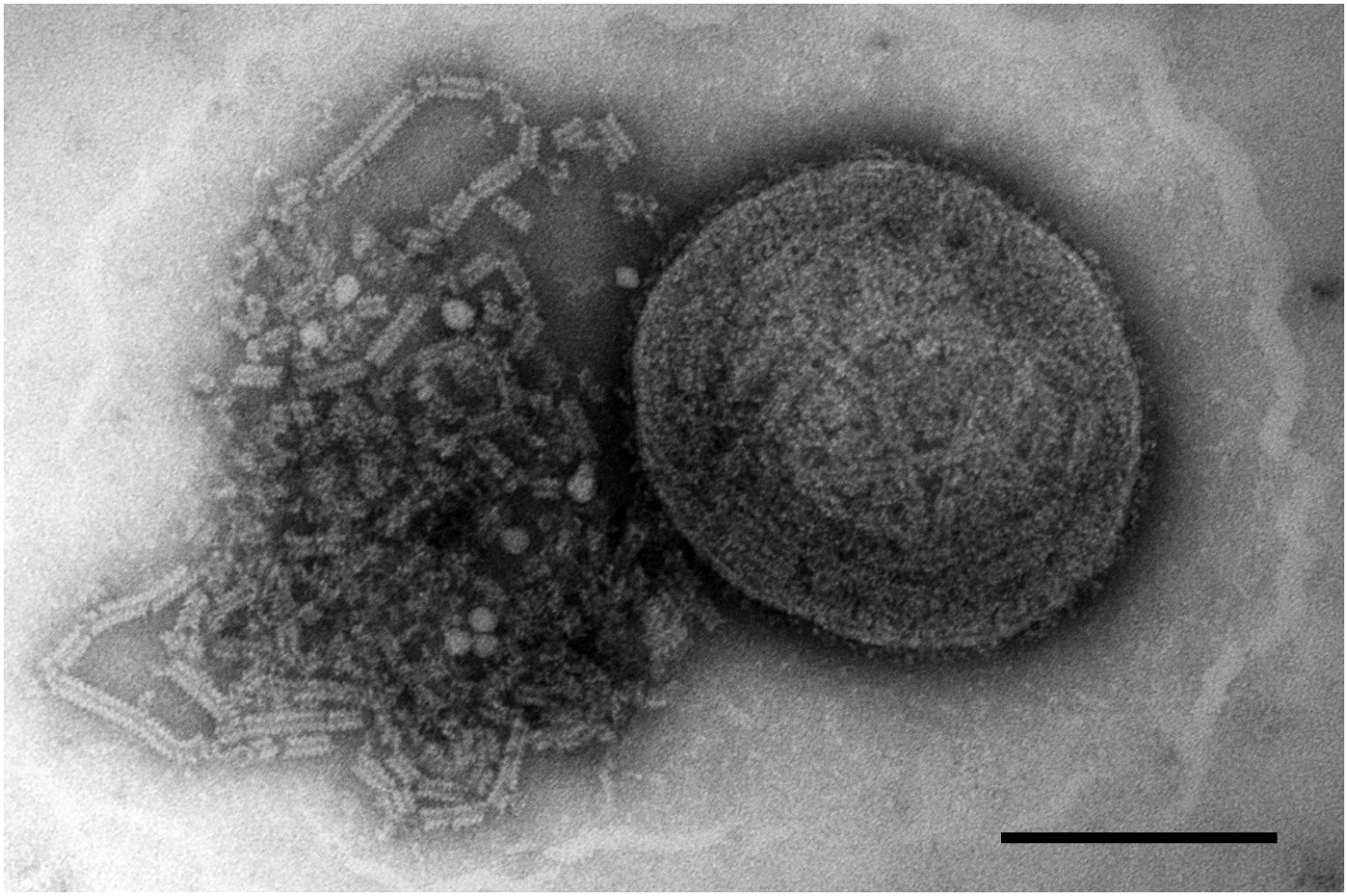
Paramyxoviridae



Sendai virus (SeV). Genus: Respirovirus. Negative staining, PTA. A single virus particle reveals strands of ribonucleoprotein (RNP) in the particle interior and masses of extracted and defragmented RNP around.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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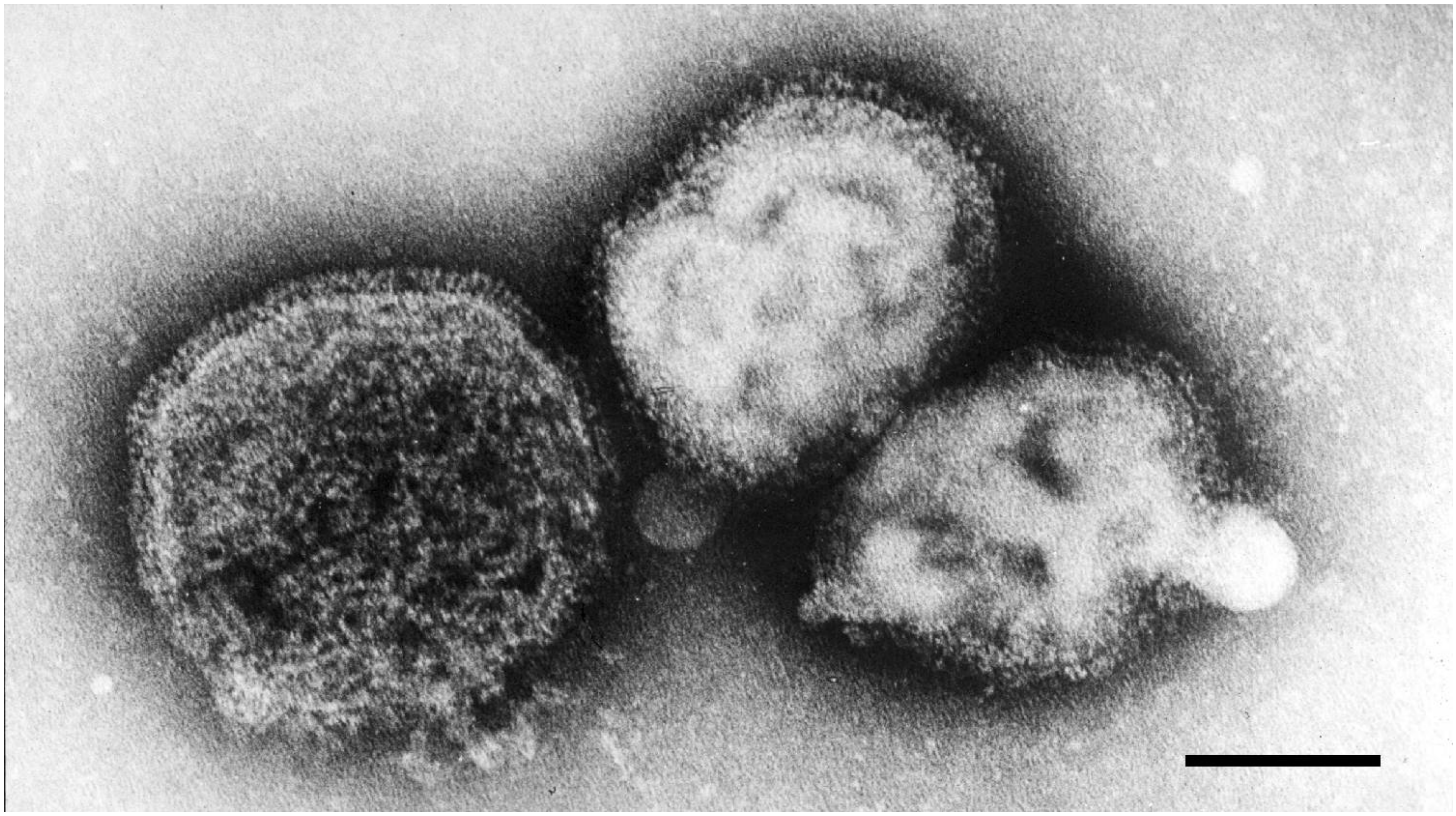
Paramyxoviridae



Measles virus (MeV). Genus: Morbillivirus. Negative staining, UA.

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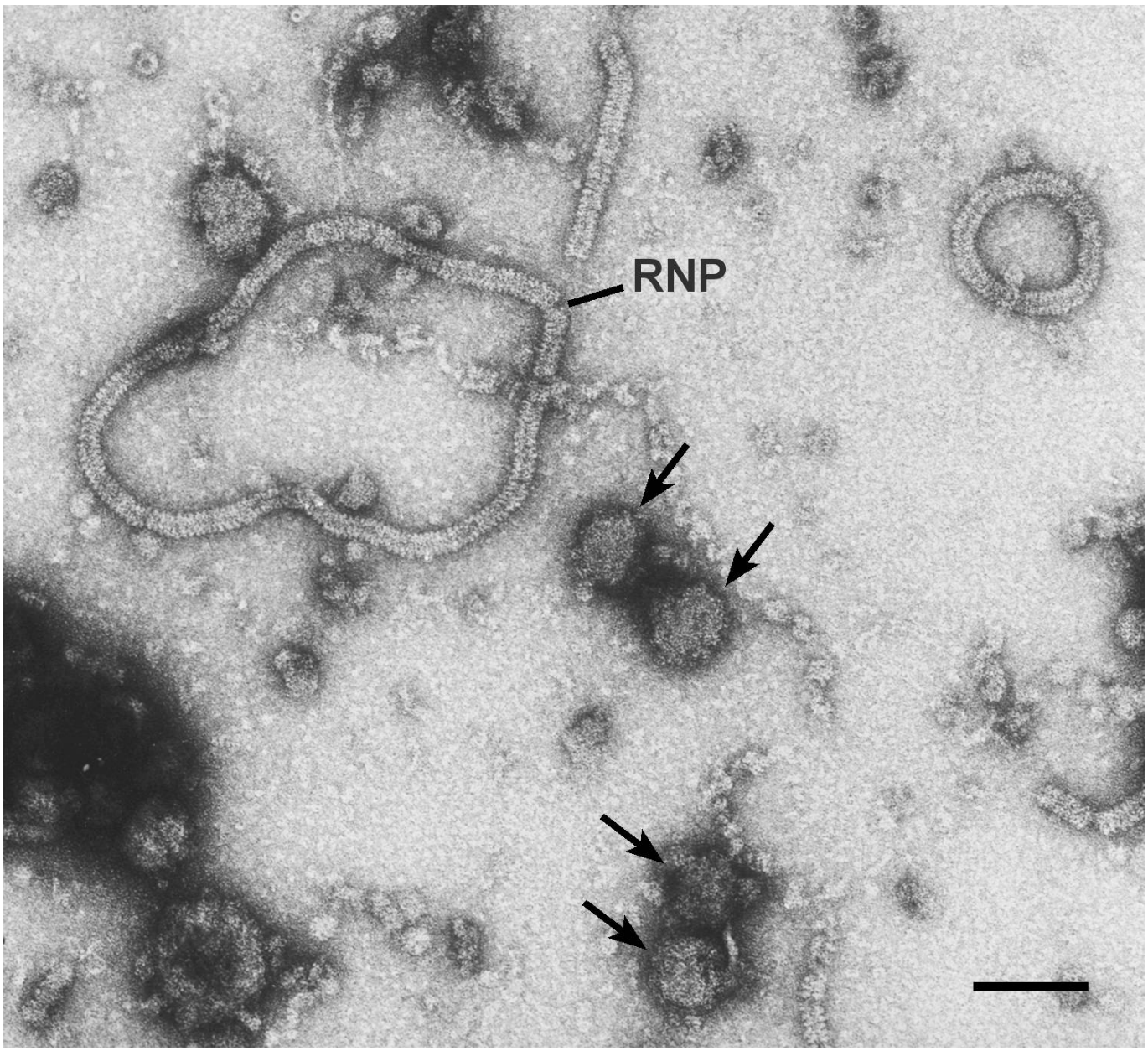
Paramyxoviridae



Paramyxovirus ribonucleoprotein (RNP) and Semliki Forest virus (SFV, Togaviridae, Genus: Alphavirus; arrows). Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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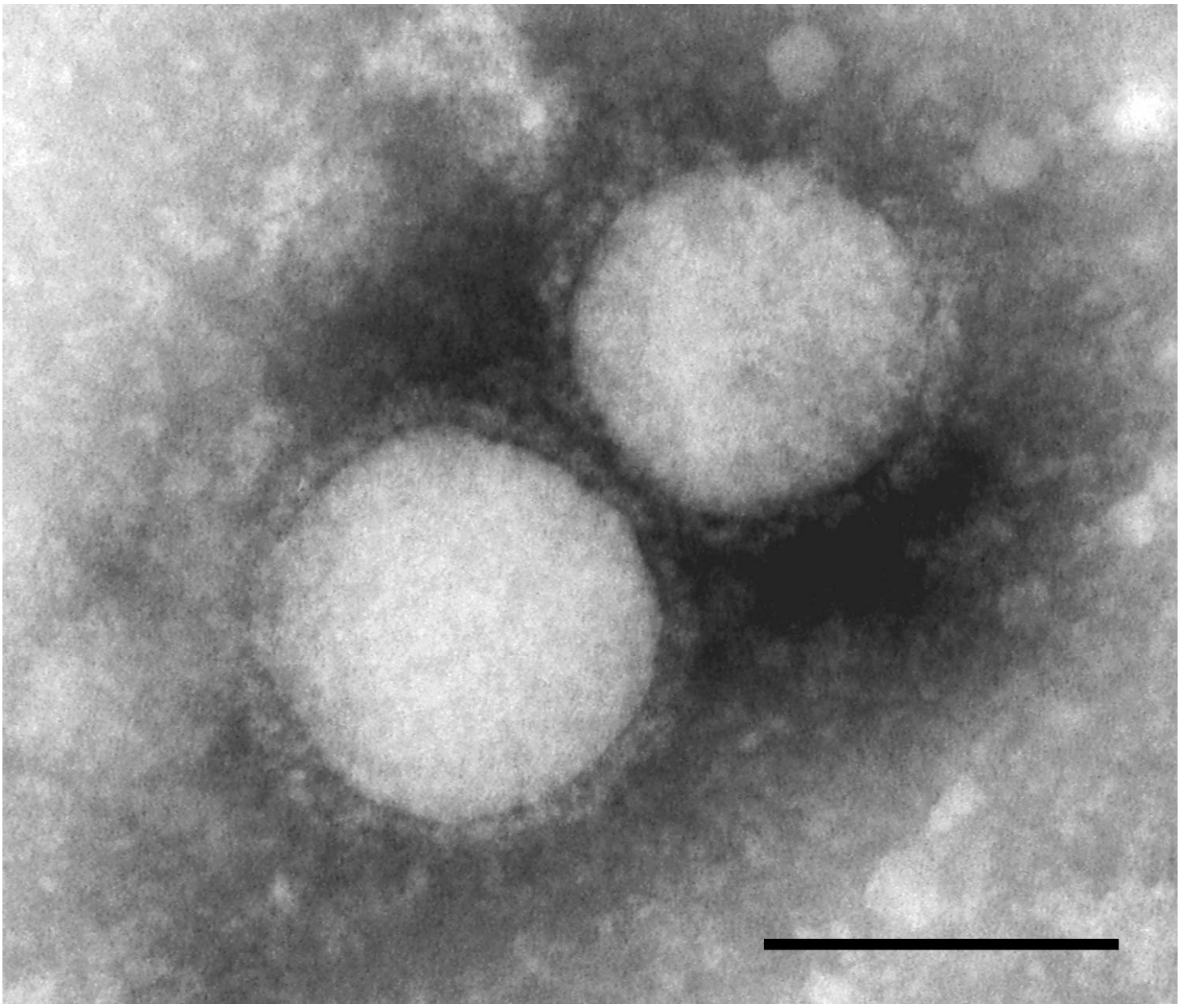
Paramyxoviridae



Newcastle disease virus (NDV). Genus: Avulavirus. Negative staining, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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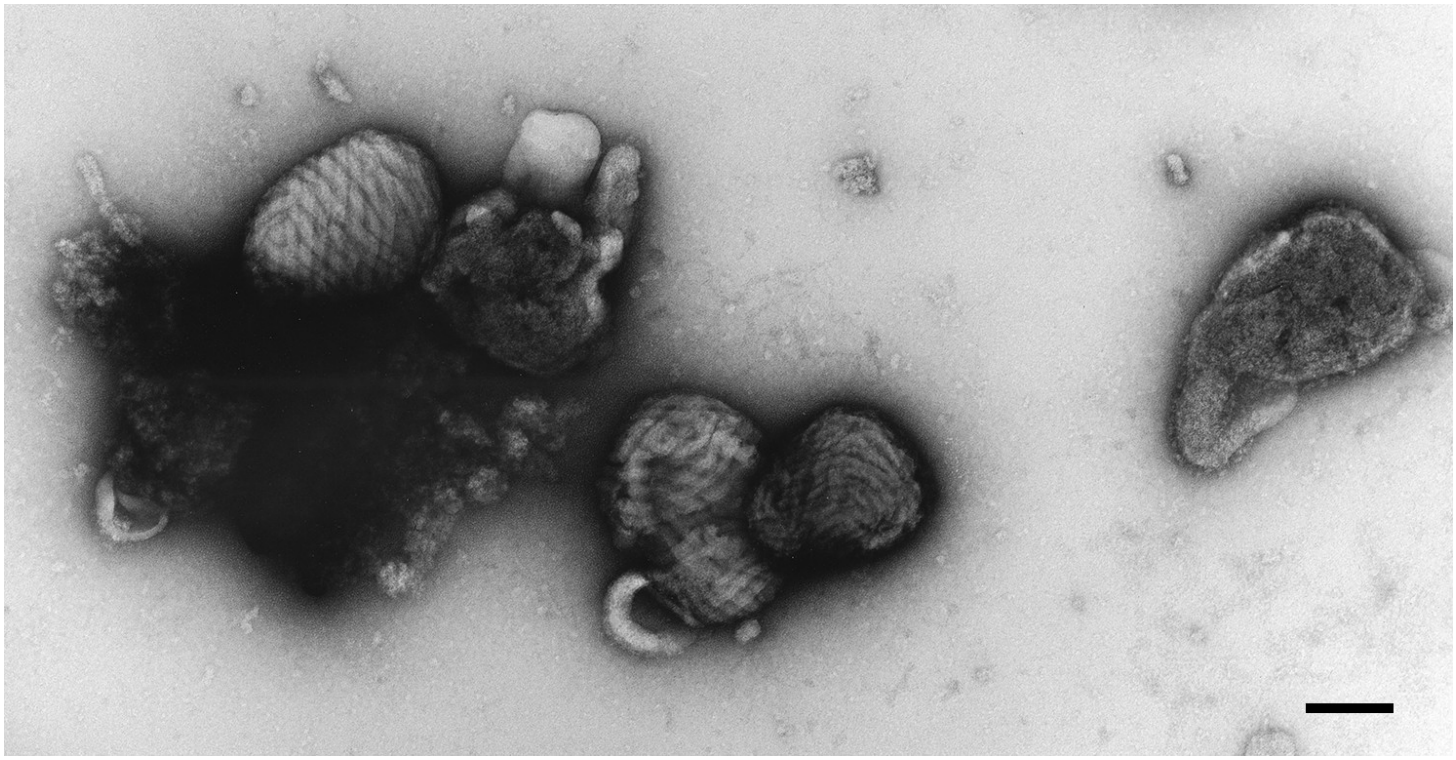
Paramyxoviridae



Orf virus (ORFV) = Contagious postular dermatitis virus = Contagious ecthyma virus. Genus: Parapoxvirus. Negative staining of cell culture supernatant. Co-infection with Paramyxovirus (particle at the right side).

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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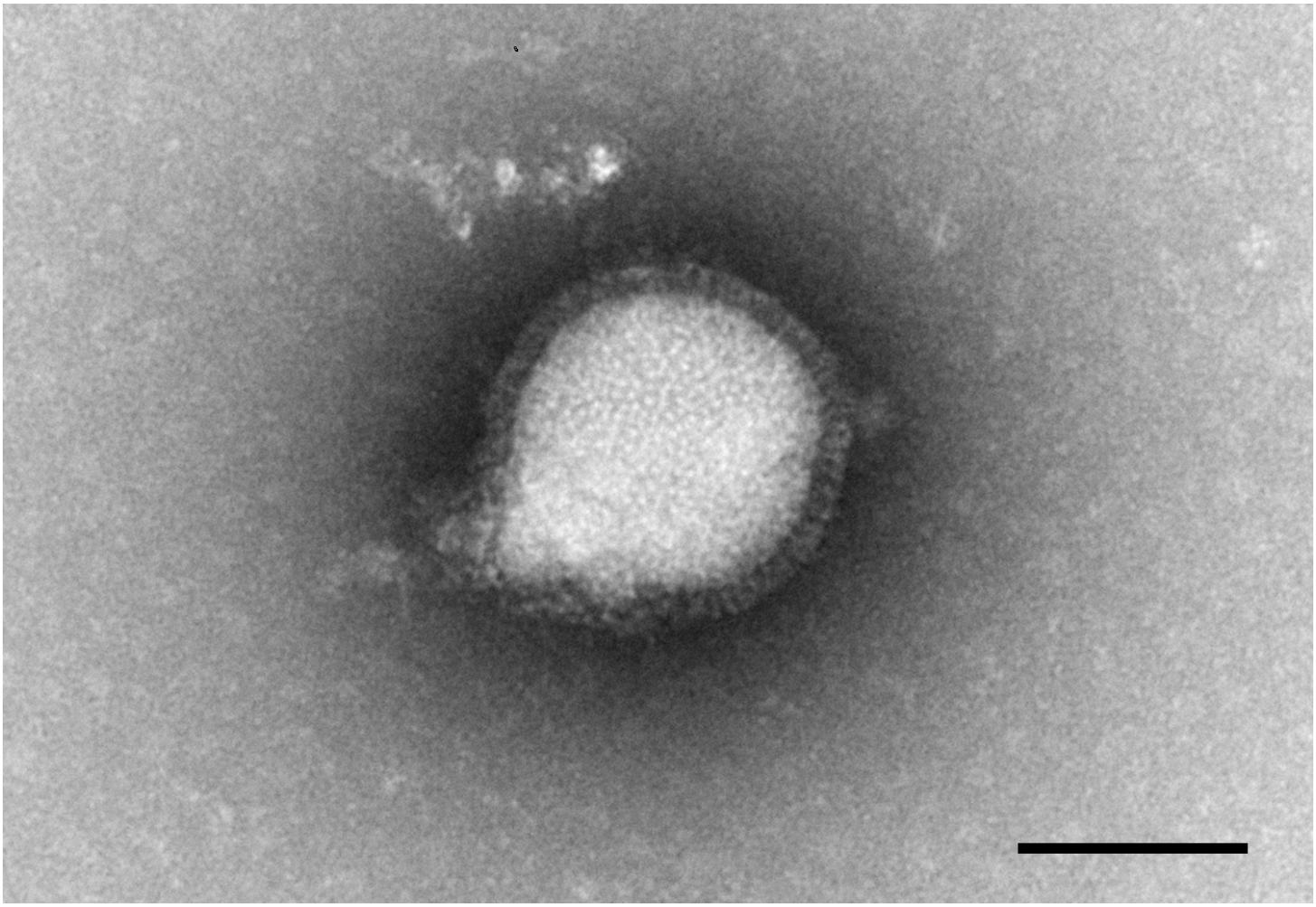
Paramyxoviridae



Mumps virus (MuV). Genus: Morbillivirus. Negative staining, PTA.

Image source: Michael Laue, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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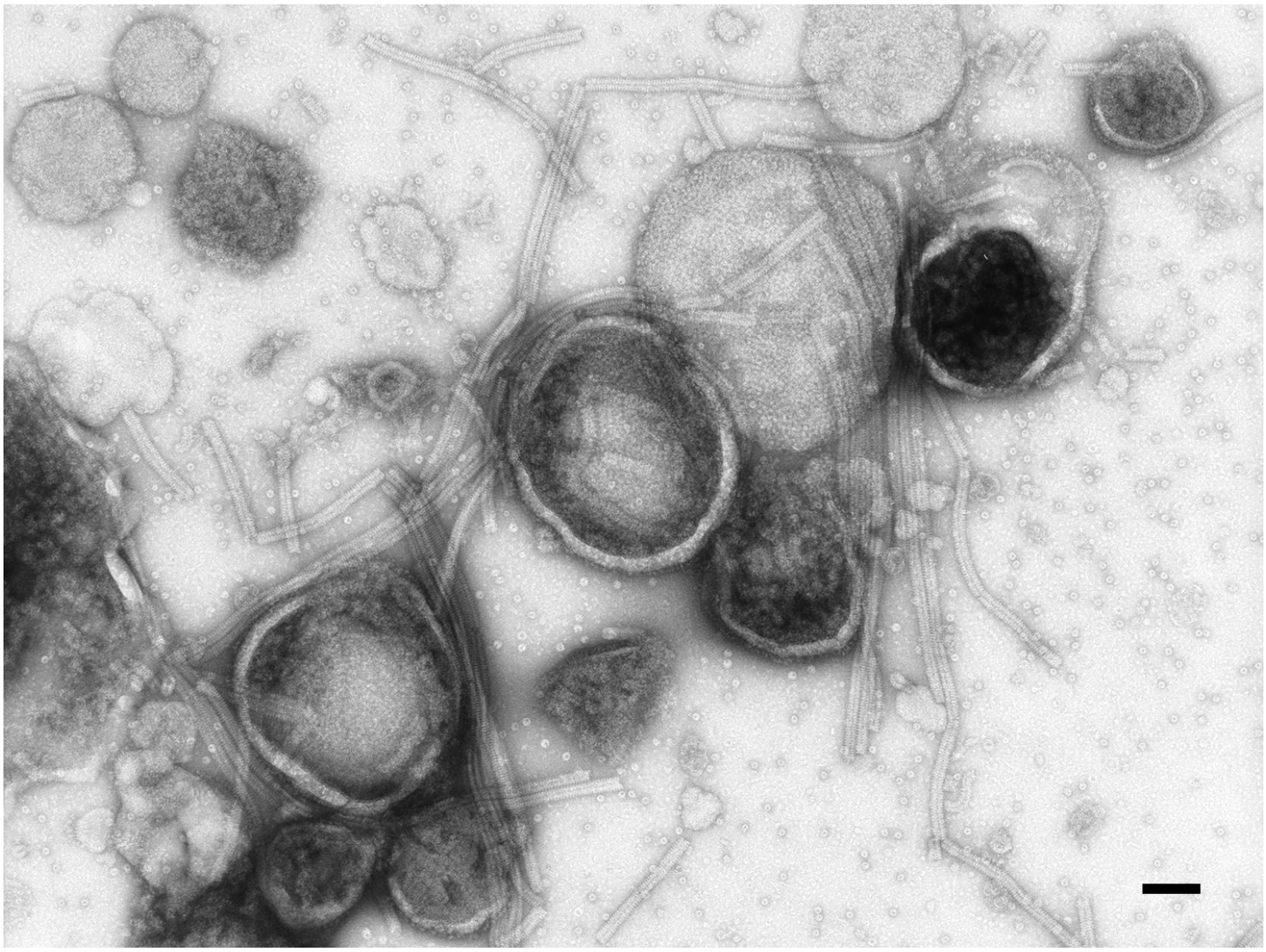
Paramyxoviridae



Human respiratory syncytial virus (HRSV). Genus: Pneumovirus. Negative staining, UA.

Image source: Andrea Männel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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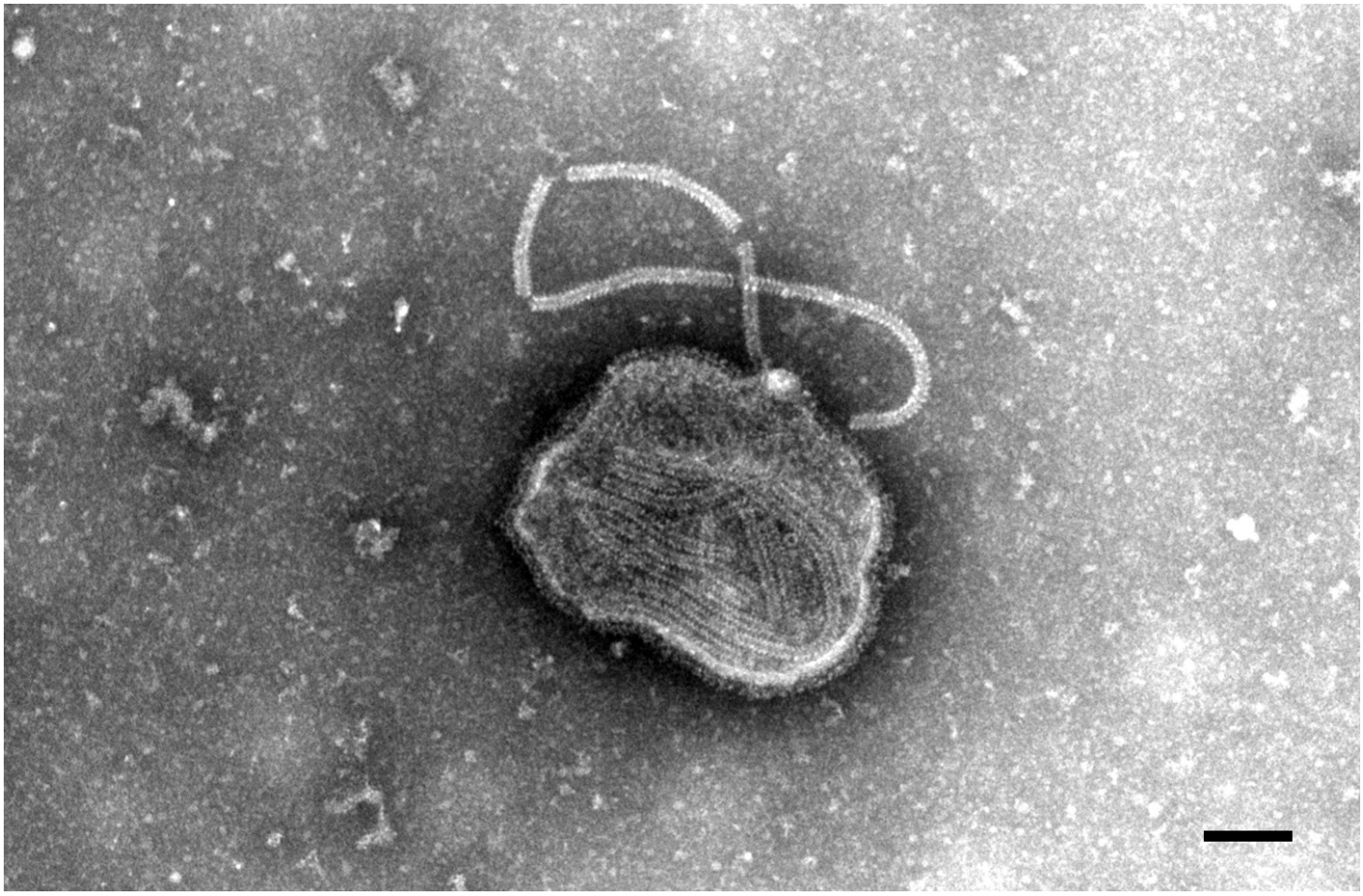
Paramyxoviridae



Bovine paramyxovirus. Negative staining, PTA. RNP is visible within the virus particle and outside.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

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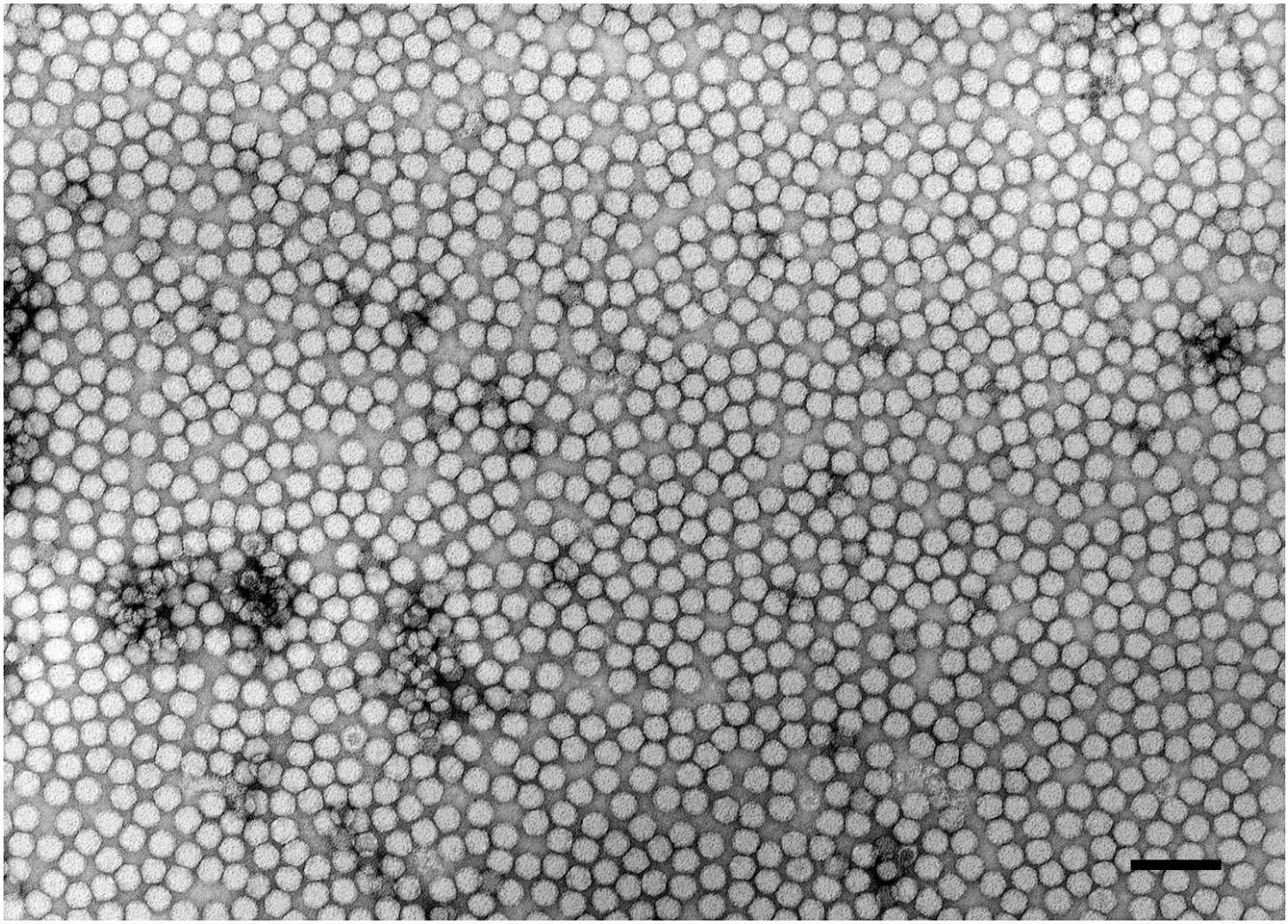
Parvoviridae



Adeno-associated virus (AAV). Genus: Dependovirus. Negative staining.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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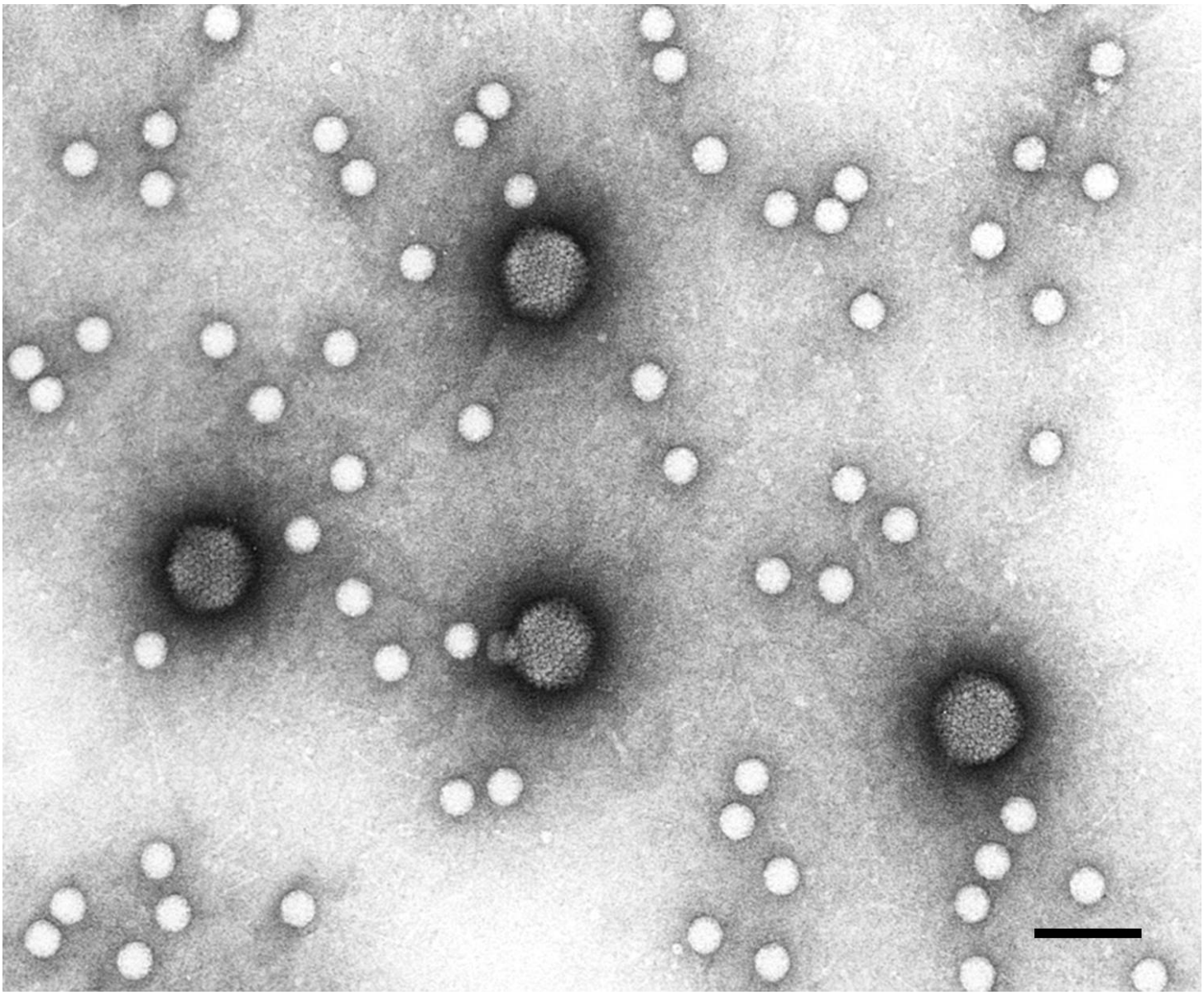
Parvoviridae



Adeno-associated virus (AAV). Genus: Dependovirus. Negative staining. Sample with particles of both, the small Adeno-associated virus and the much bigger Adenovirus.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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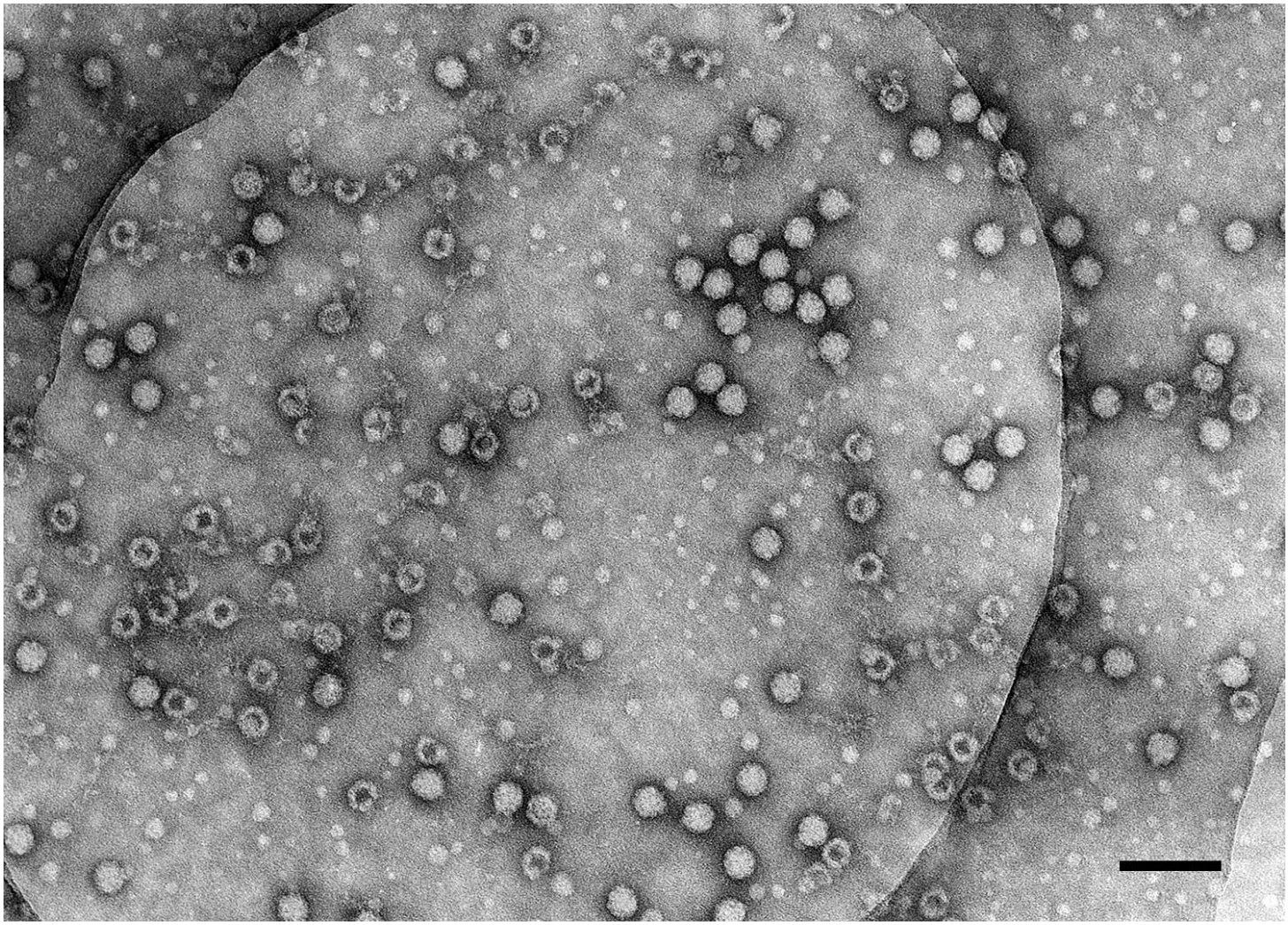
Parvoviridae



Porcine parvovirus (PPV). Genus: Parvovirus. Negative staining on carbon film on holey grid. Intact and damaged particles which show a dark core are visible side by side.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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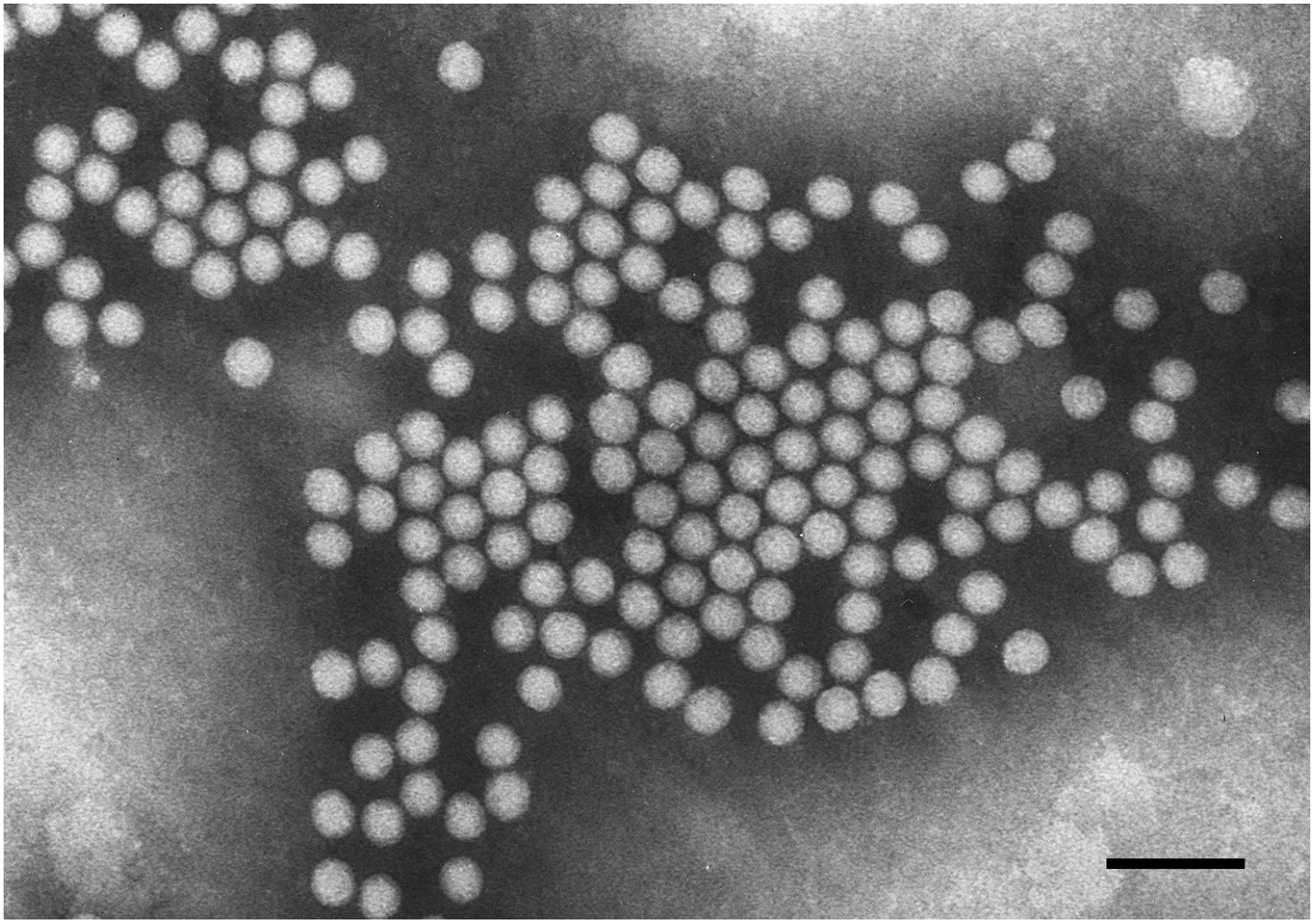
Picornaviridae



Poliovirus (PV). Genus: Enterovirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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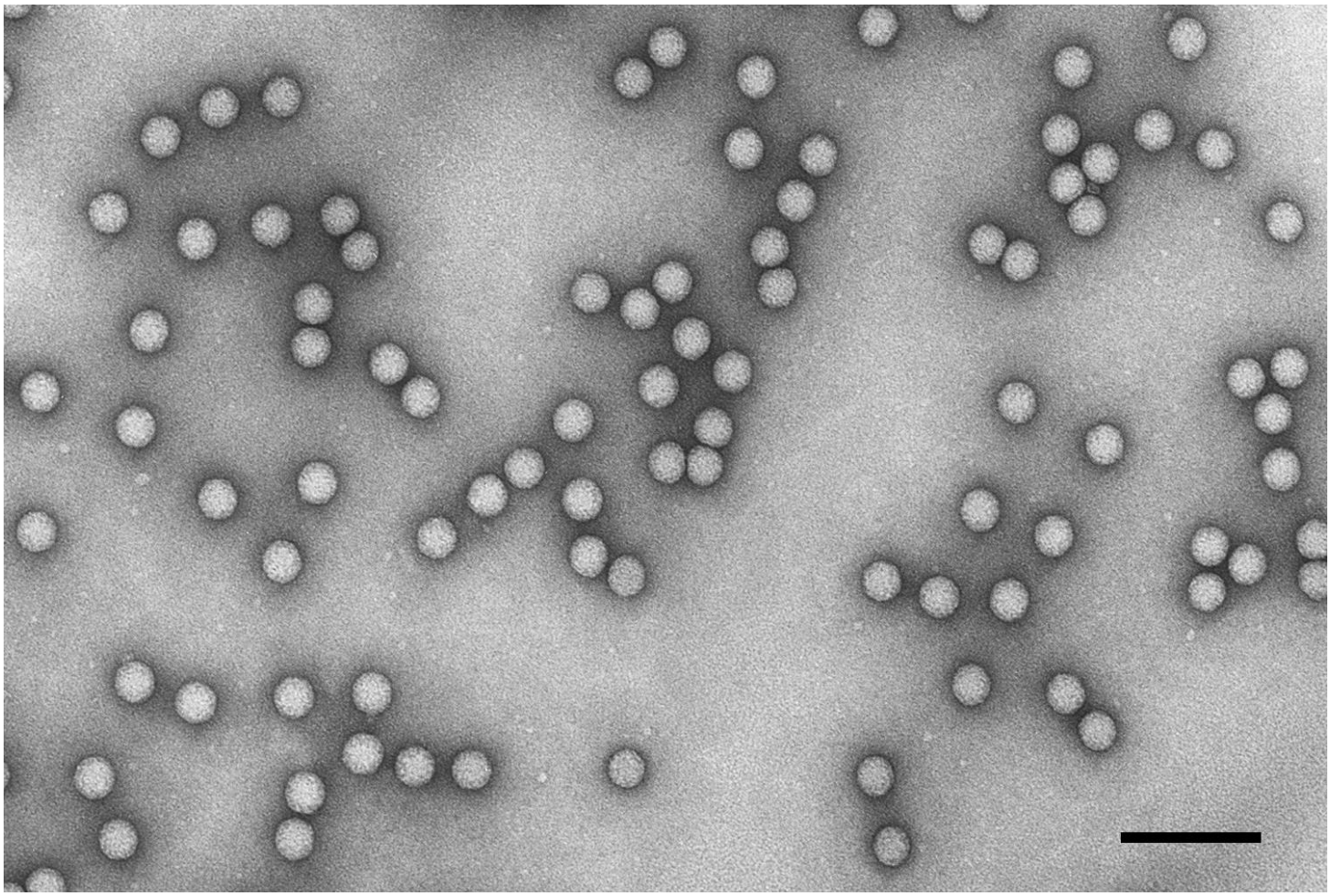
Picornaviridae



Poliovirus (PV). Genus: Enterovirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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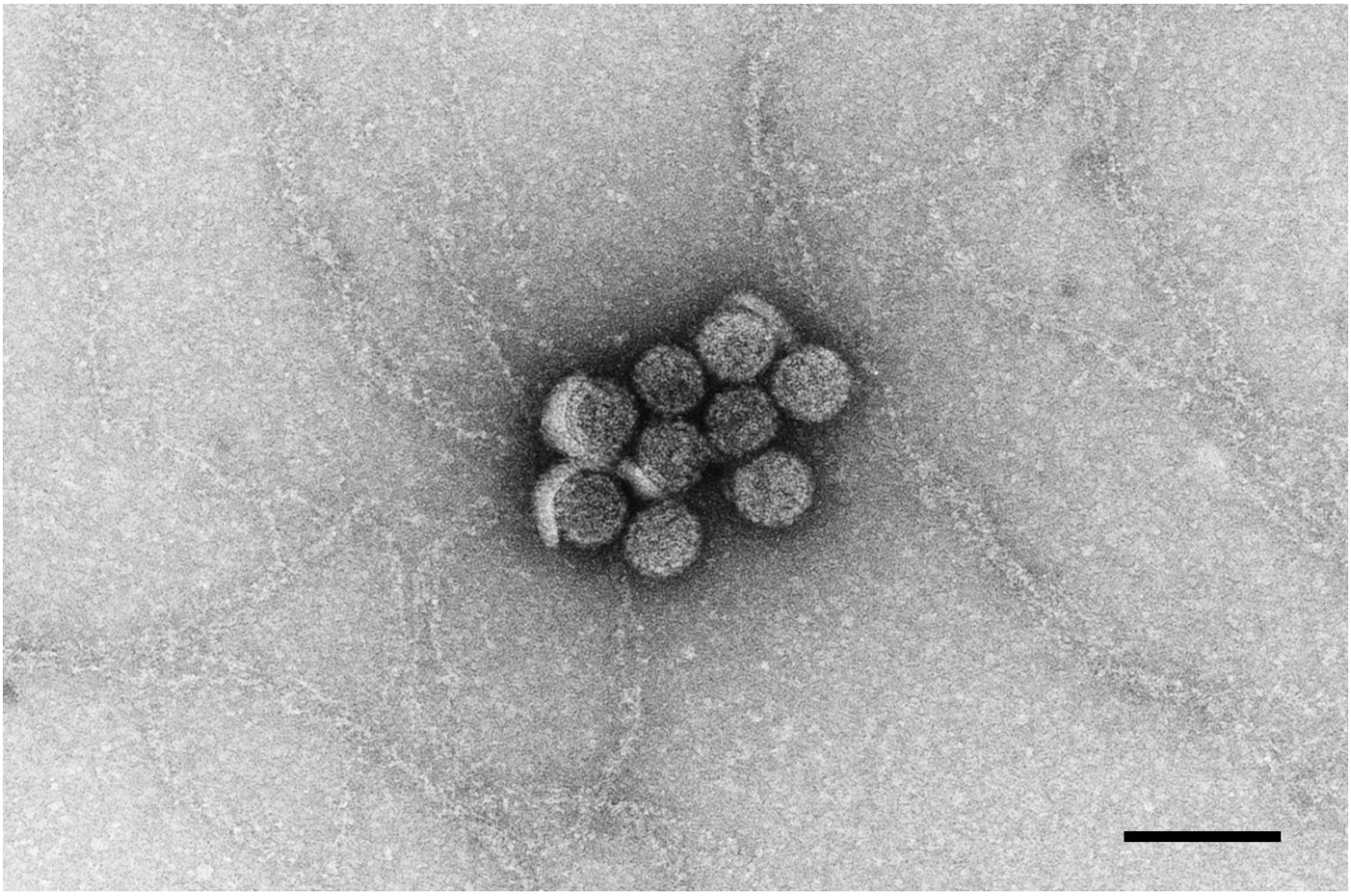
Polyomaviridae



Human polyomavirus (HPyV). Genus: Polyomavirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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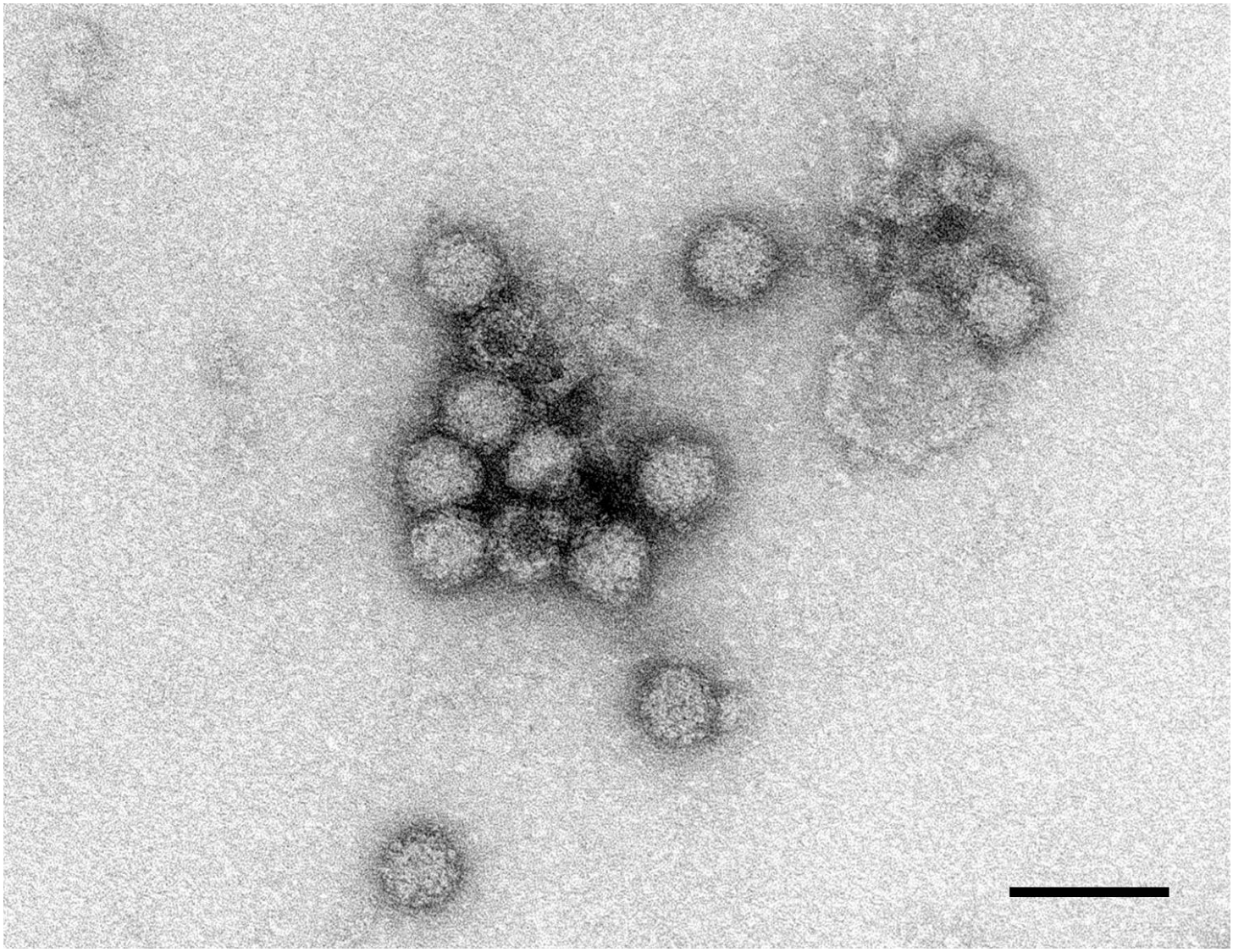
Polyomaviridae



JC polyomavirus (JCPyV). Genus: Polyomavirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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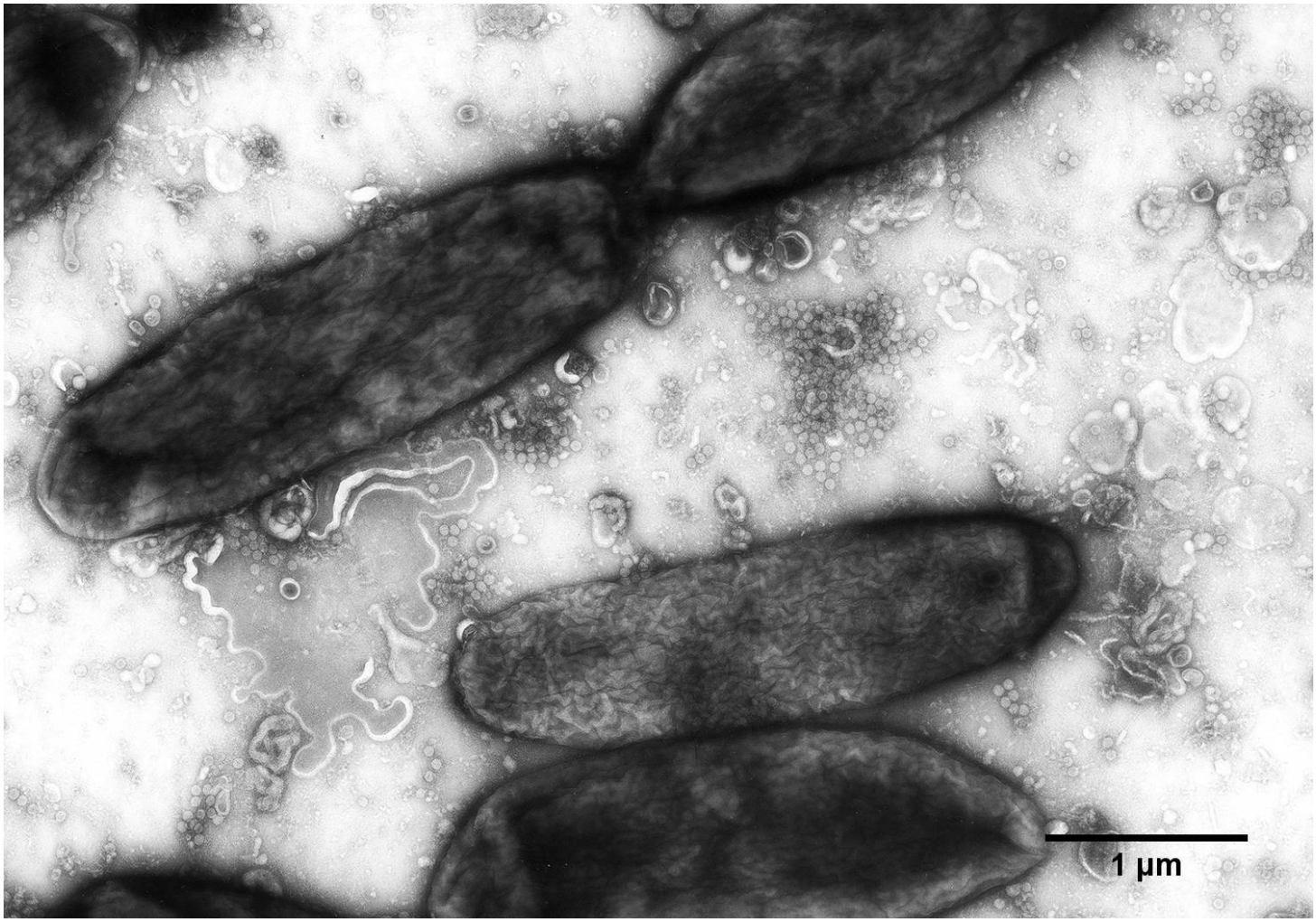
Polyomaviridae



Human polyomavirus (HPyV). Genus: Polyomavirus. Negative staining (PTA) of a urine sample. Virus particles are visible between rod-shape bacteria. Compare enlarged view in the following image.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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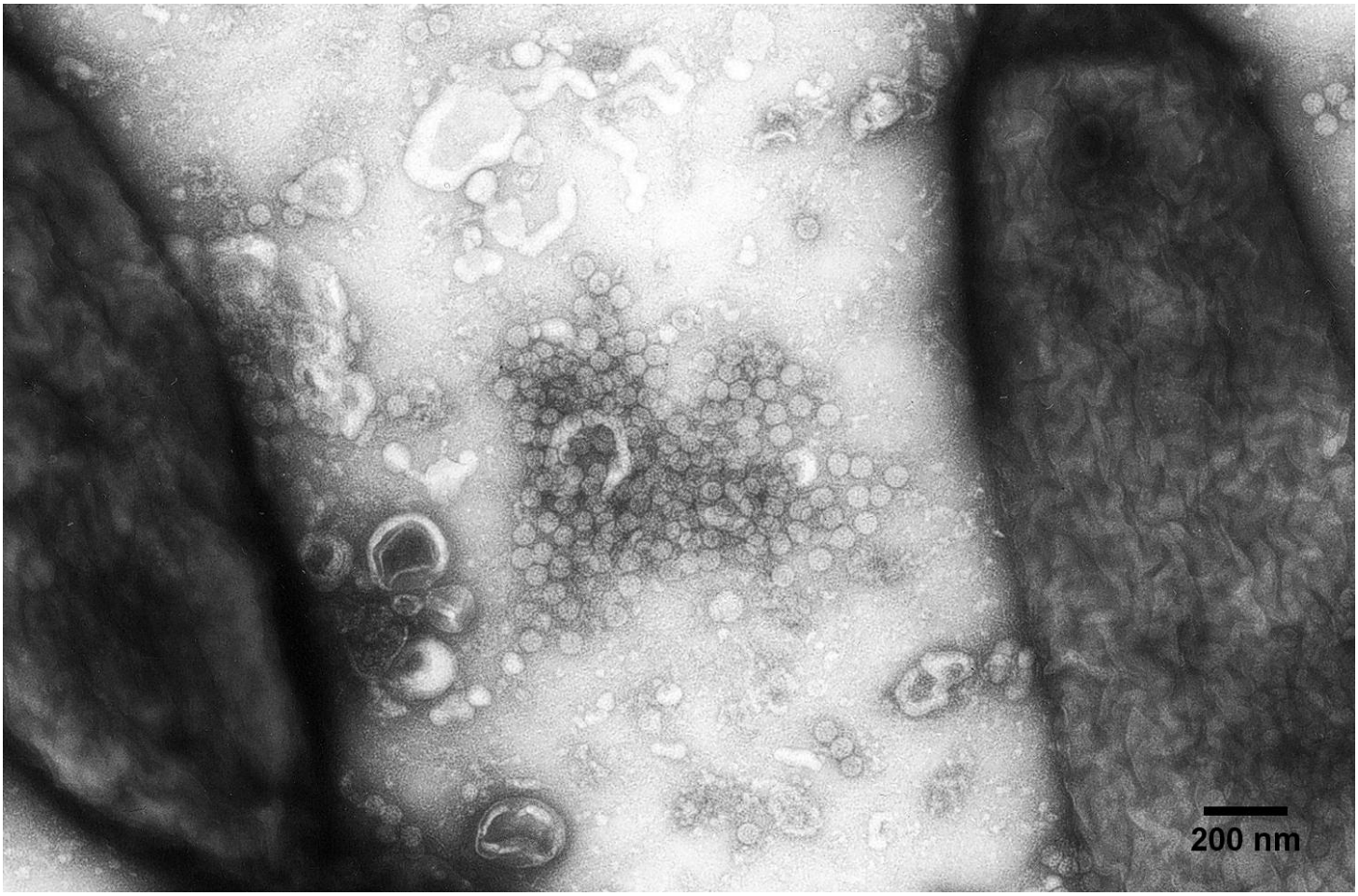
Polyomaviridae



Human polyomavirus (HPyV). Genus: Polyomavirus. Negative staining of a urine sample, PTA. Virus particles are visible between rod-shape bacteria. Compare overview in the preceeding image.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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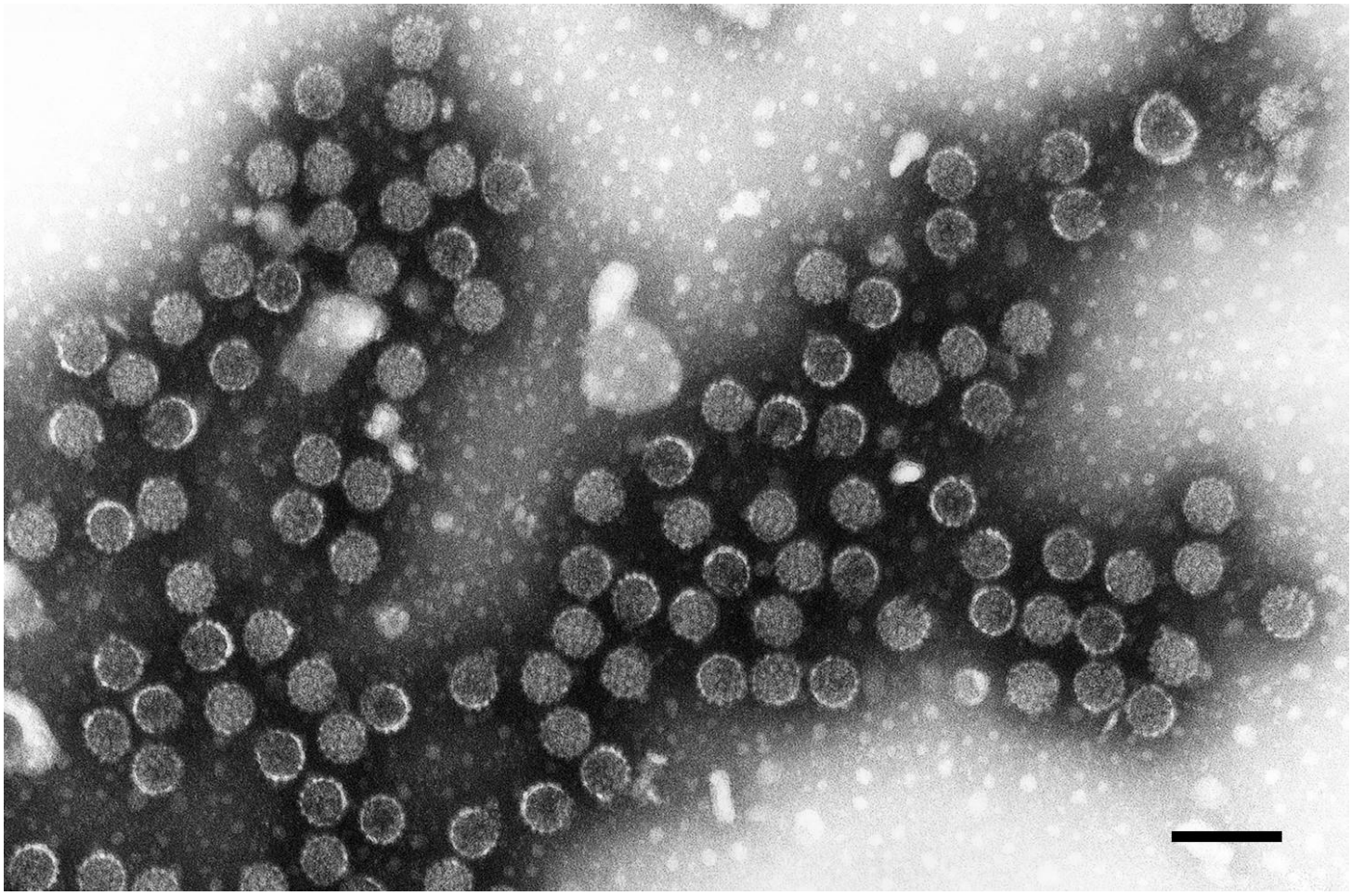
Polyomaviridae



Human polyomavirus (HPyV). Genus: Polyomavirus. Negative staining, PTA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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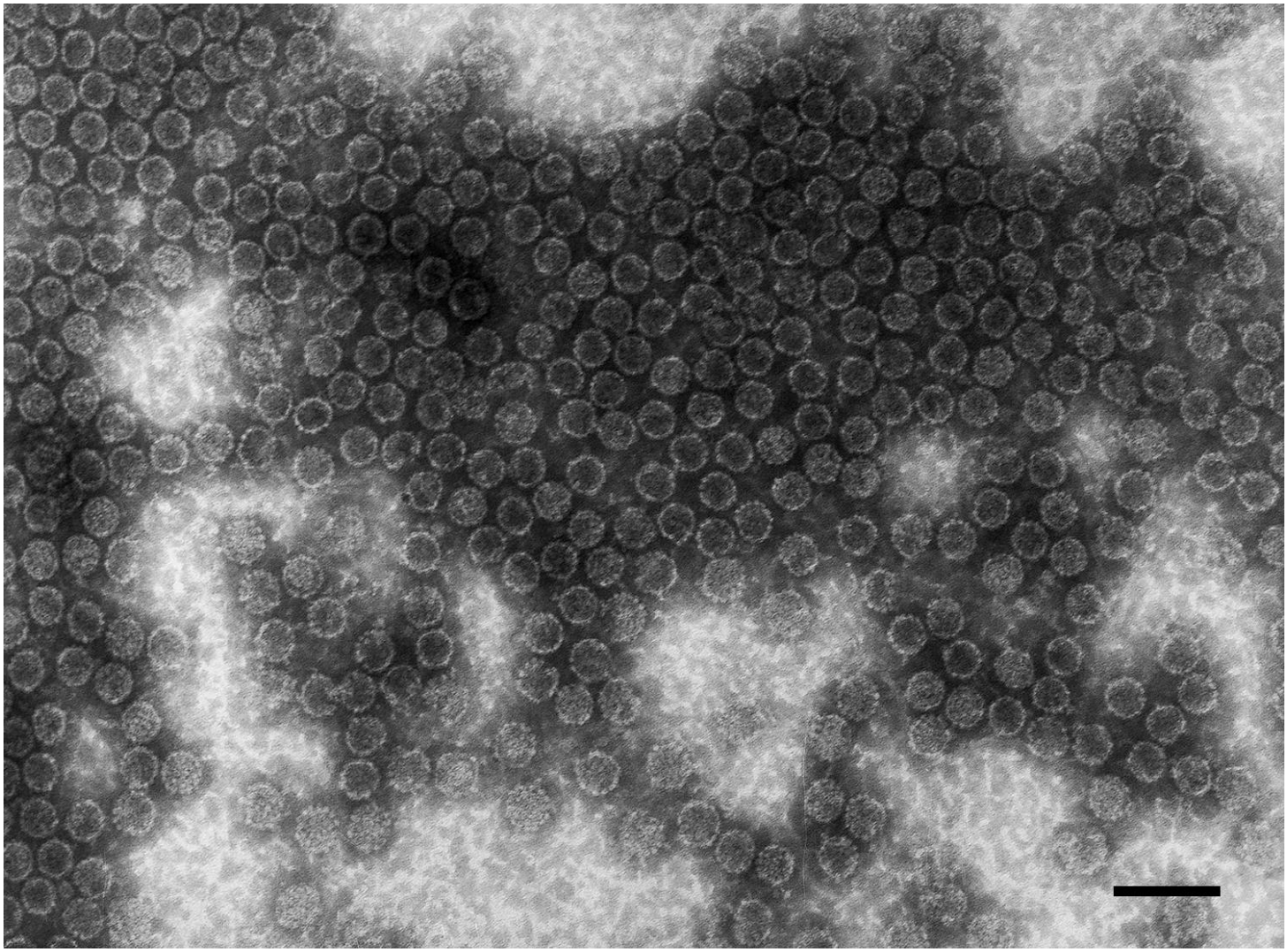
Polyomaviridae



Simian virus 40 (SV40). Genus: Polyomavirus. Negative staining, PTA. Note that the stain has penetrated the capsids.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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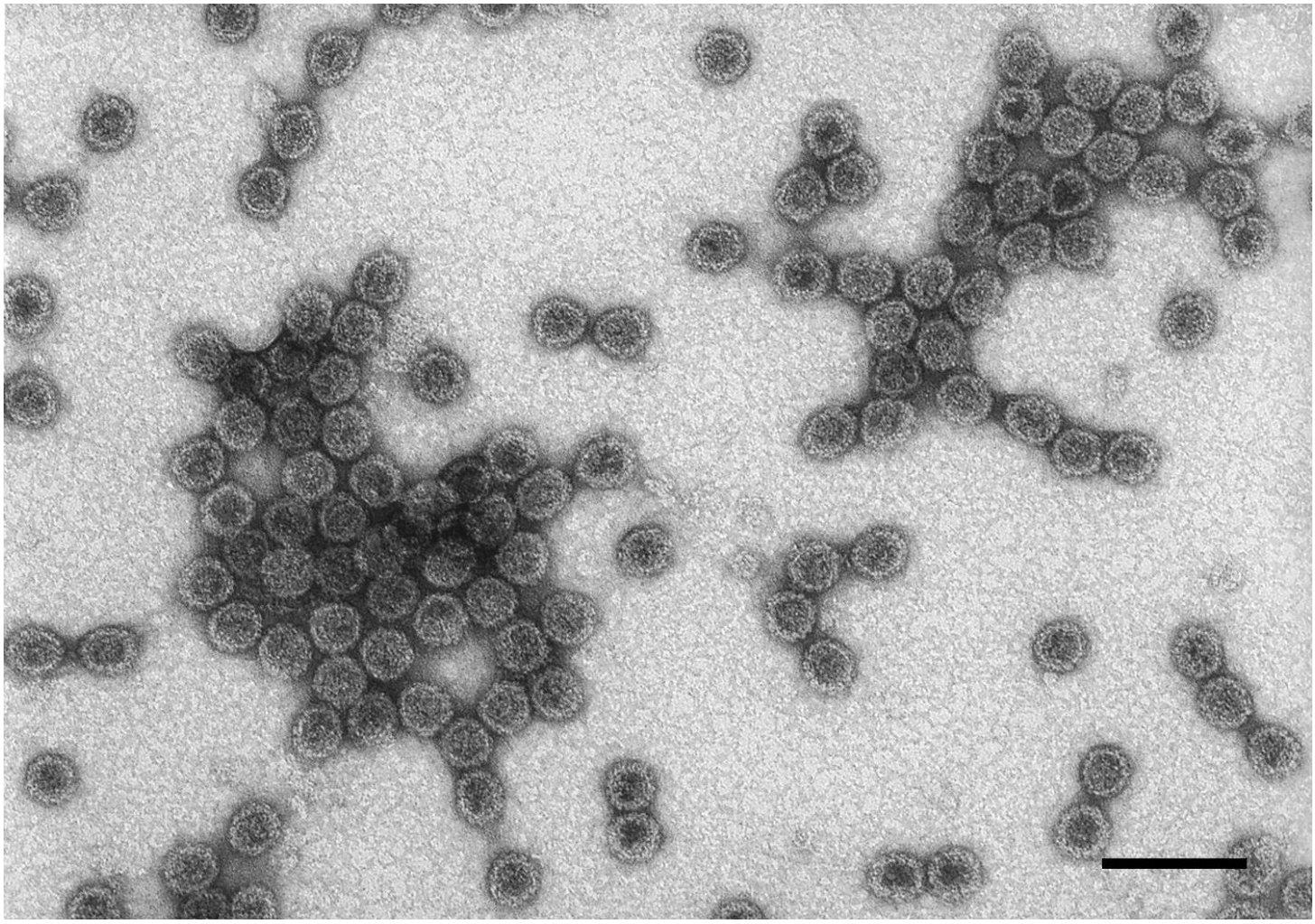
Polyomaviridae



Simian virus 40 (SV40). Genus: Polyomavirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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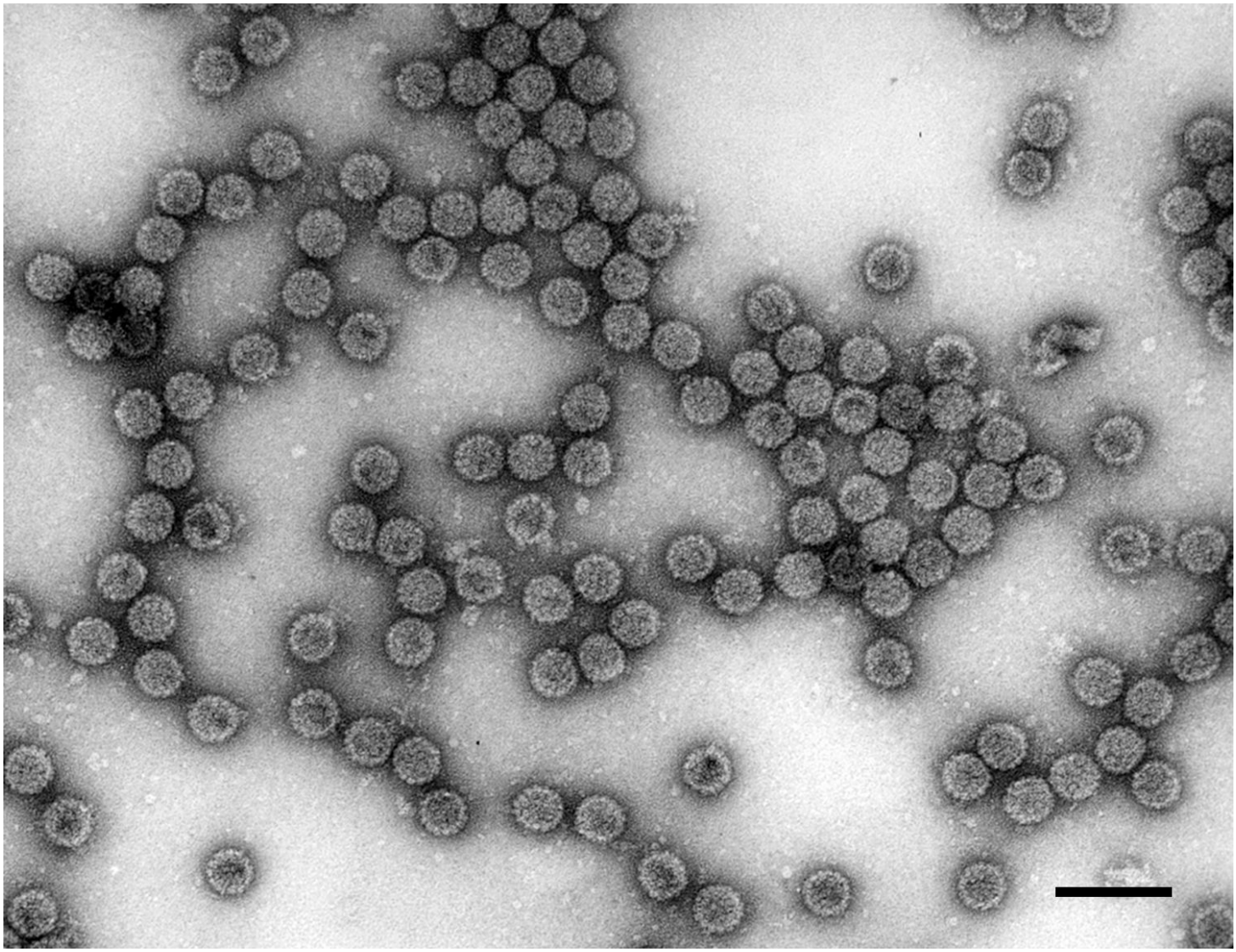
Polyomaviridae



Hamster polyomavirus (HaPyV). Genus: Polyomavirus. Negative staining, PTA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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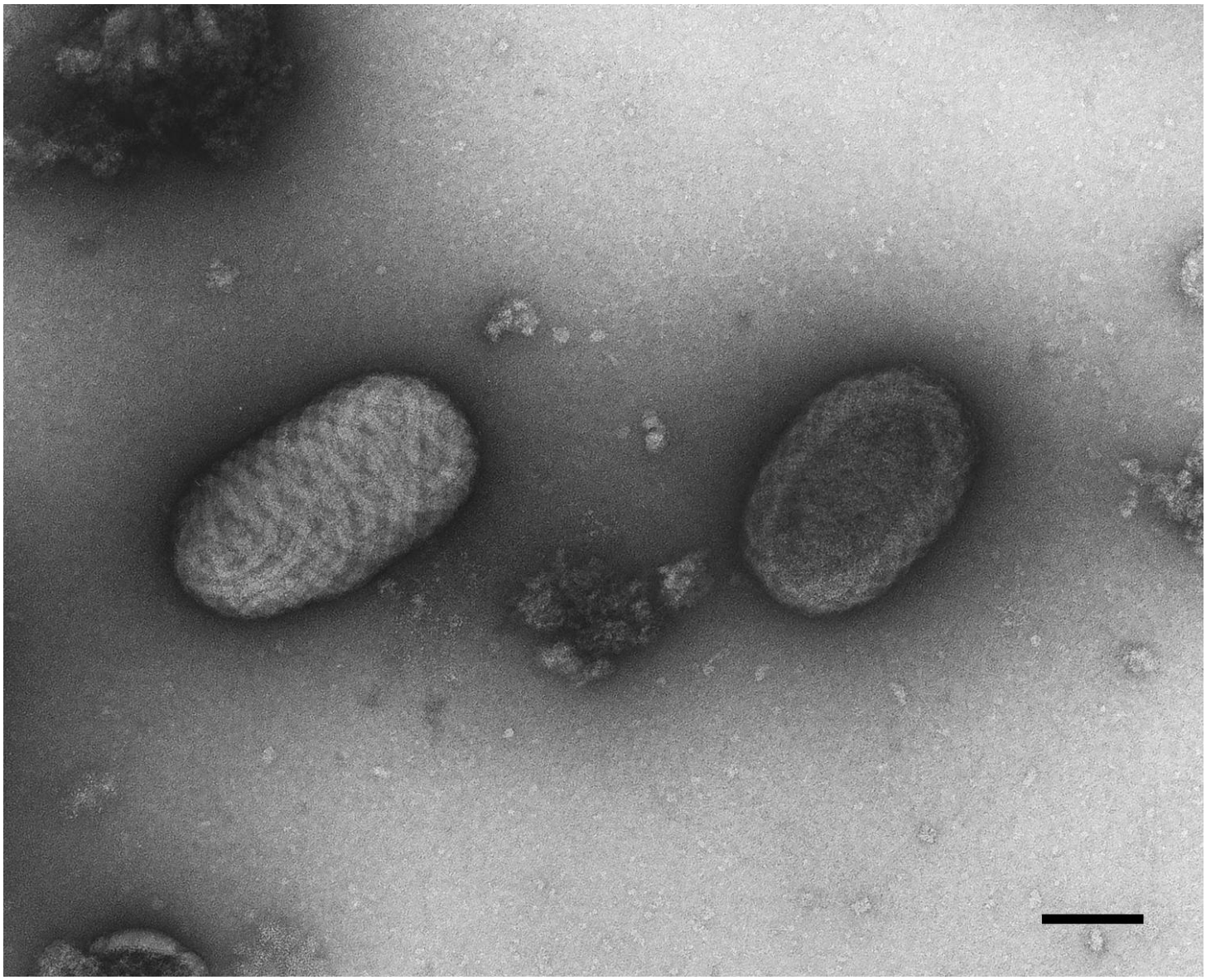
Poxviridae



Orf virus (ORFV) = Contagious postular dermatitis virus = Contagious ecthyma virus. Genus: Parapoxvirus. Negative staining, UA. Comparison of M-type (left) and C-type (right).

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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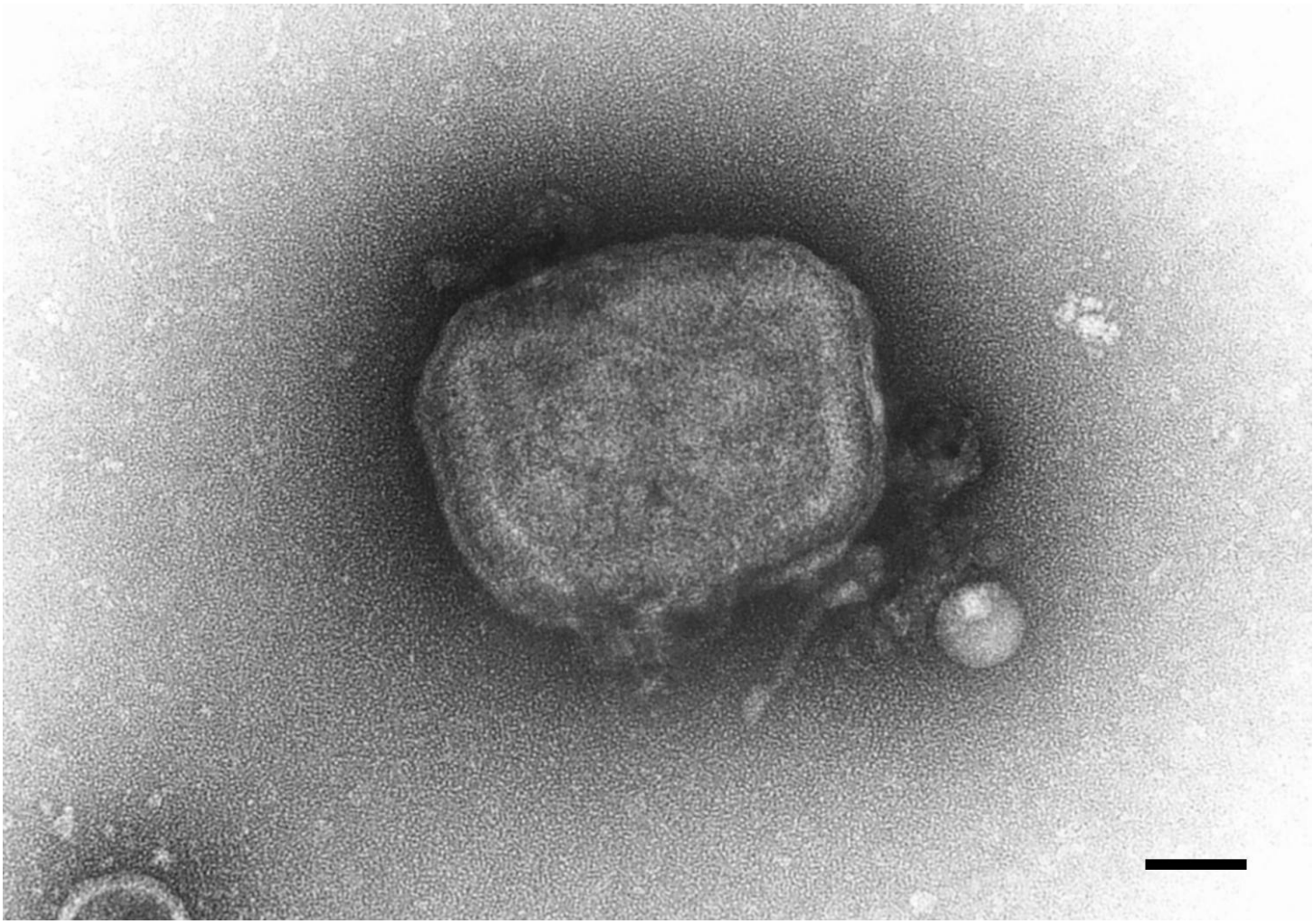
Poxviridae



Monkeypox virus (MPXV). Genus: Orthopoxvirus. Negative staining, UA. C-type.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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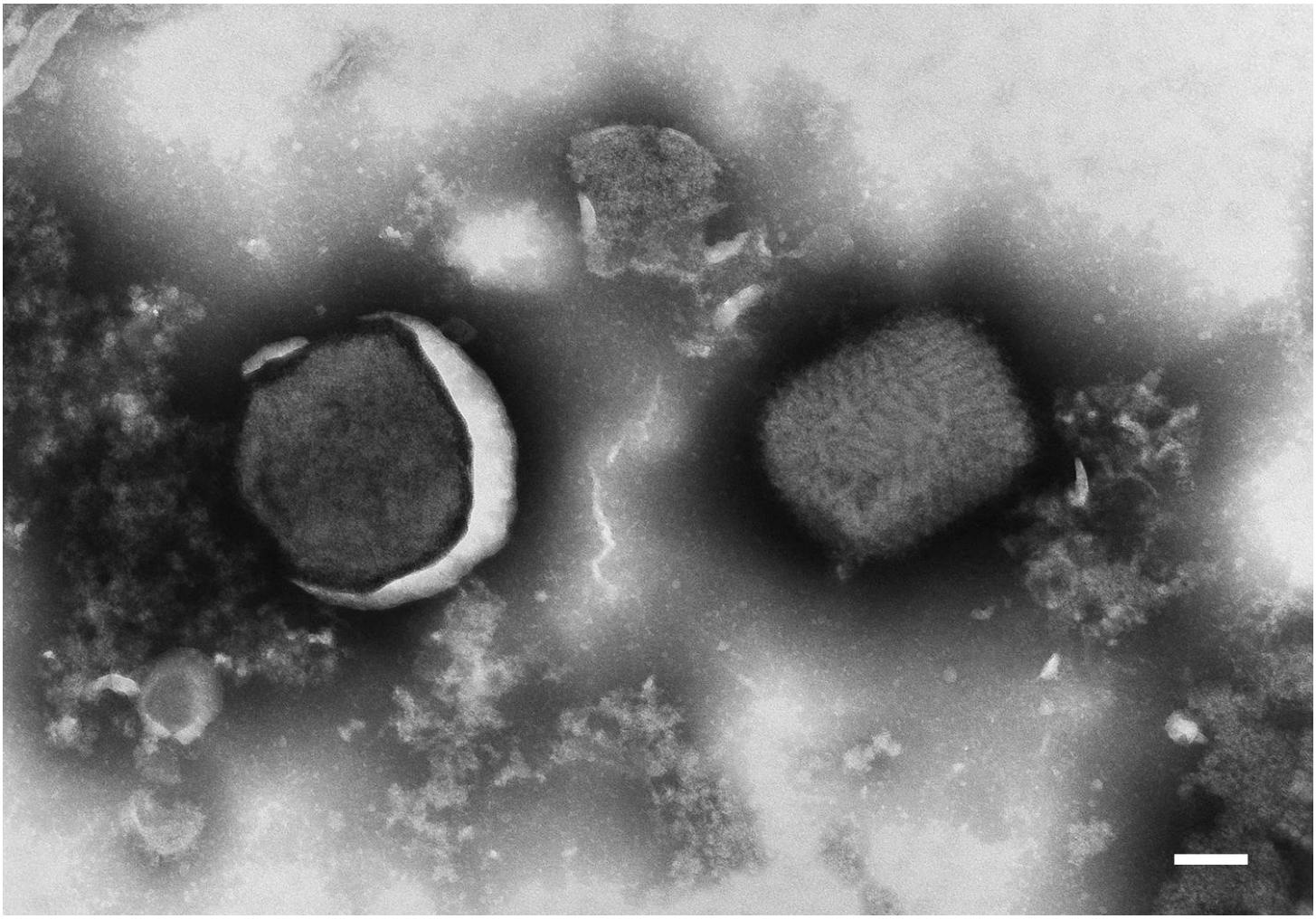
Poxviridae



Canarypox virus (CNPV). Genus: Avipoxvirus. Negative staining, PTA. The virus particle on the left is surrounded by a membrane (= outer membrane).

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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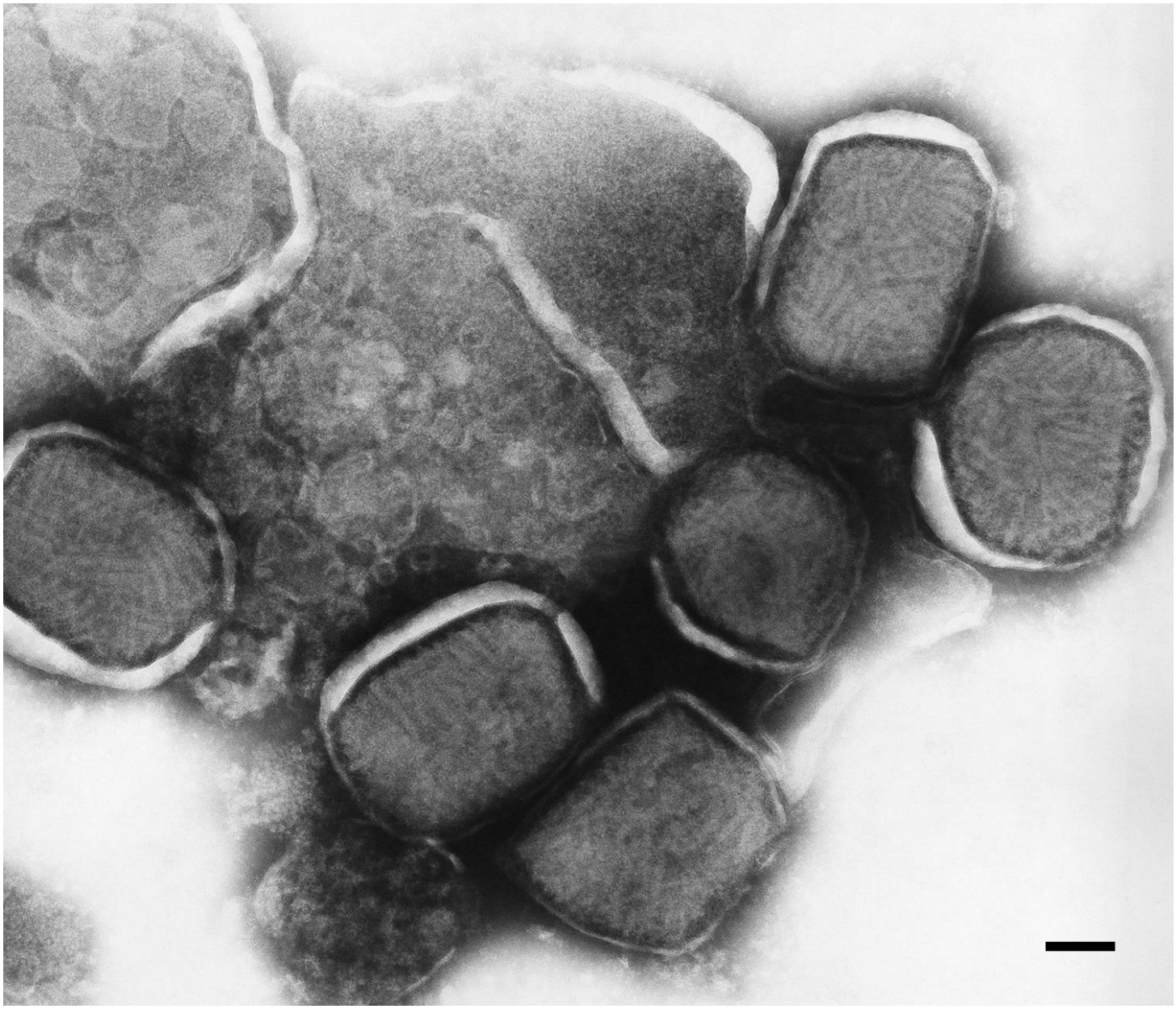
Poxviridae



Pigeonpox virus (PGPV). Genus: Avipoxvirus. Negative staining, PTA. All of the particles are surrounded by an outer membrane.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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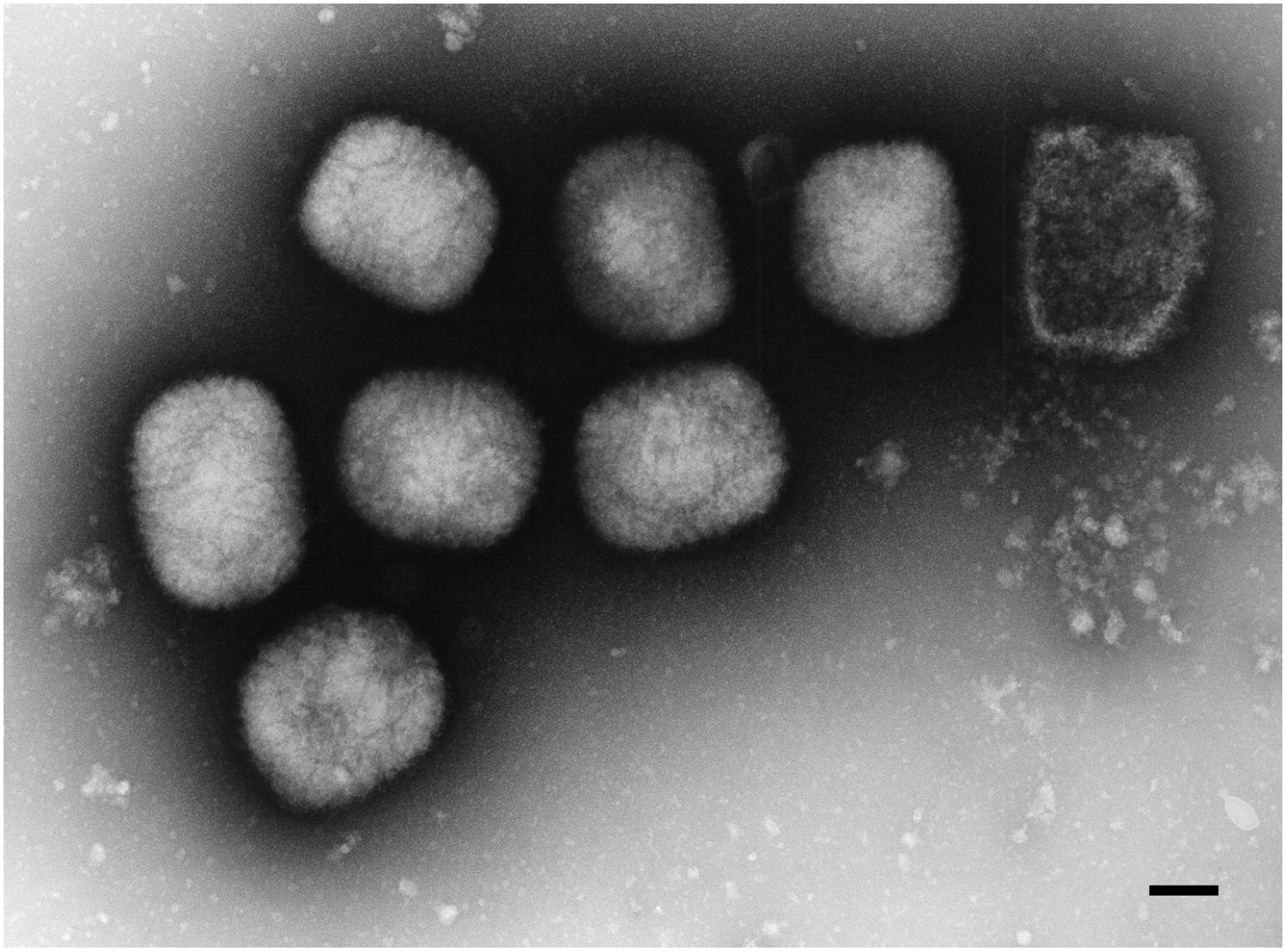
Poxviridae



Vaccinia virus (VACV). Genus: Orthopoxvirus. Negative staining, MAT.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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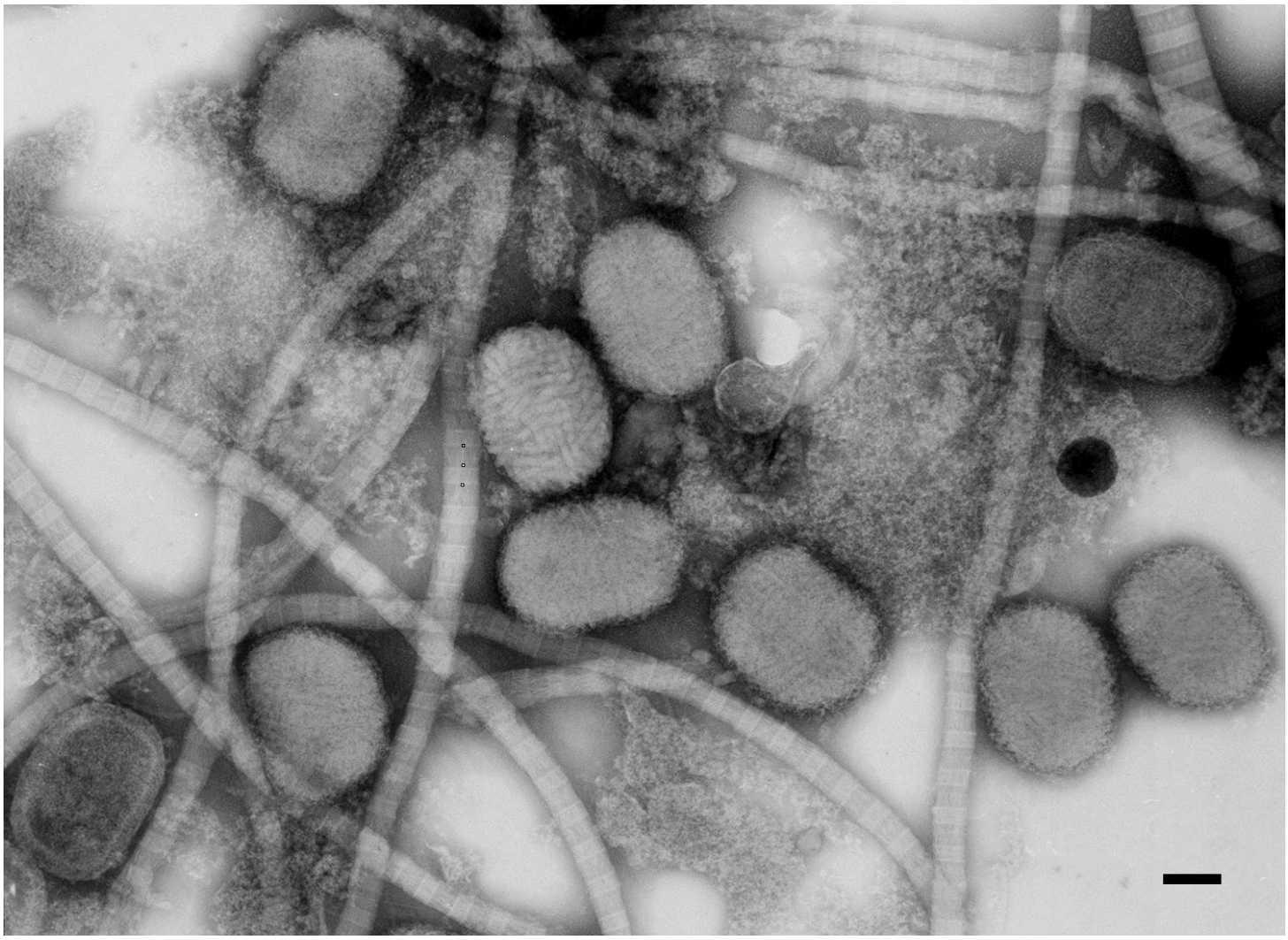
Poxviridae



Molluscum contagiosum virus (MOCV) from skin lesion. Genus: Molluscipoxvirus. Negative staining, PTA. Virus particles are intermingled with collagen fibrils.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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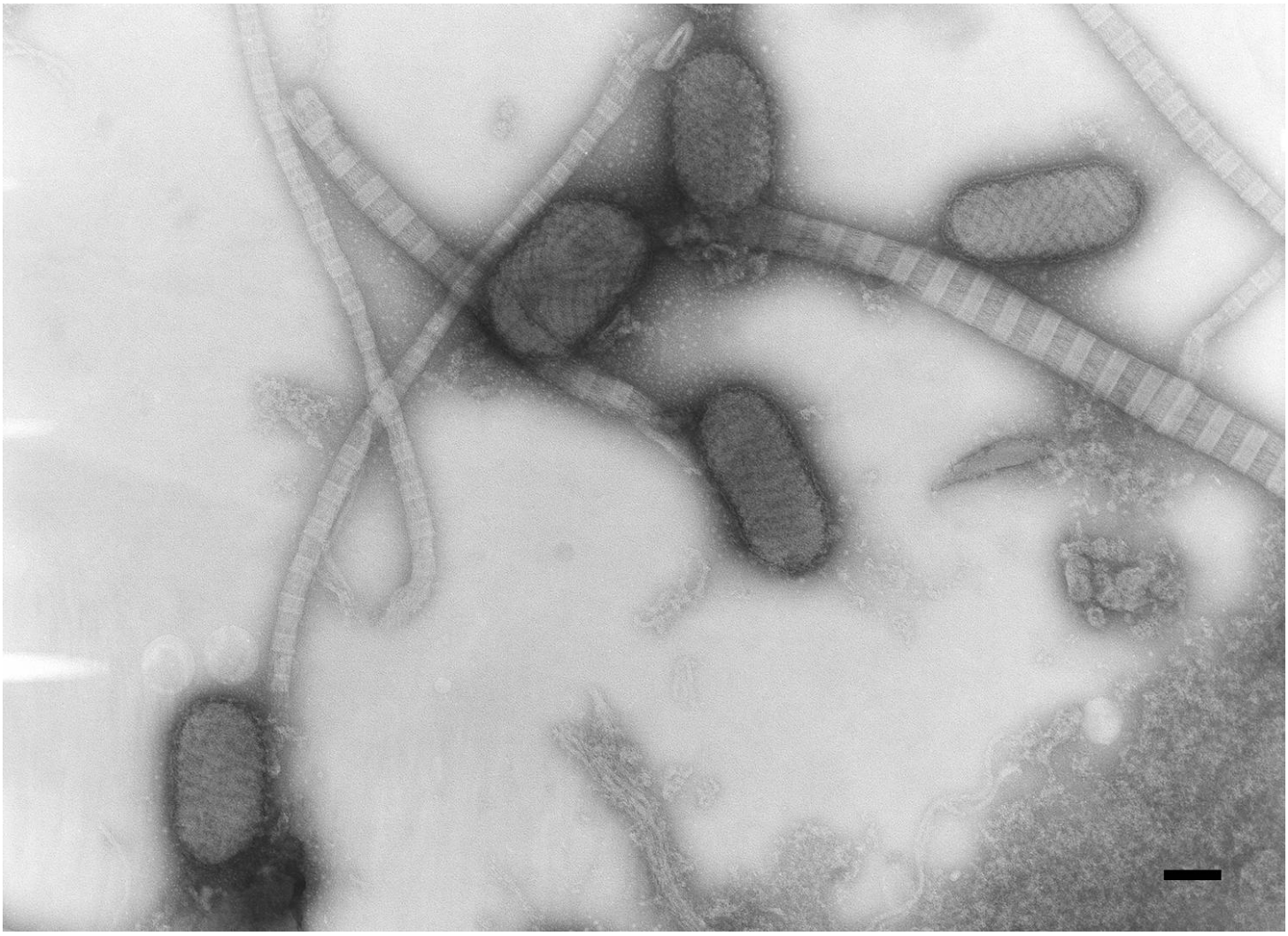
Poxviridae



Parapoxvirus (PPV) from human skin lesion. Genus: Parapoxvirus. Negative staining, PTA. Virus particles are intermingled with collagen fibrils.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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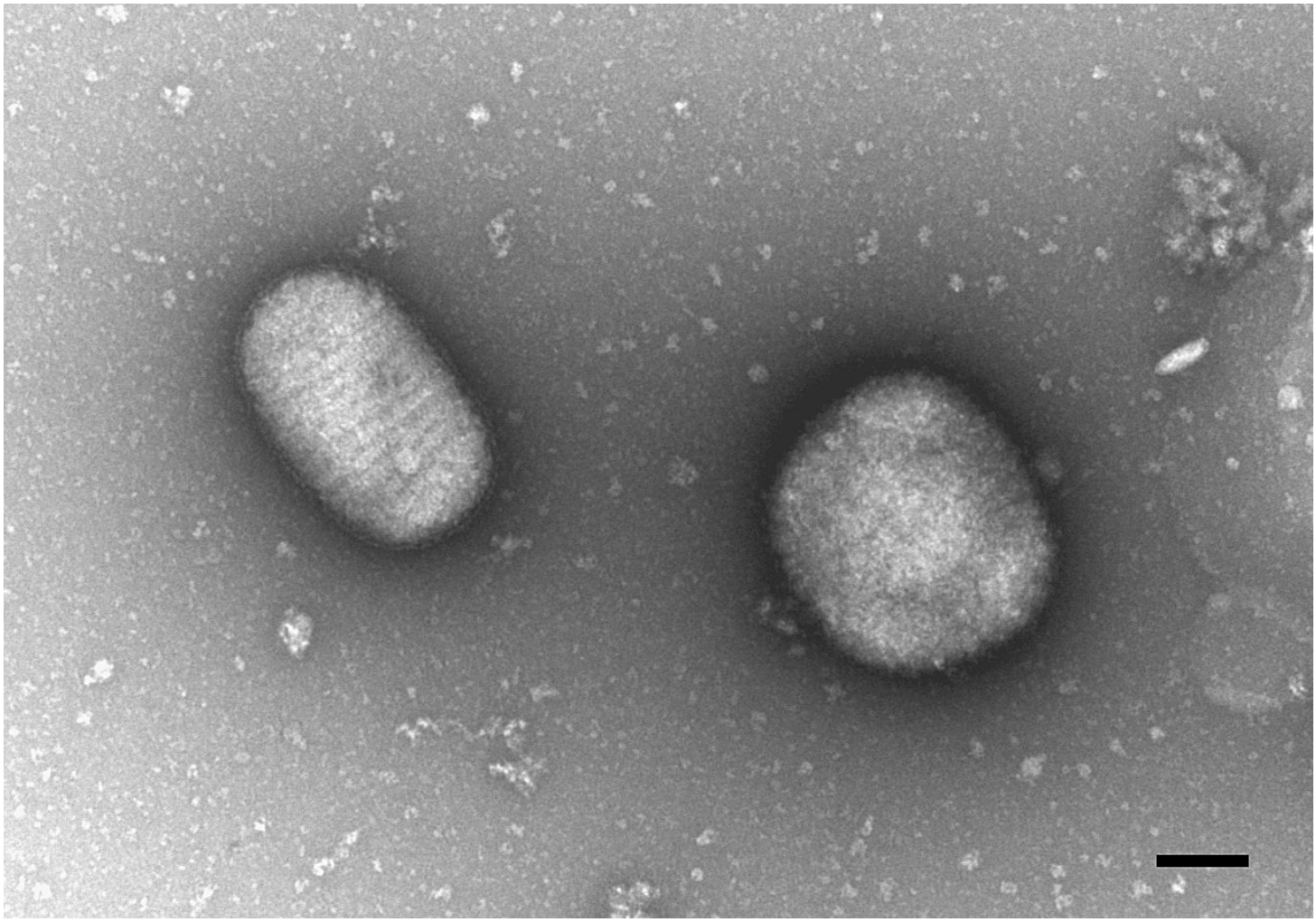
Poxviridae



Parapoxvirus (PPV; left) and Ectromelia virus (ECTV; Genus: Orthopoxvirus; right). Negative staining, UA. Comparison of the two principle morphotypes of poxviruses that can be distinguished by diagnostic electron microscopy: Parapoxvirus morphology (ovoid and circular surface bands) and Orthopoxvirus-like morphology (rectangular, brick-like shape).

Image source: Michael Laue, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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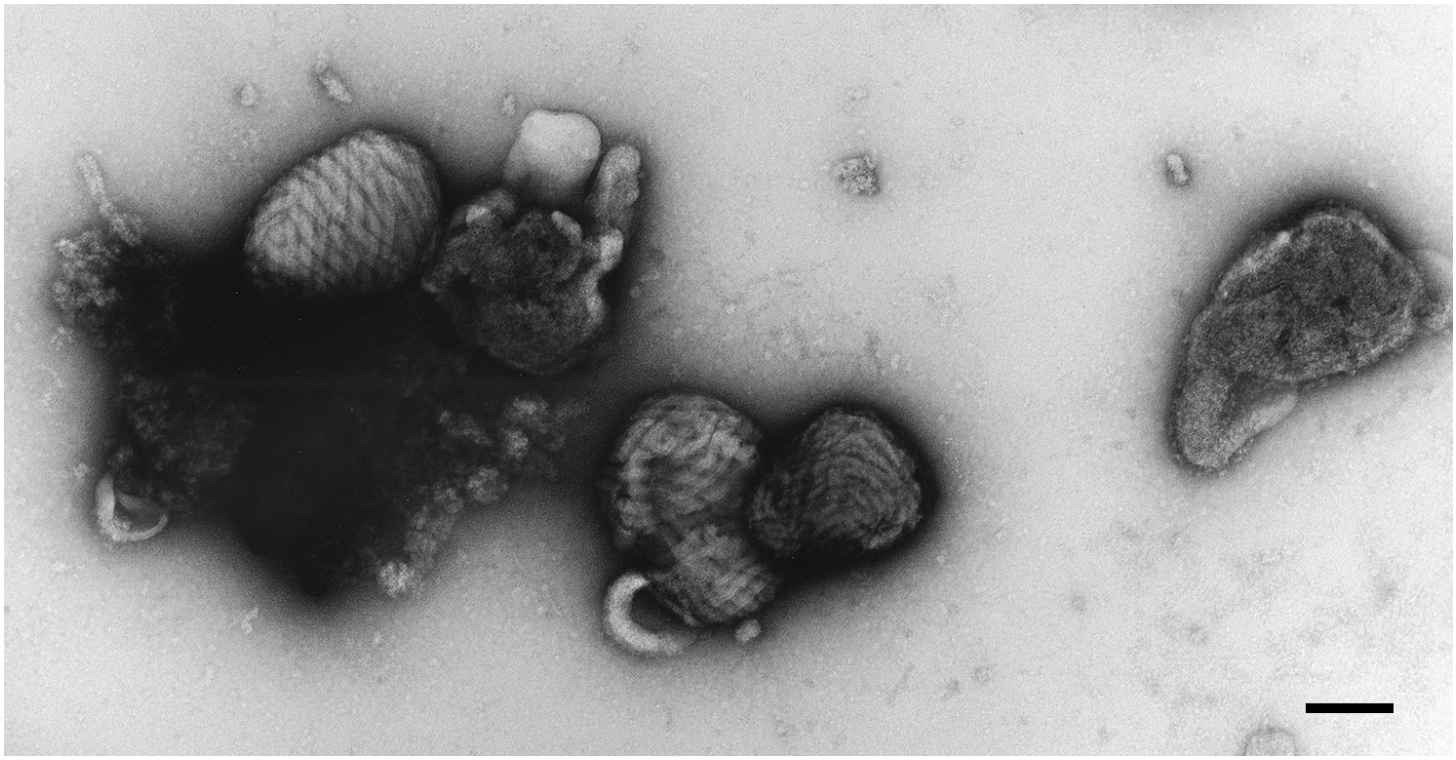
Poxviridae



Orf virus (ORFV) = Contagious postular dermatitis virus = Contagious ecthyma virus. Genus: Parapoxvirus. Negative staining of cell culture supernatant, UA. Co-infection with Paramyxovirus (particle at the right side).

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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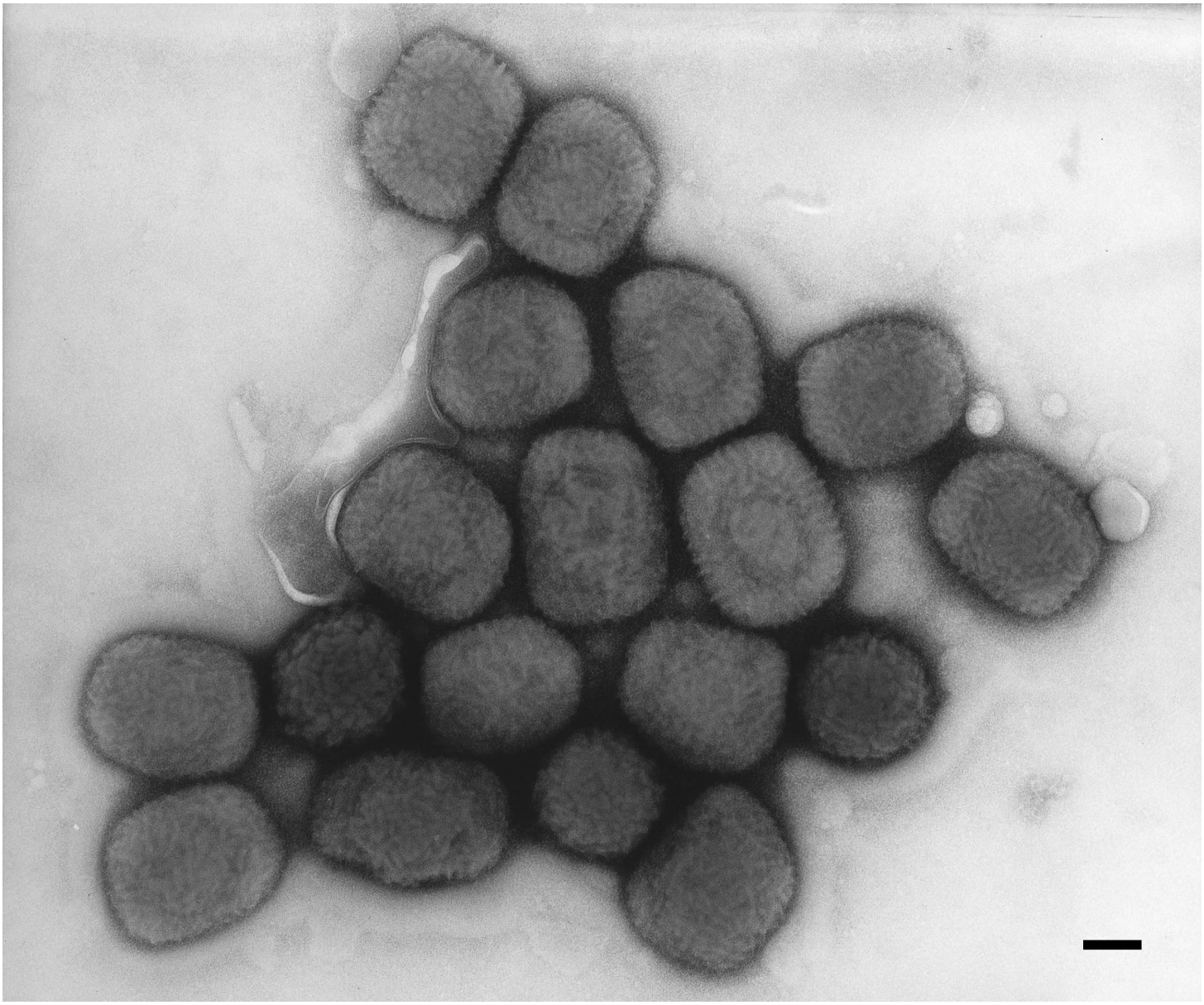
Poxviridae



Ectromelia virus (ECTV). Genus: Orthopoxvirus. Negative staining, PTA.

Image source: Andrea Männel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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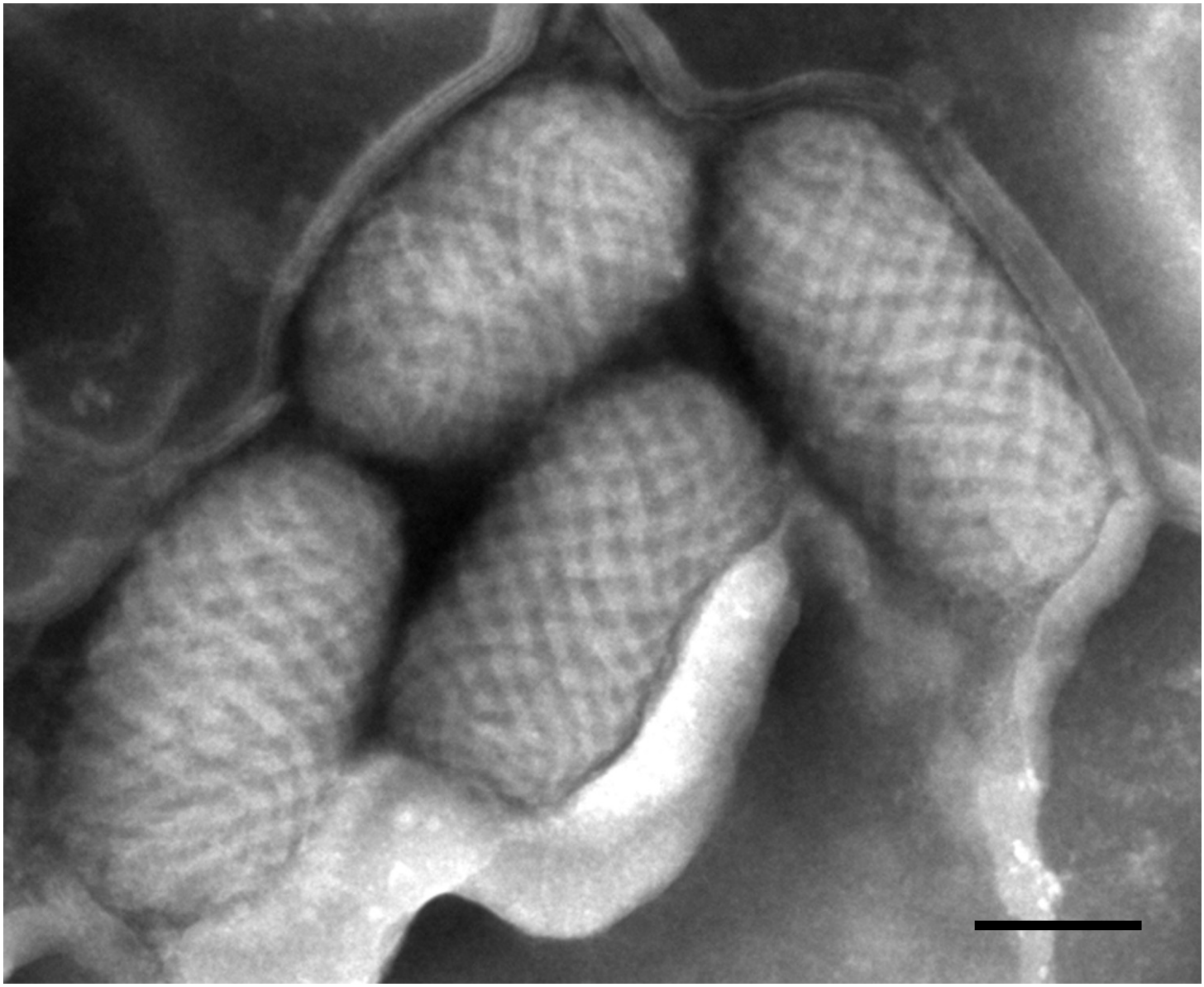
Poxviridae



Orf virus (ORFV) = Contagious postular dermatitis virus = Contagious ecthyma virus. Genus: Parapoxvirus. Negative staining, PTA.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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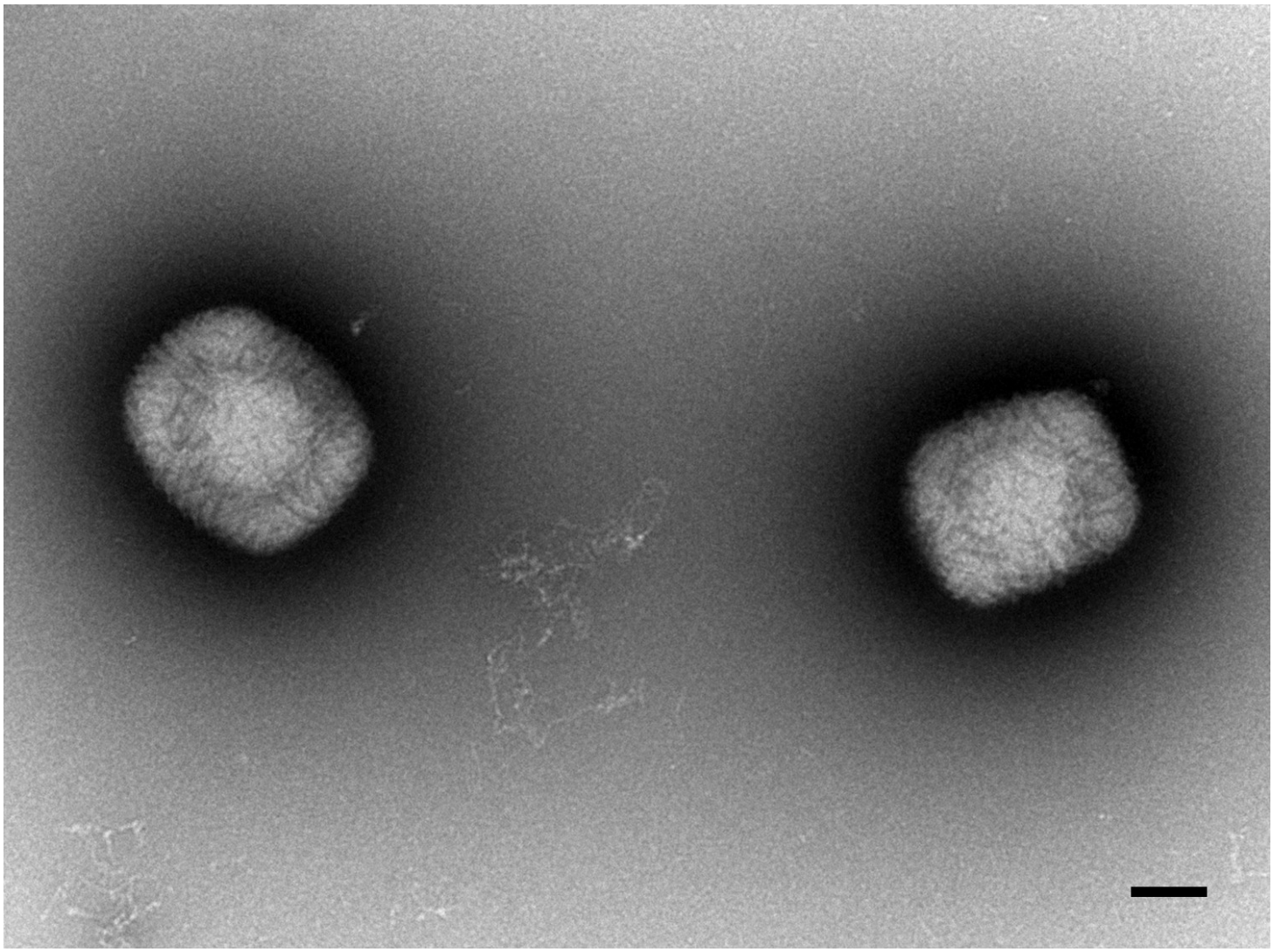
Poxviridae



Cowpox virus (CPXV), Brighton Red (BR). Genus: Orthopoxvirus. Negative staining, PTA.

Image source: Michael Laue, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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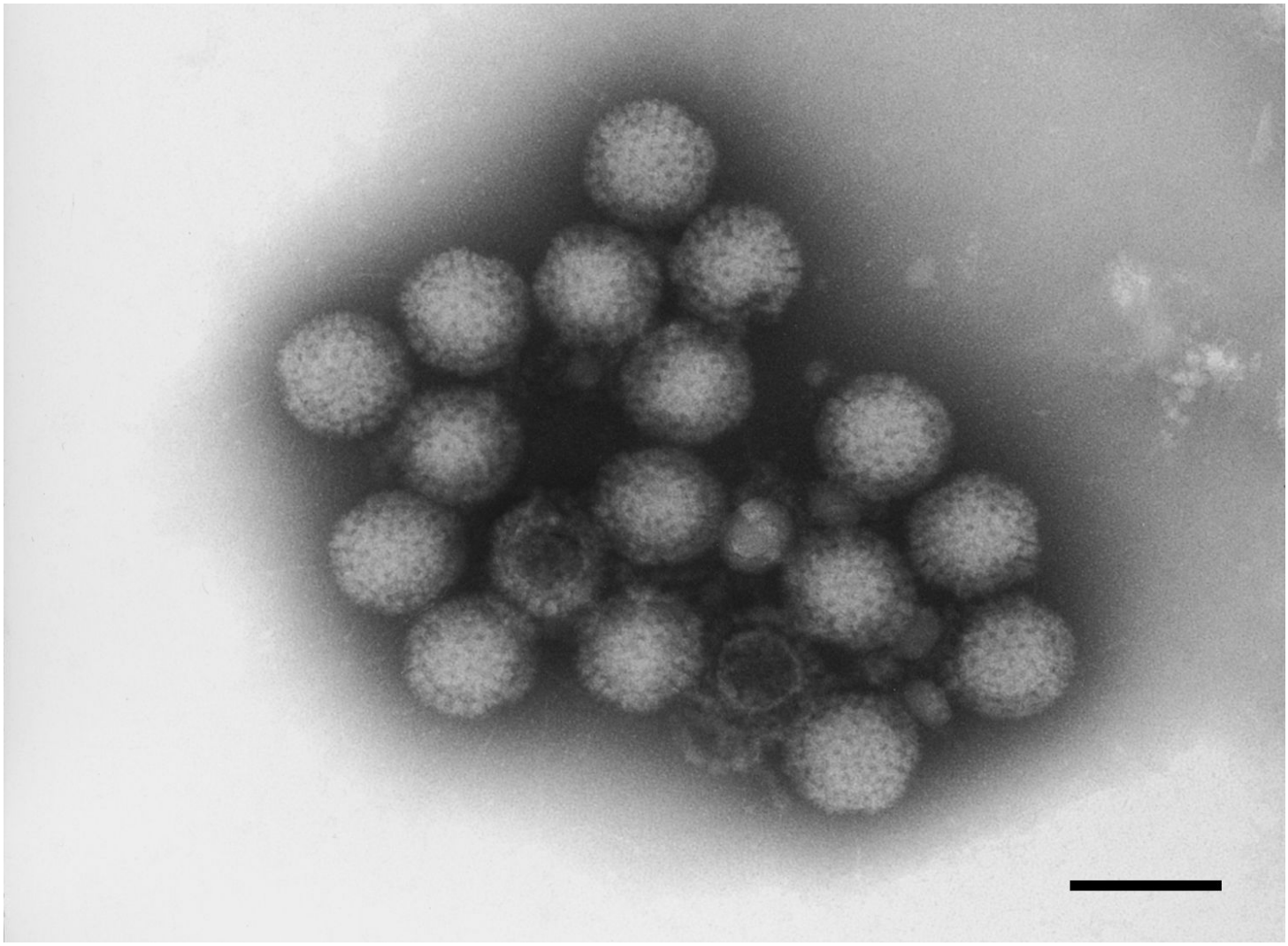
Reoviridae



Mammalian orthoreovirus 1 Lang (MRV-1La). Genus: Orthoreovirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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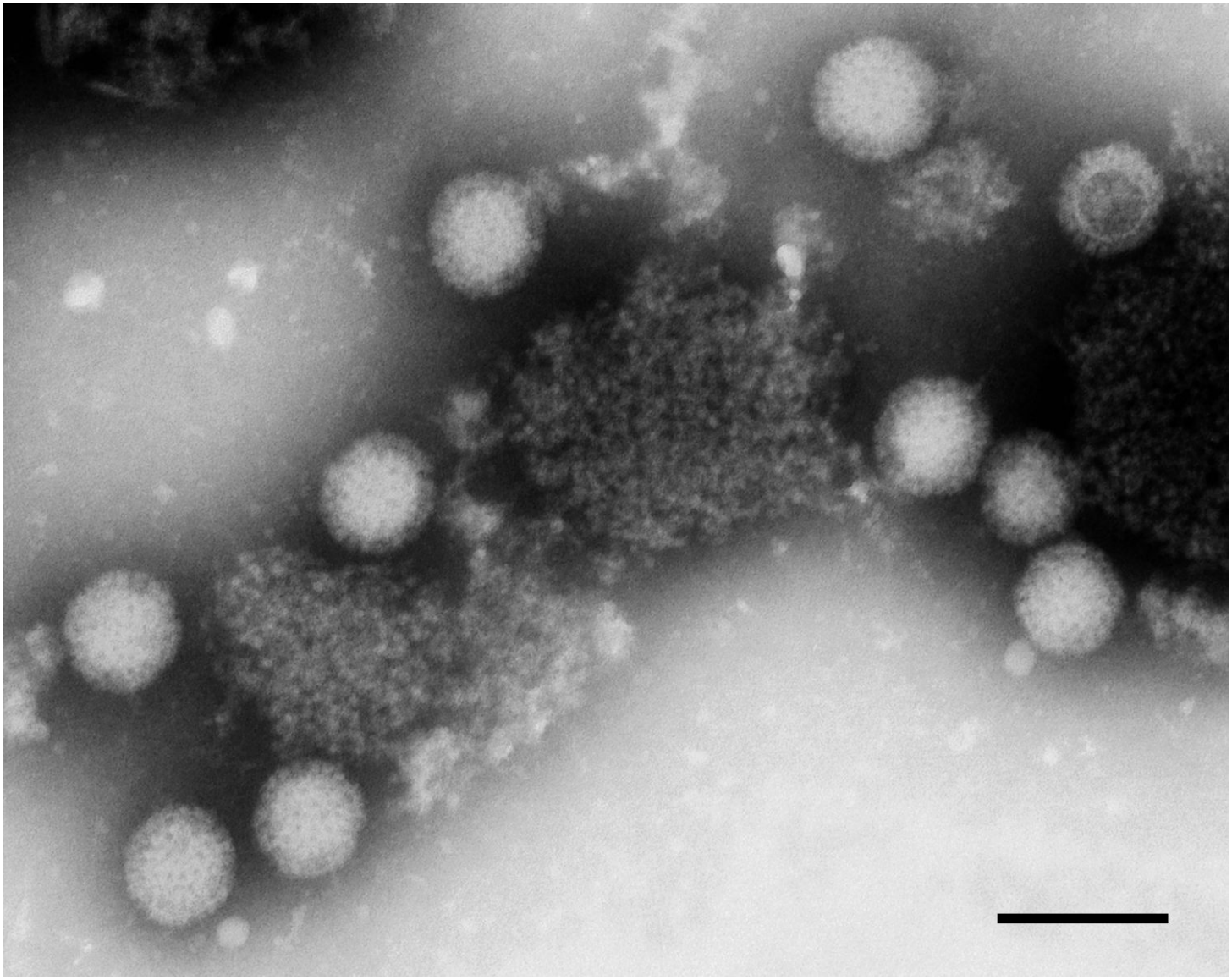
Reoviridae



Avian orthoreovirus S1133 (ARV-1133). Genus: Orthoreovirus. Negative staining, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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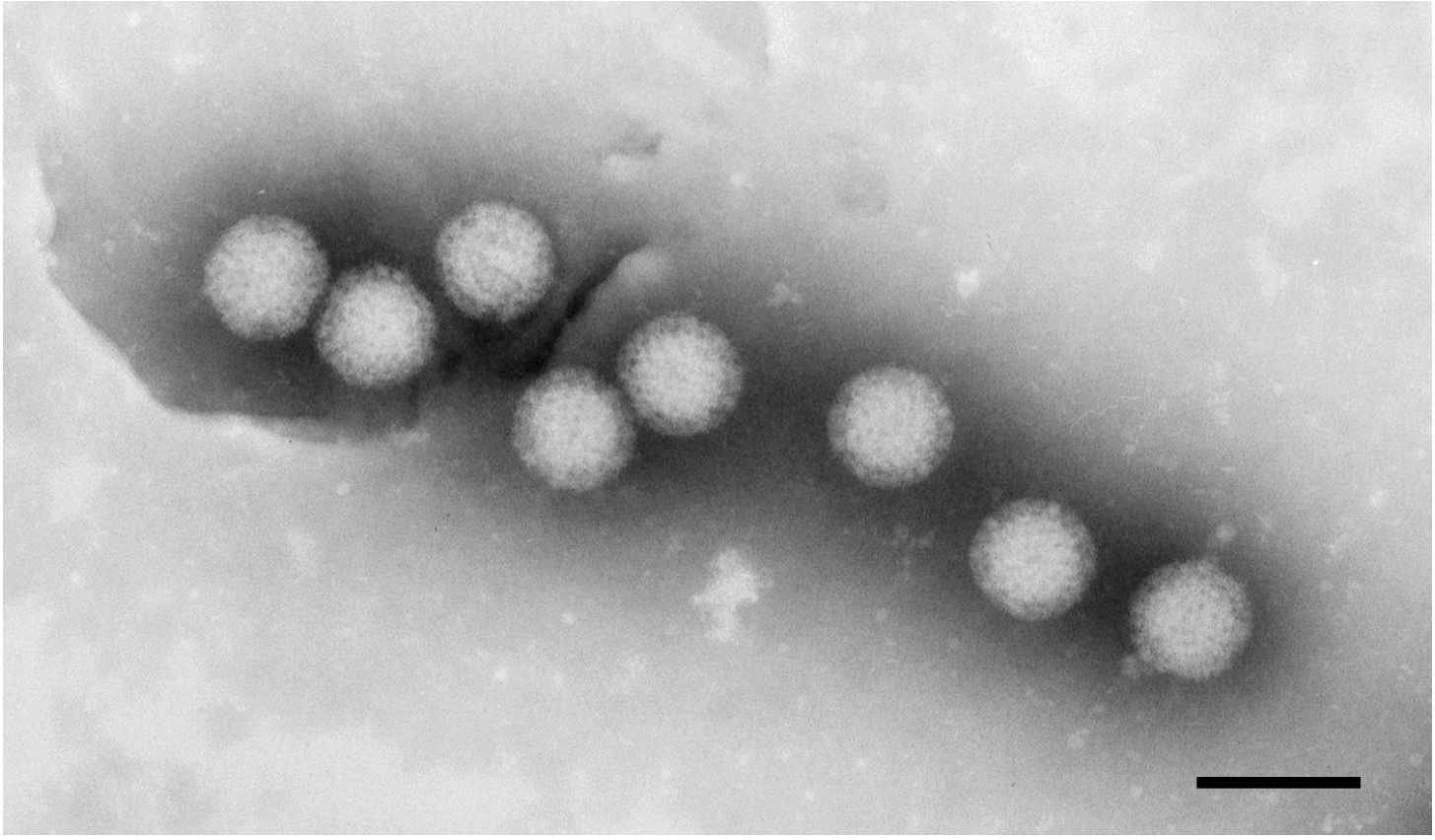
Reoviridae



Avian orthoreovirus S1133 (ARV-1133). Genus: Orthoreovirus. Negative staining, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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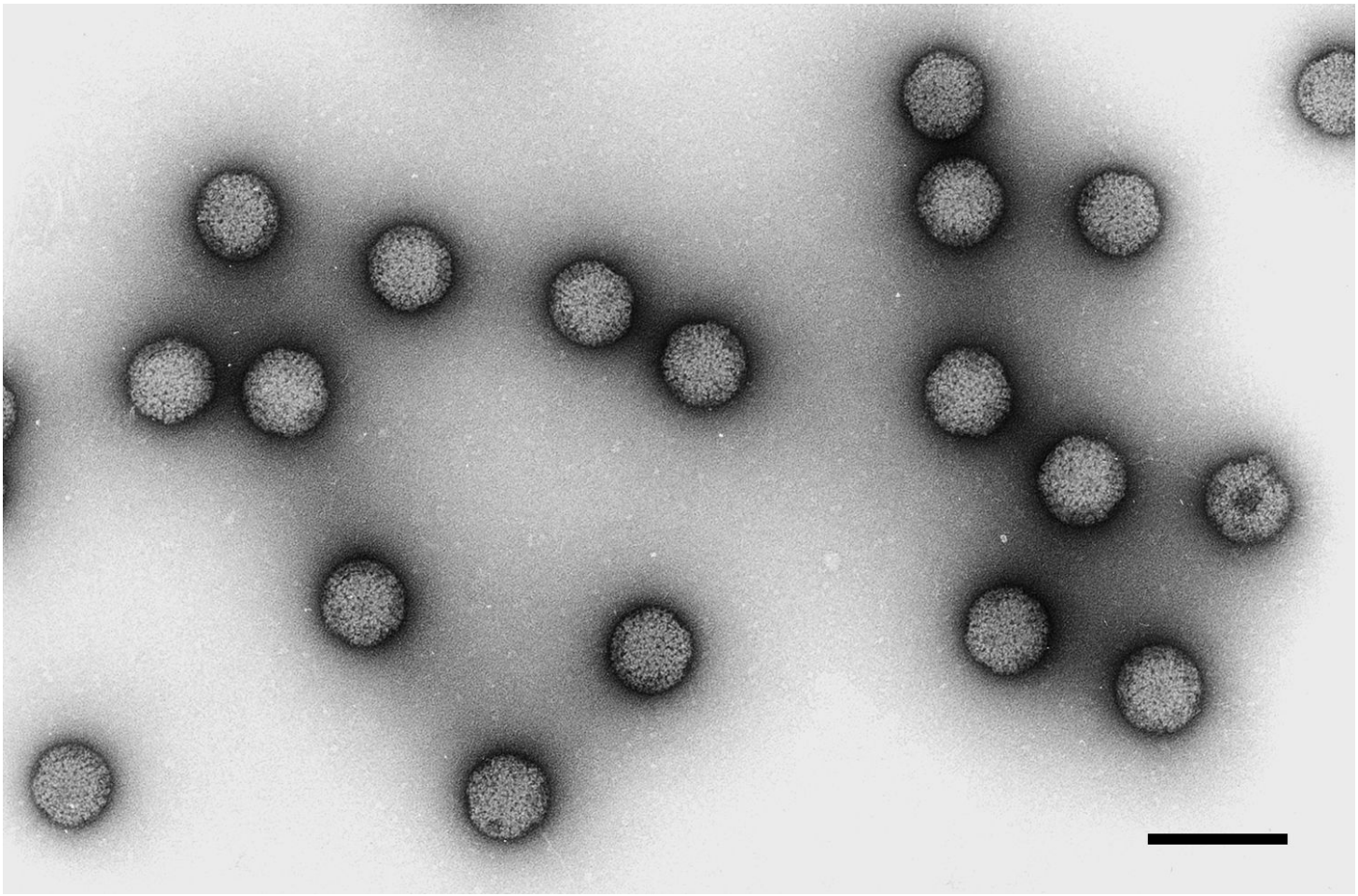
Reoviridae



Mammalian orthoreovirus 1 Lang (MRV-1La). Genus: Orthoreovirus. Negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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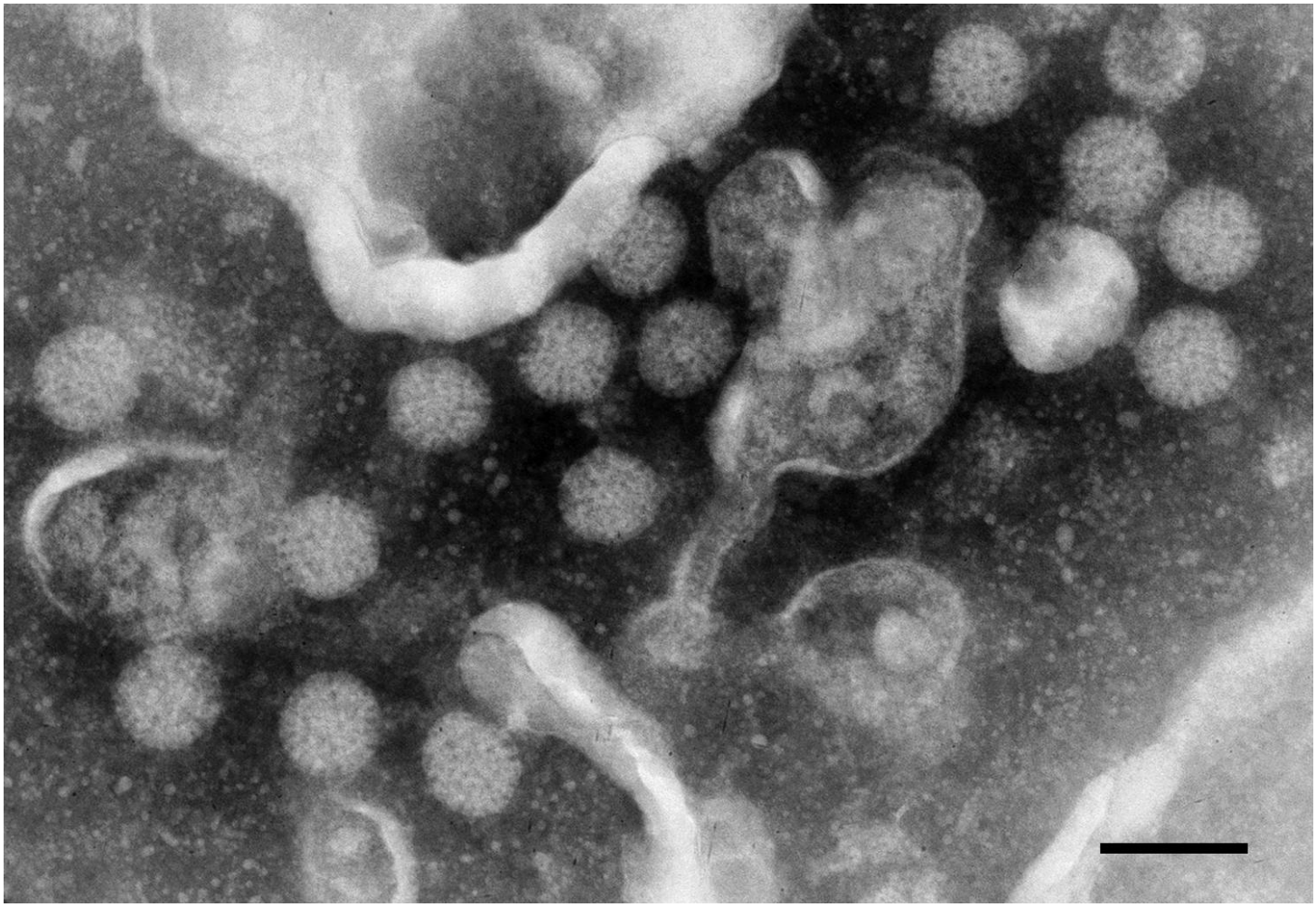
Reoviridae



Chicken rotavirus, Rotavirus D (AvRV-D). Genus: Rotavirus. Negative staining, UA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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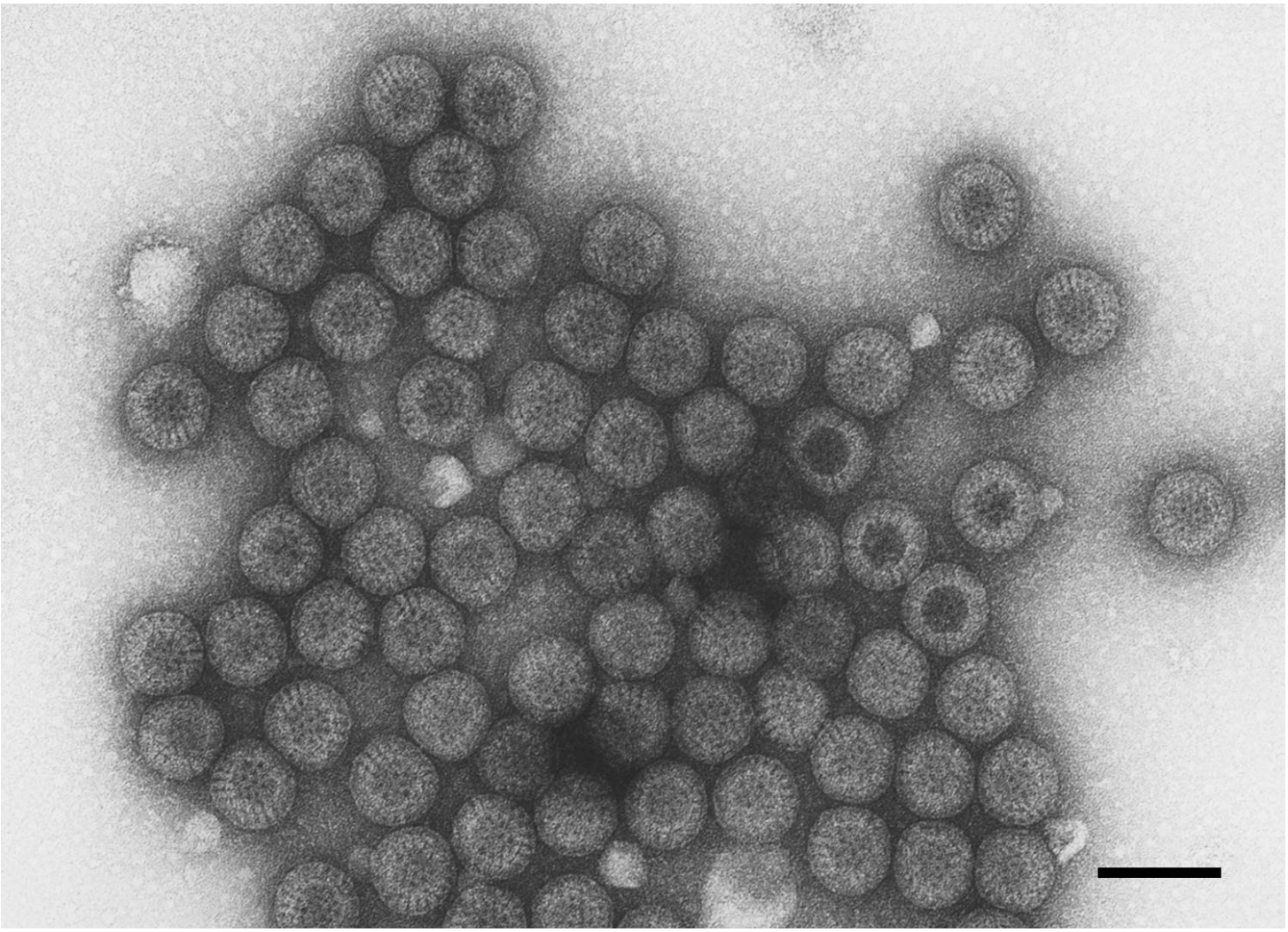
Reoviridae



Human rotavirus C (HRV-C). Genus: Rotavirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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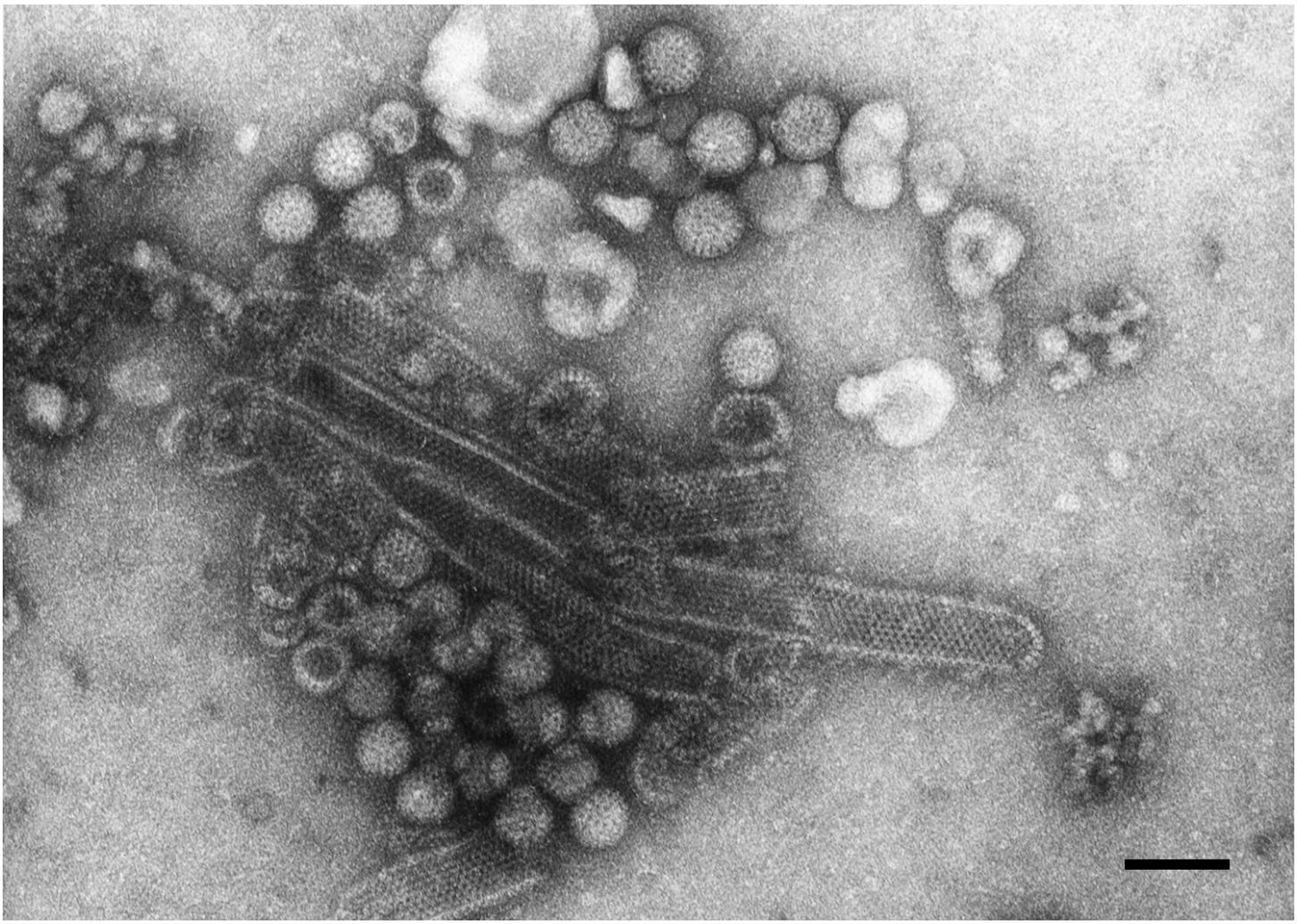
Reoviridae



Human rotavirus (HRV) from stool. Genus: Rotavirus. Negative staining, UA. Note the tubular forms.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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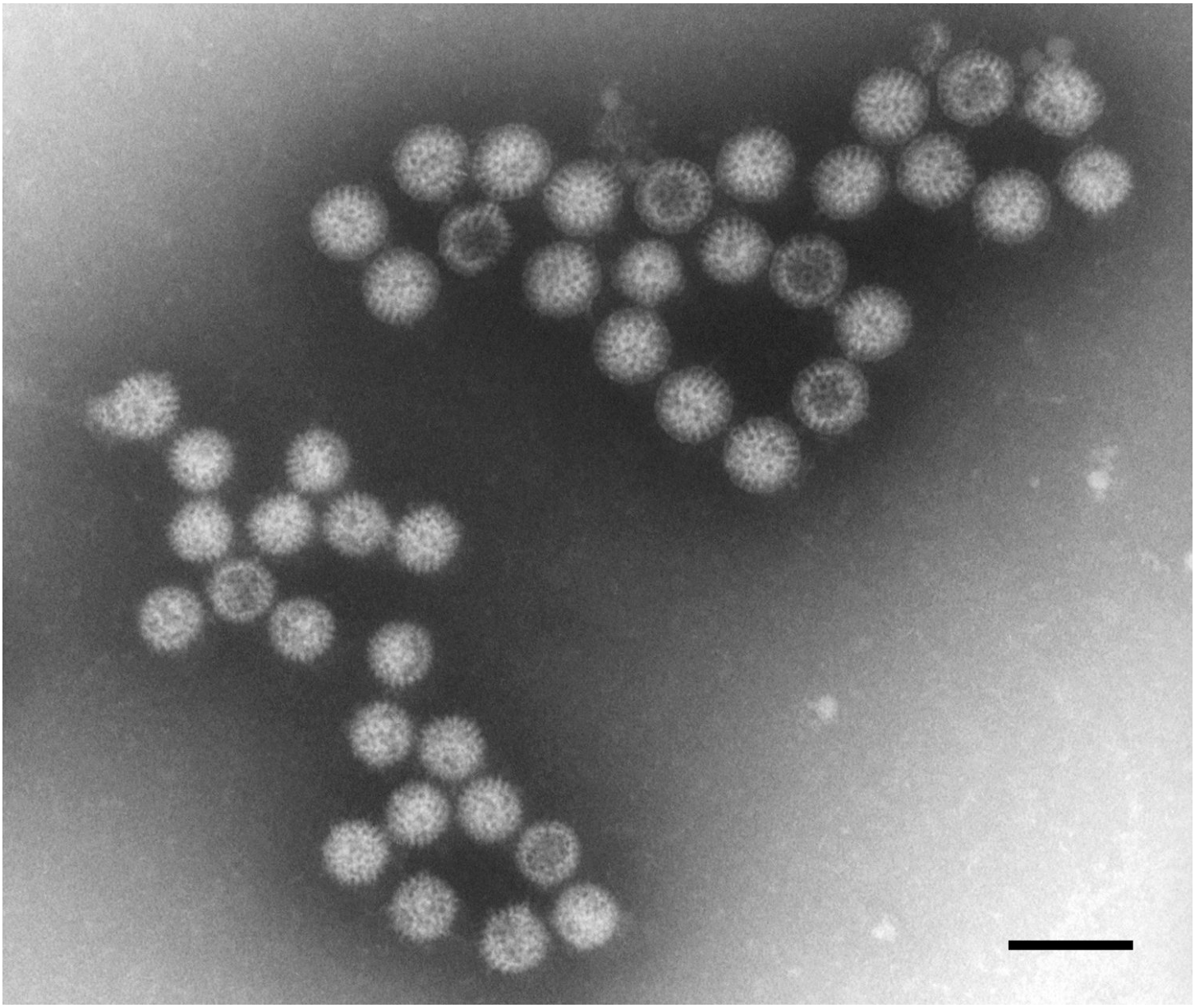
Reoviridae



Immune aggregate of Human rotavirus (HRV) particles. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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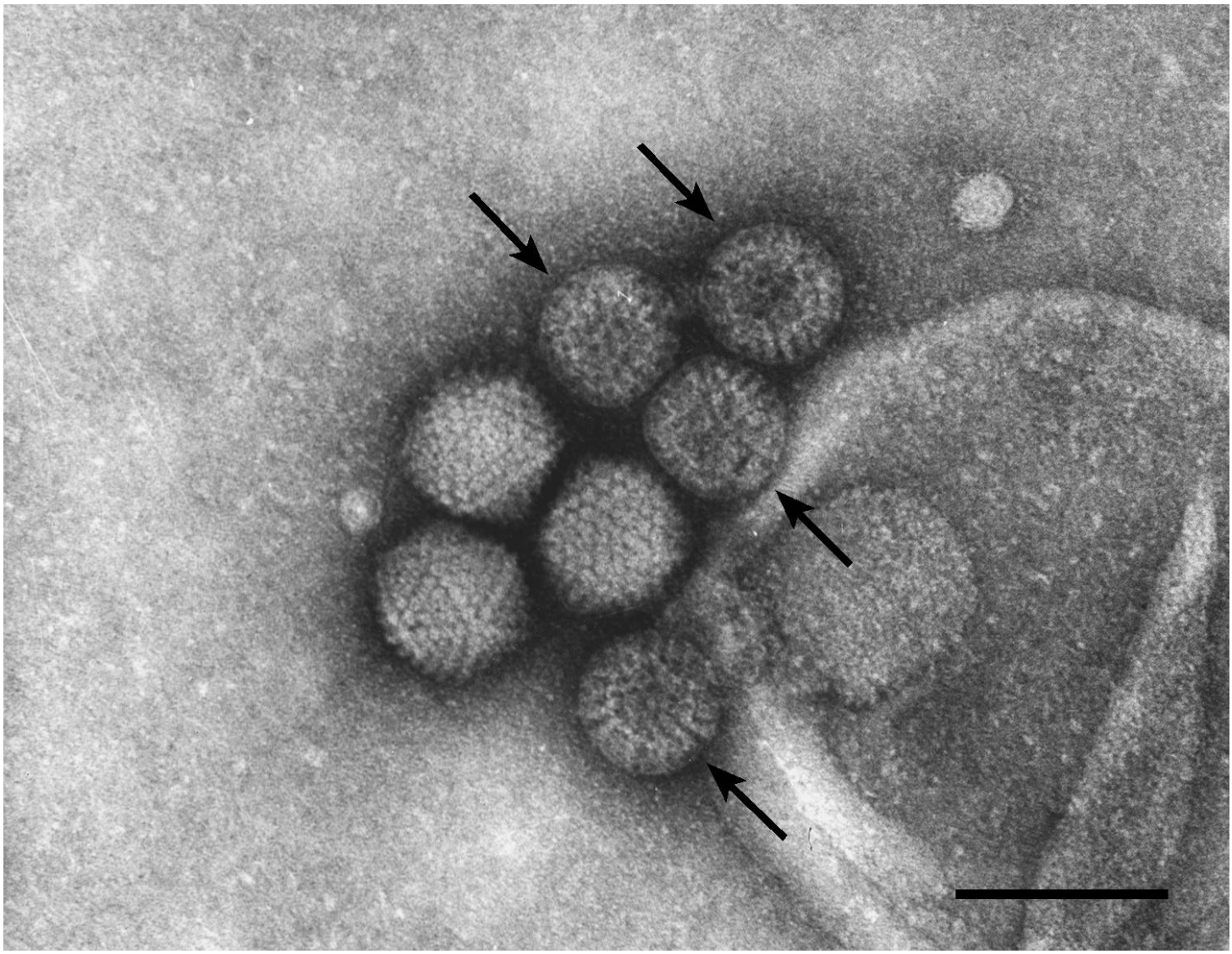
Reoviridae



Human adenovirus (HAdV) and Human rotavirus (HRV, arrows) from stool. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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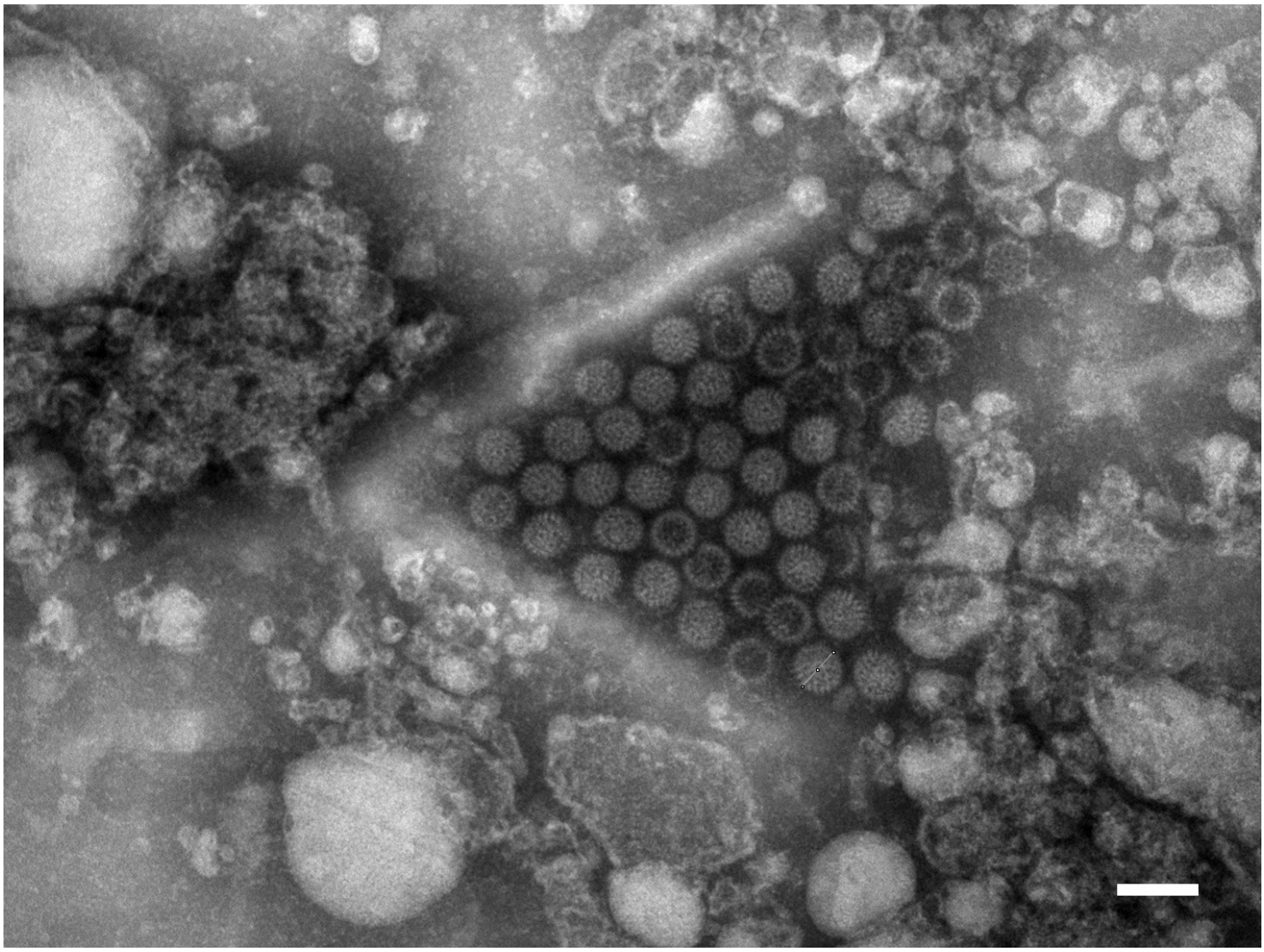
Reoviridae



Porcine rotavirus E (PoRV-E). Genus: Rotavirus. Negative staining, PTA.

Image source: Kathrin Hoffmann, LUA Sachsen, Dresden. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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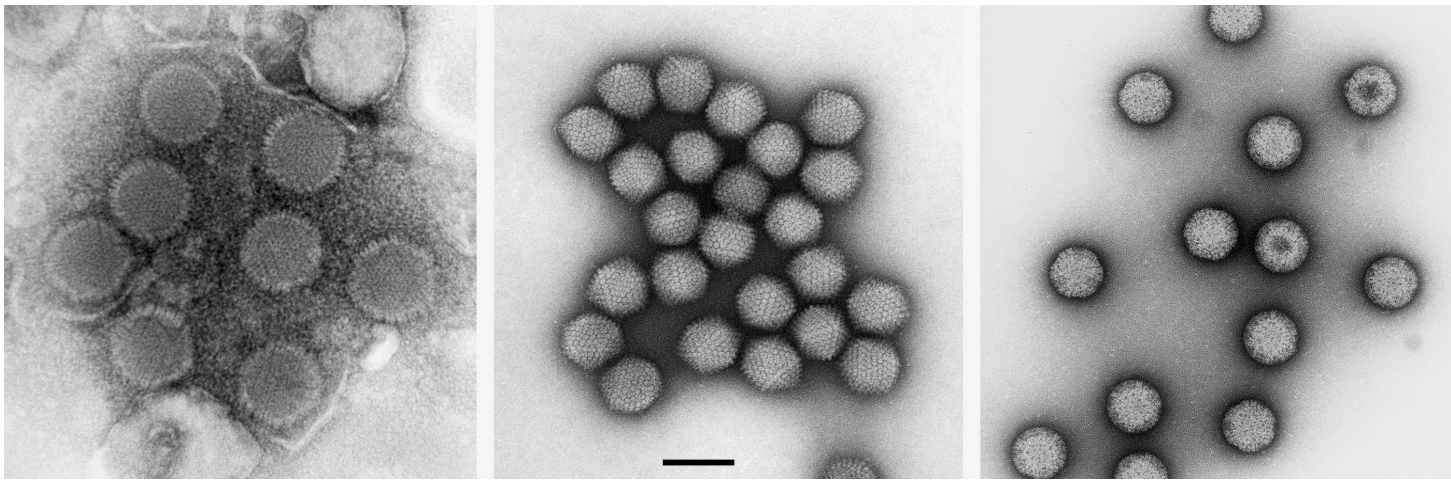
Reoviridae



Comparison of three virus particle morphotypes (from left to right): Herpesviridae (naked capsids of Murine herpesvirus 8), Adenoviridae (Genus: Aviadenovirus) and Reoviridae (Genus: Orthoreovirus).Negative staining, UA. Isolated Herpesvirus capsids are bigger than` Adenovirus or Reovirus particles. In addition, all particles clearly differ in their ultrastructure. For more details please refer to the virus group descriptions.

Image source: Lars Möller & Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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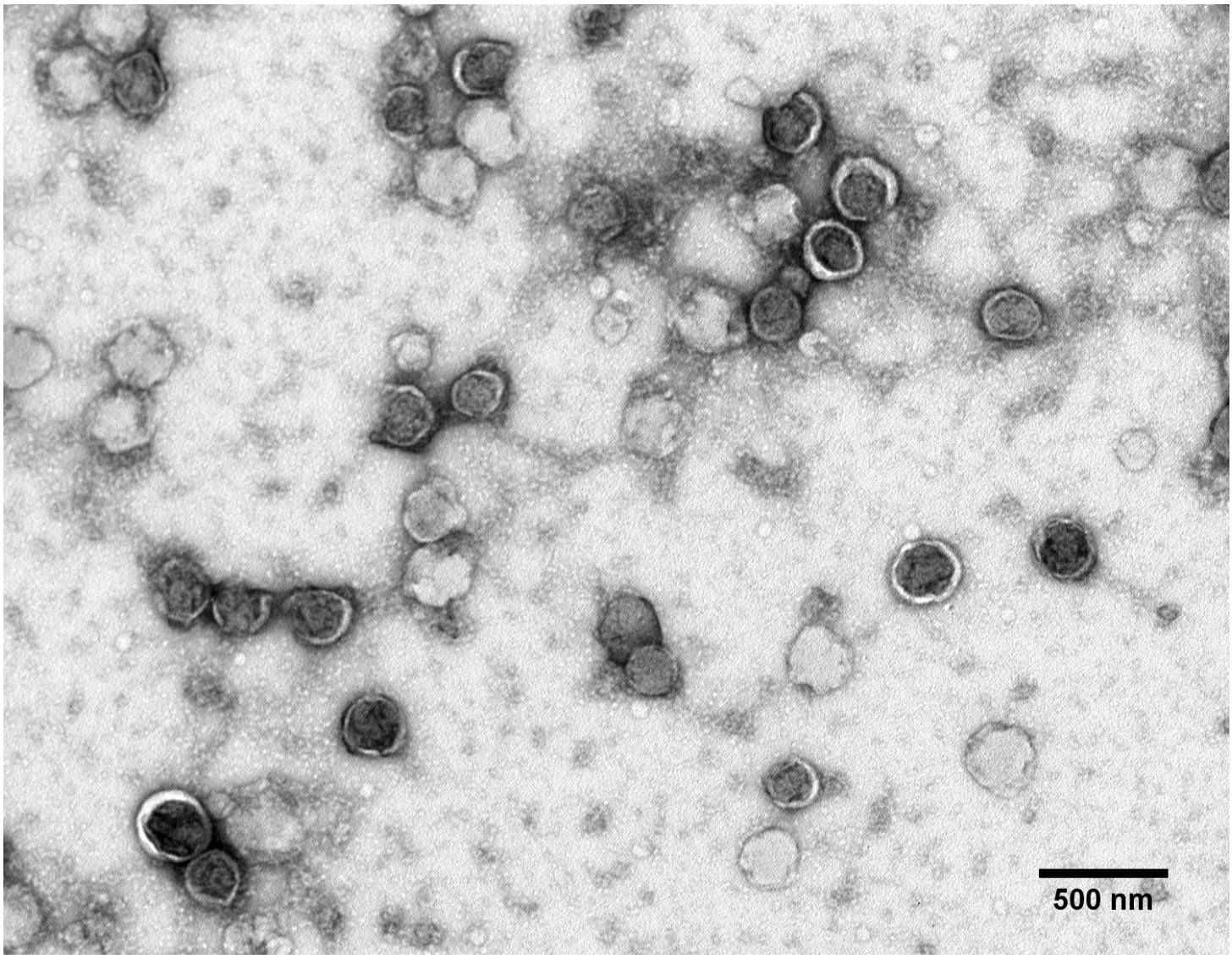
Retroviridae



Human immunodeficiency virus (HIV-1, molecular clone NLV4.3). Genus: Lentivirus. Negative staining. UA. Sample was fixed with 2.5% glutaraldehyde in HEPES-buffer.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

MAT = methylamine tungstic acid, PTA = phosphotungstic acid, UA = uranyl acetate

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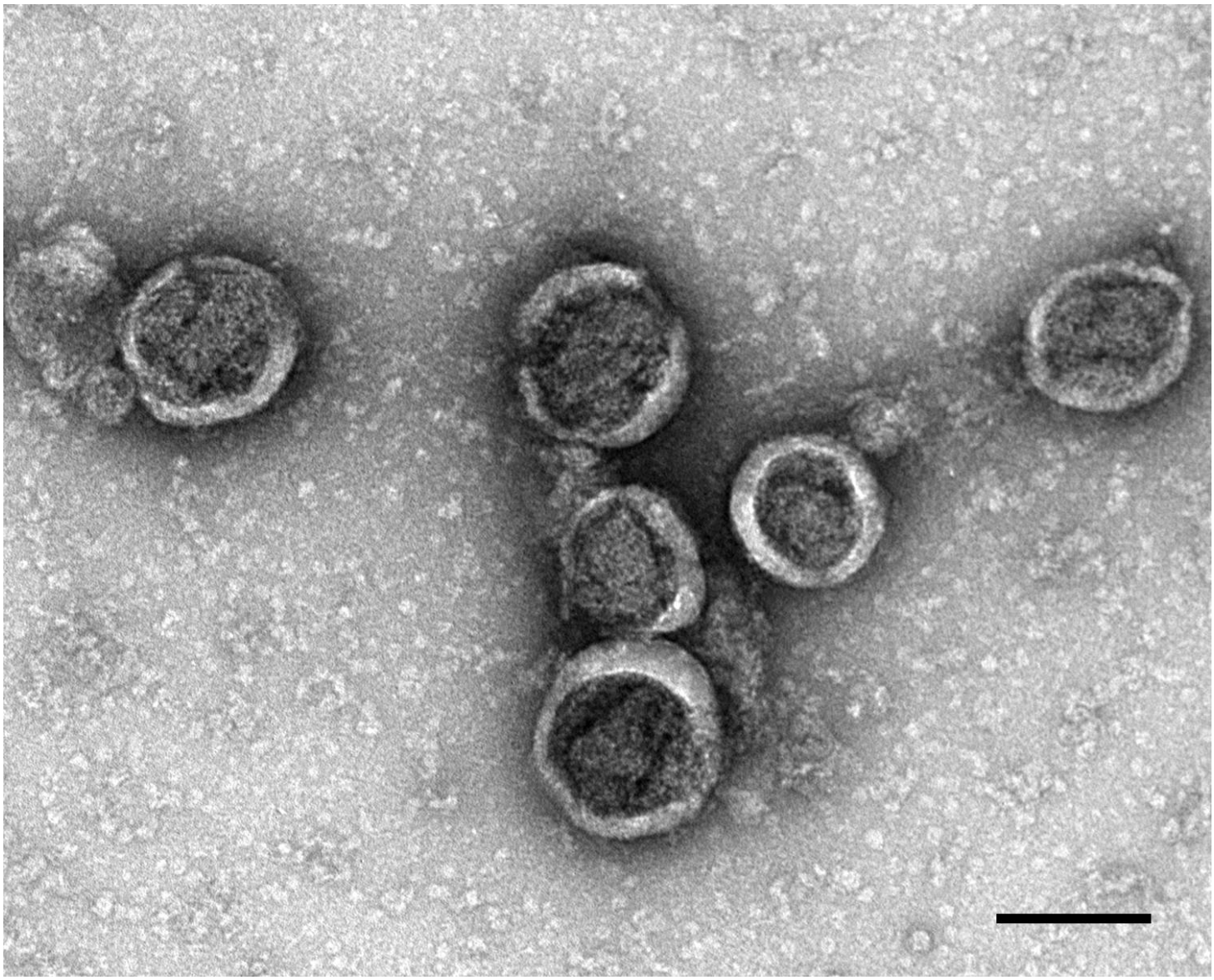
Retroviridae



Human immunodeficiency virus (HIV-1, molecular clone NLV4.3). Genus: Lentivirus. Negative staining. UA. Sample was fixed with 2.5% glutaraldehyde in HEPES-buffer. Cores are visible within the membrane-bound particles.

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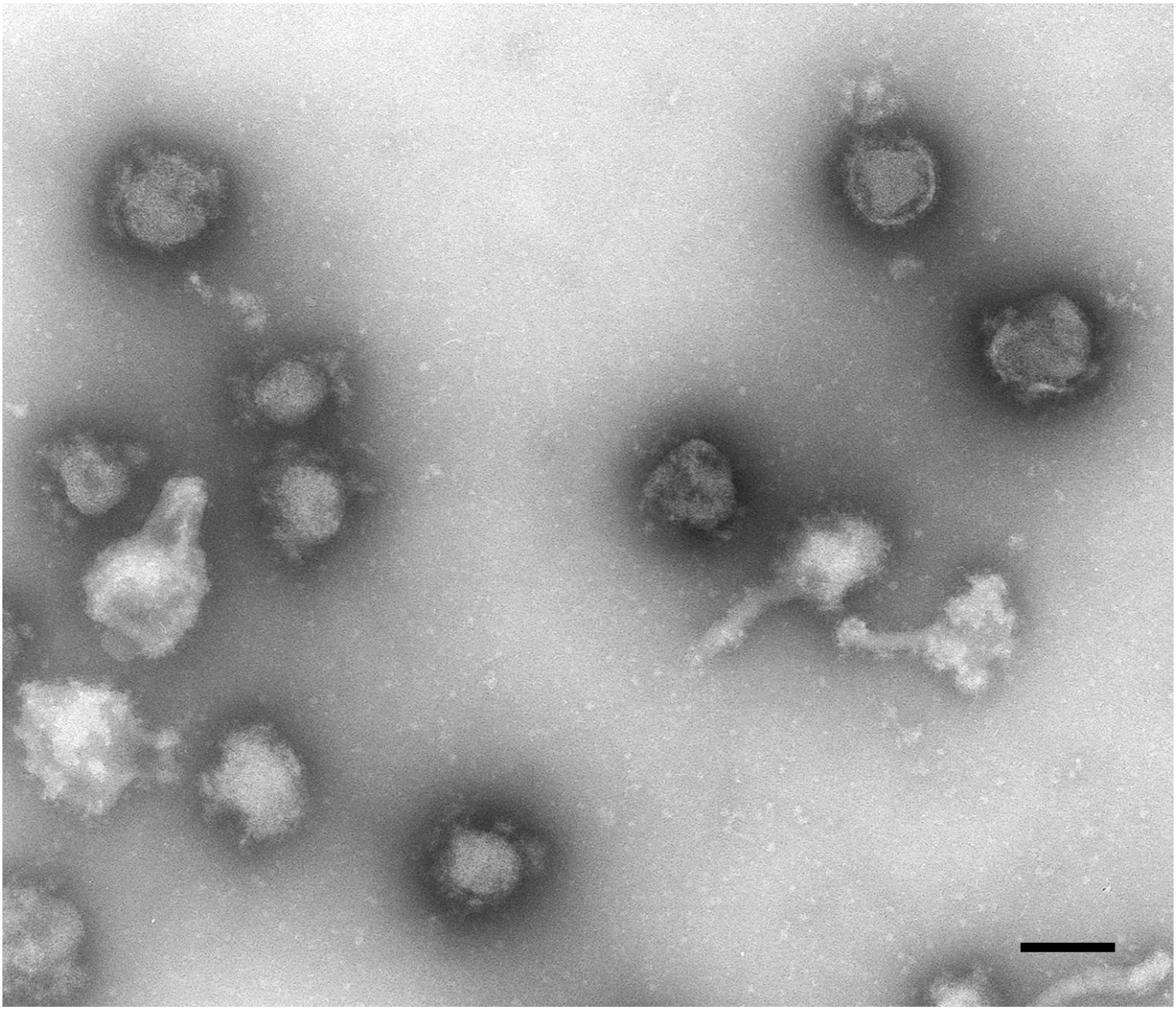
Retroviridae



Murine leukemia virus (MLV). Genus: Gammaretrovirus. Negative staining, PTA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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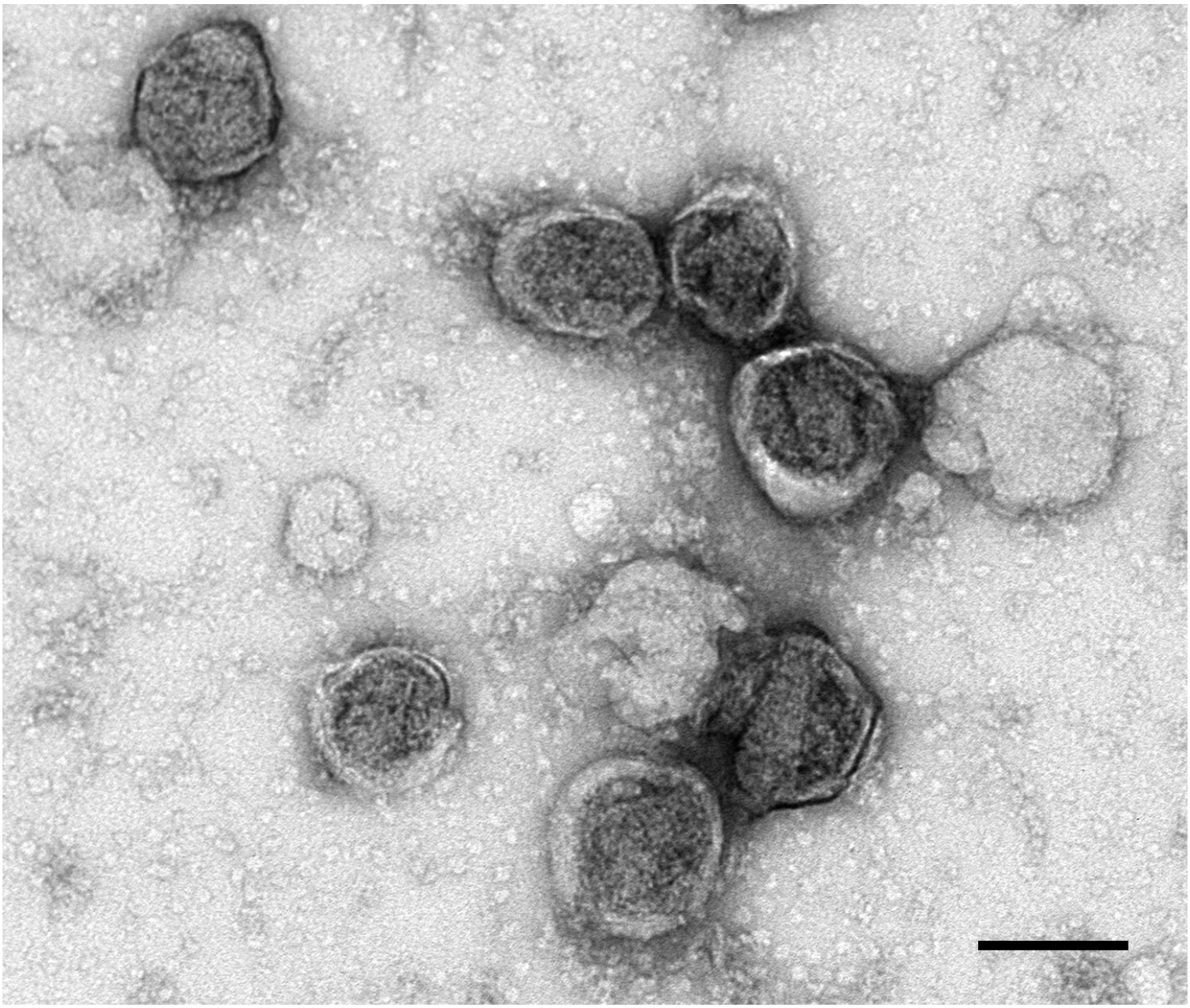
Retroviridae



Human immunodeficiency virus (HIV-1, molecular clone NLV4.3). Genus: Lentivirus. Negative staining. UA. Sample was fixed with 2.5% glutaraldehyde in HEPES-buffer. Cores are visible within the membrane-bound particles.

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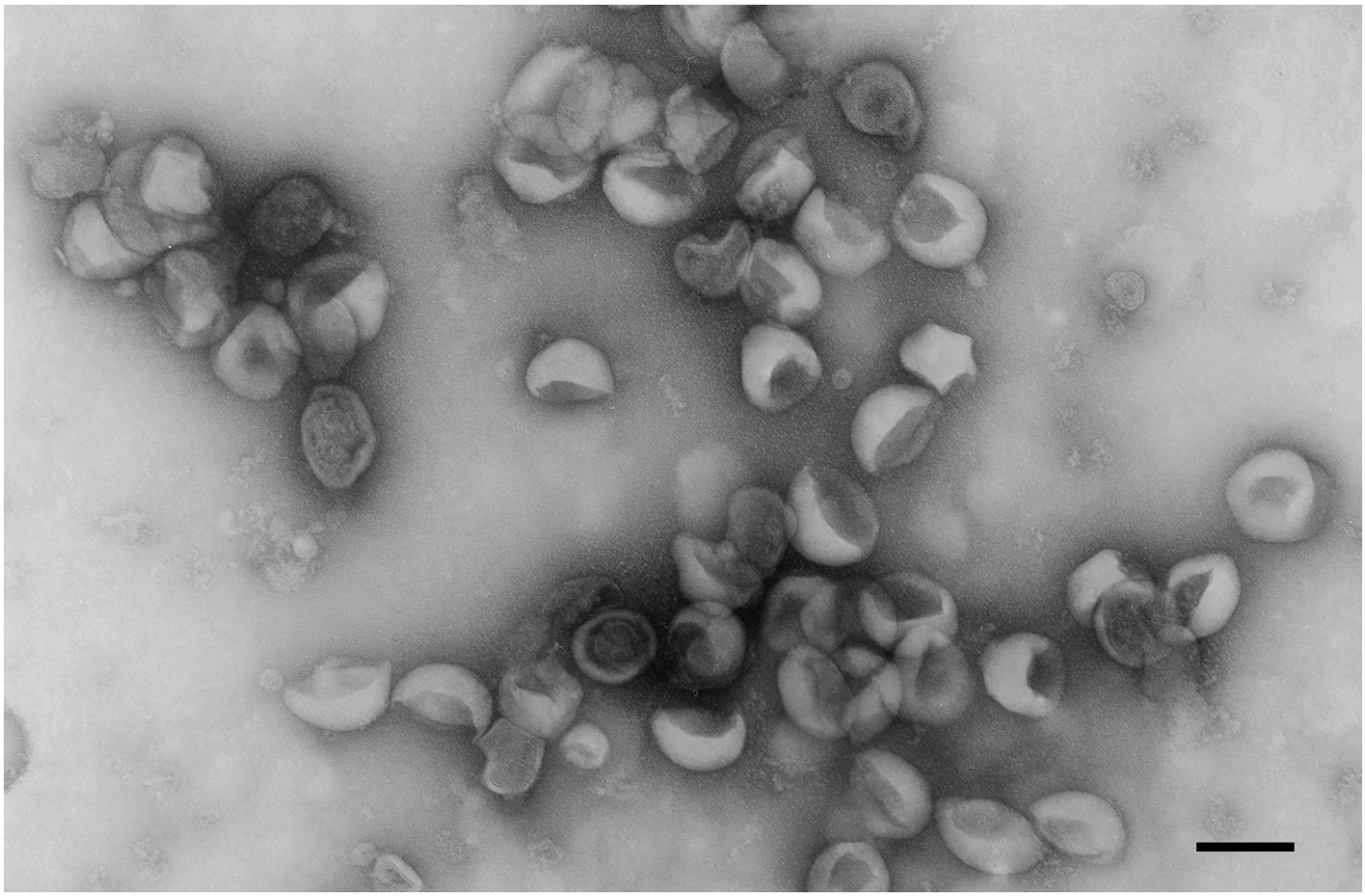
Retroviridae



Reticuloendotheliosis virus (REV). Genus: Gammaretrovirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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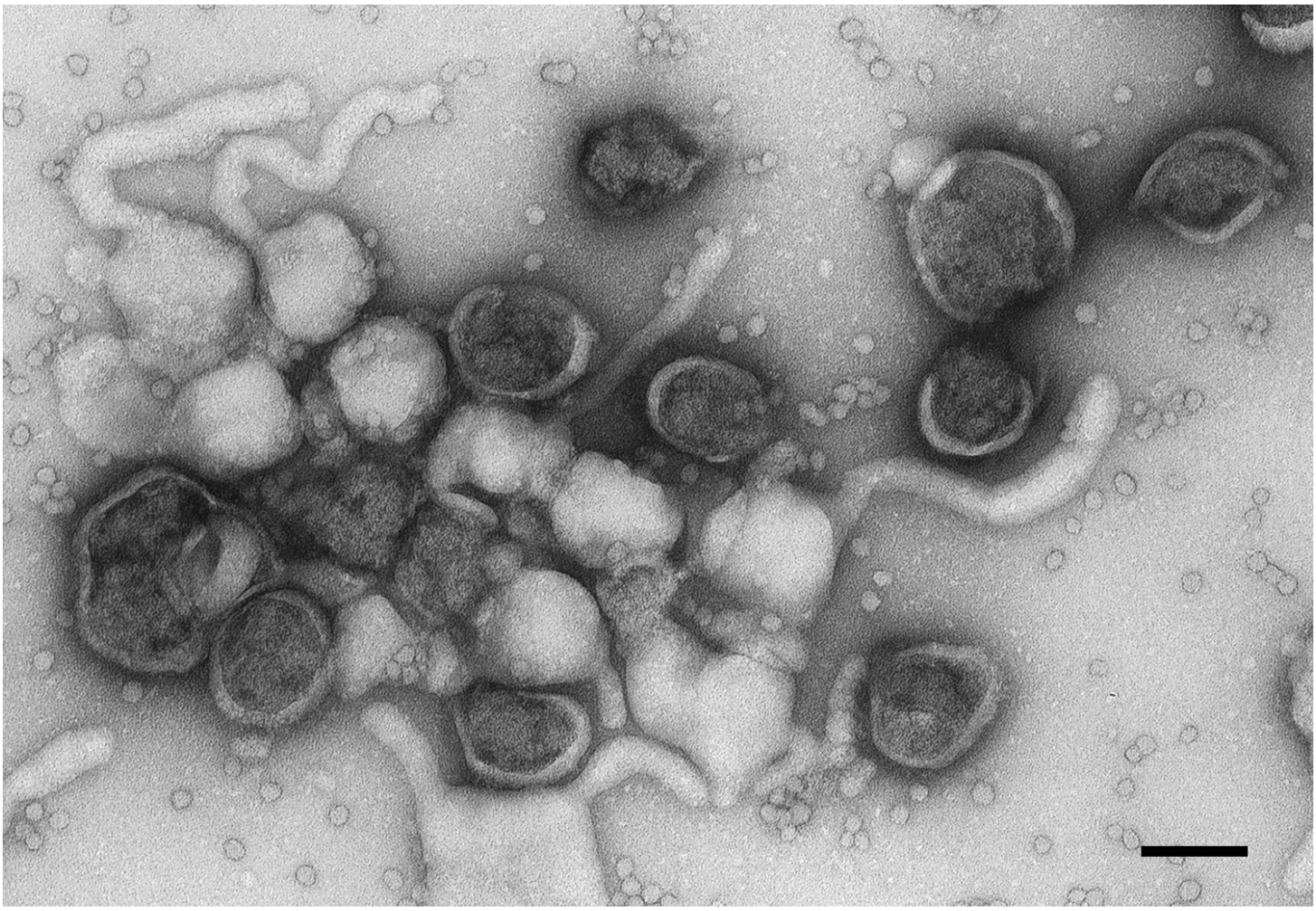
Retroviridae



Human immunodeficiency virus 2 (HIV-2). Genus: Lentivirus. Negative staining, PTA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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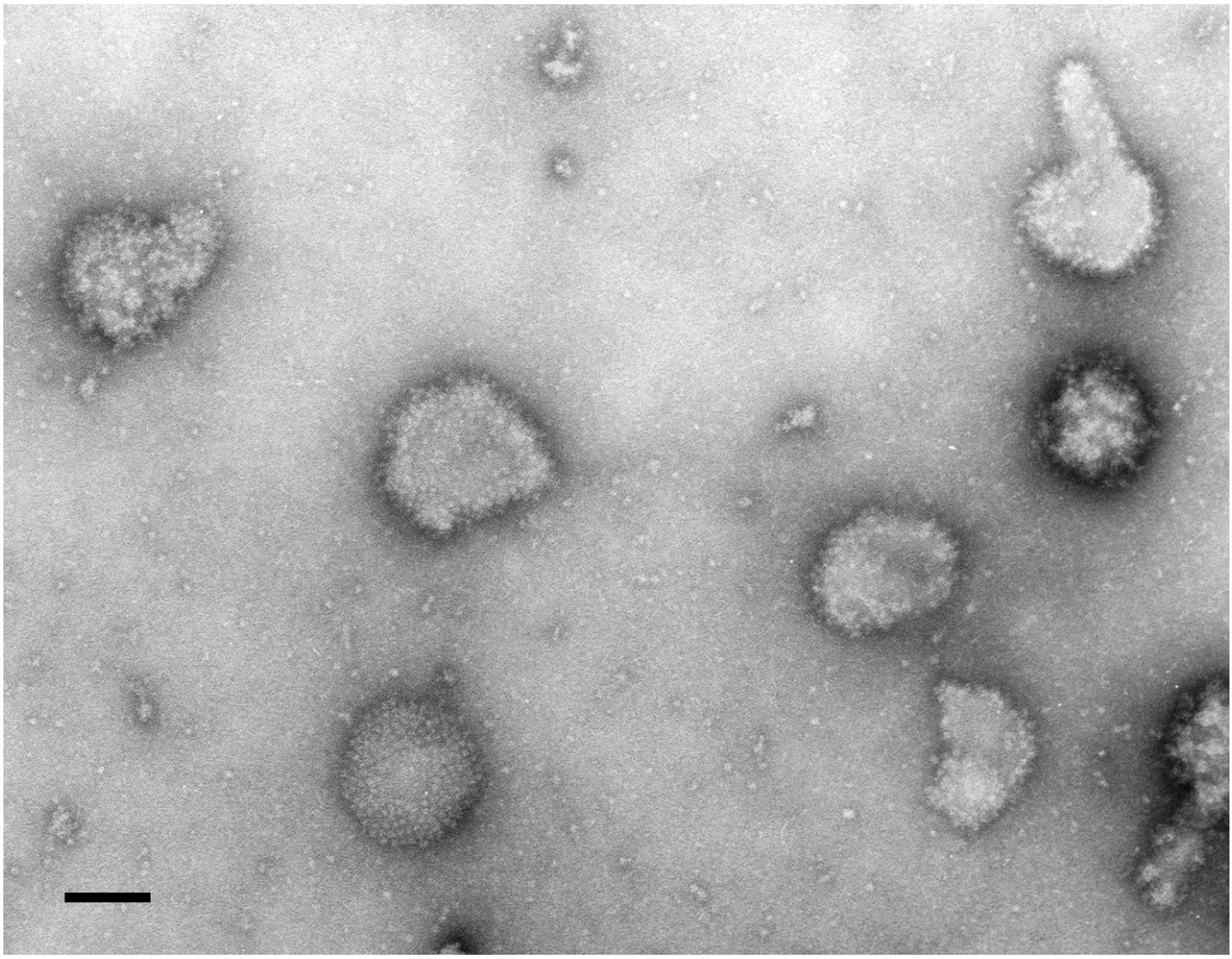
Retroviridae



Murine leukemia virus (MuLV). Genus: Gammaretrovirus. Negative staining, PTA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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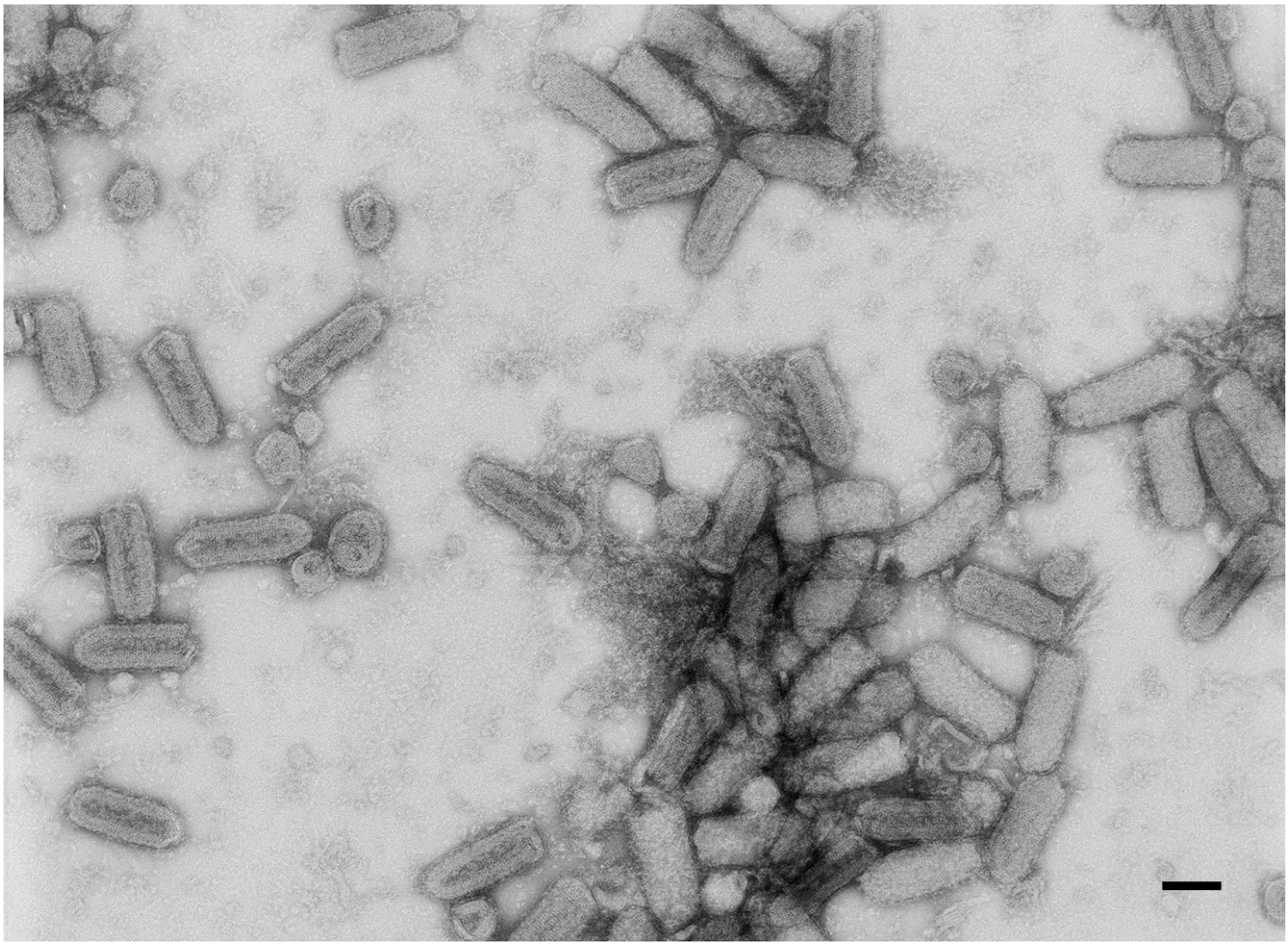
Rhabdoviridae



Vesicular stomatitis virus (VSV). Genus: Vesiculovirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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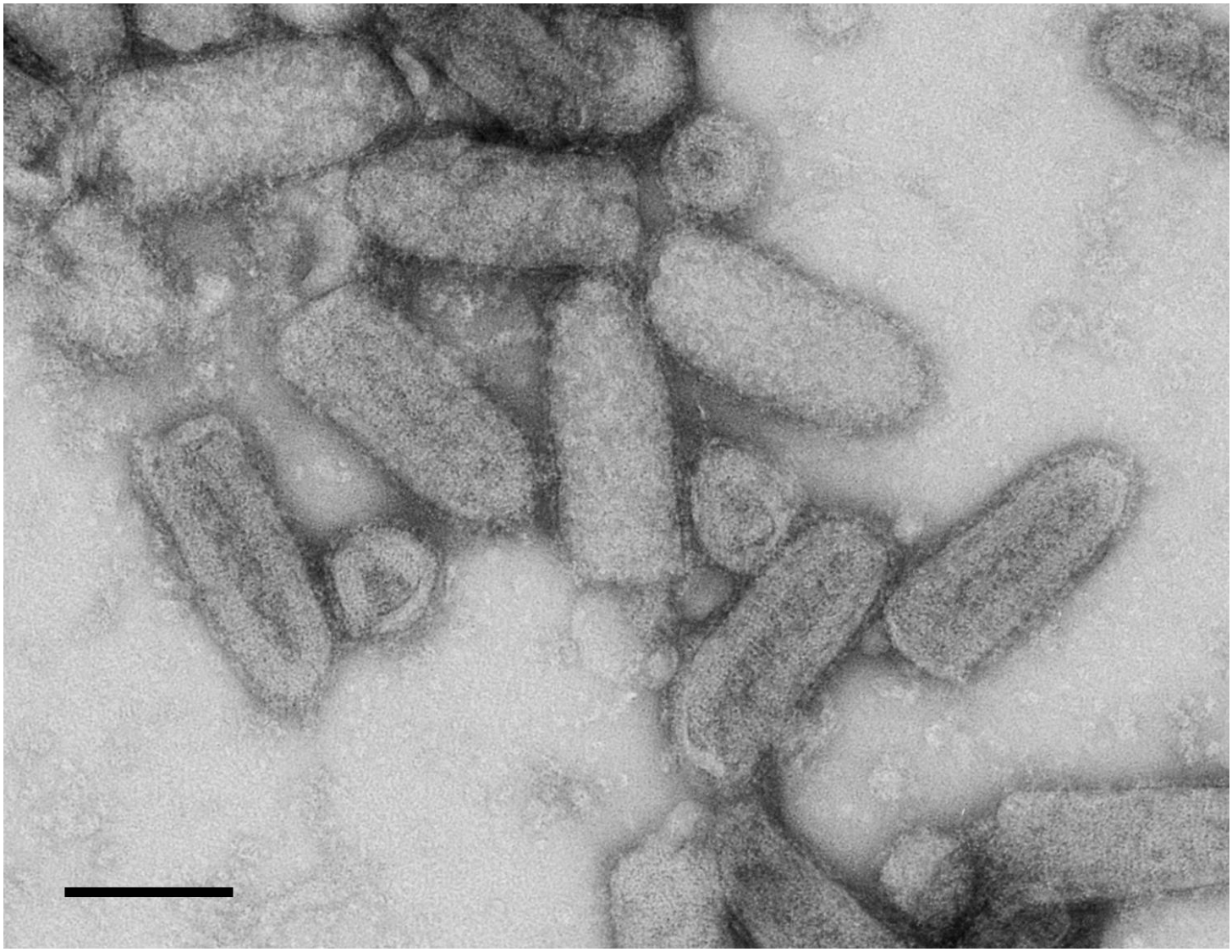
Rhabdoviridae



Vesicular stomatitis virus (VSV). Genus: Vesiculovirus. Negative staining, UA

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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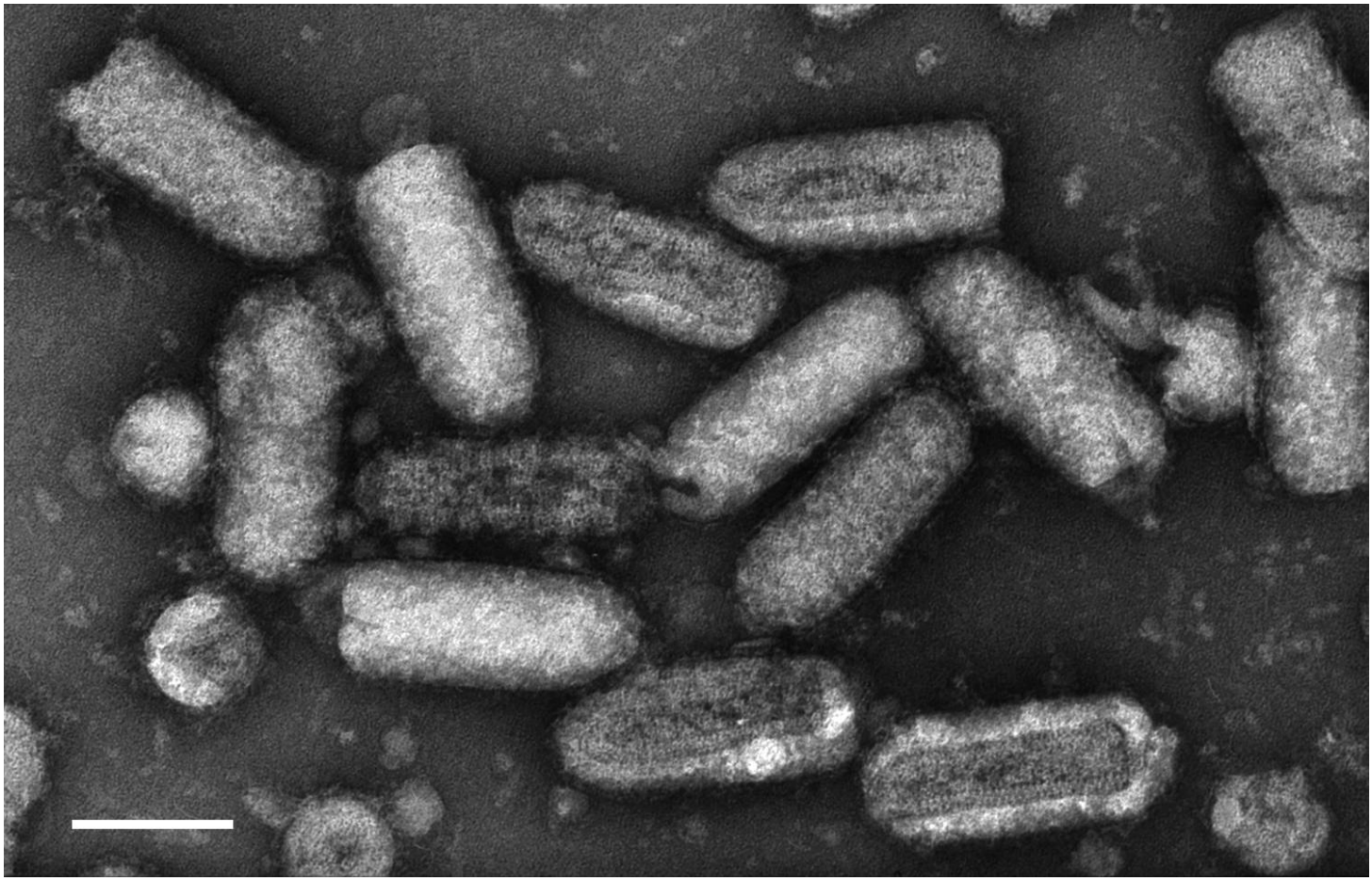
Rhabdoviridae



Vesicular stomatitis virus (VSV). Genus: Vesiculovirus. Negative staining, PTA.

Image source: Andrea Männel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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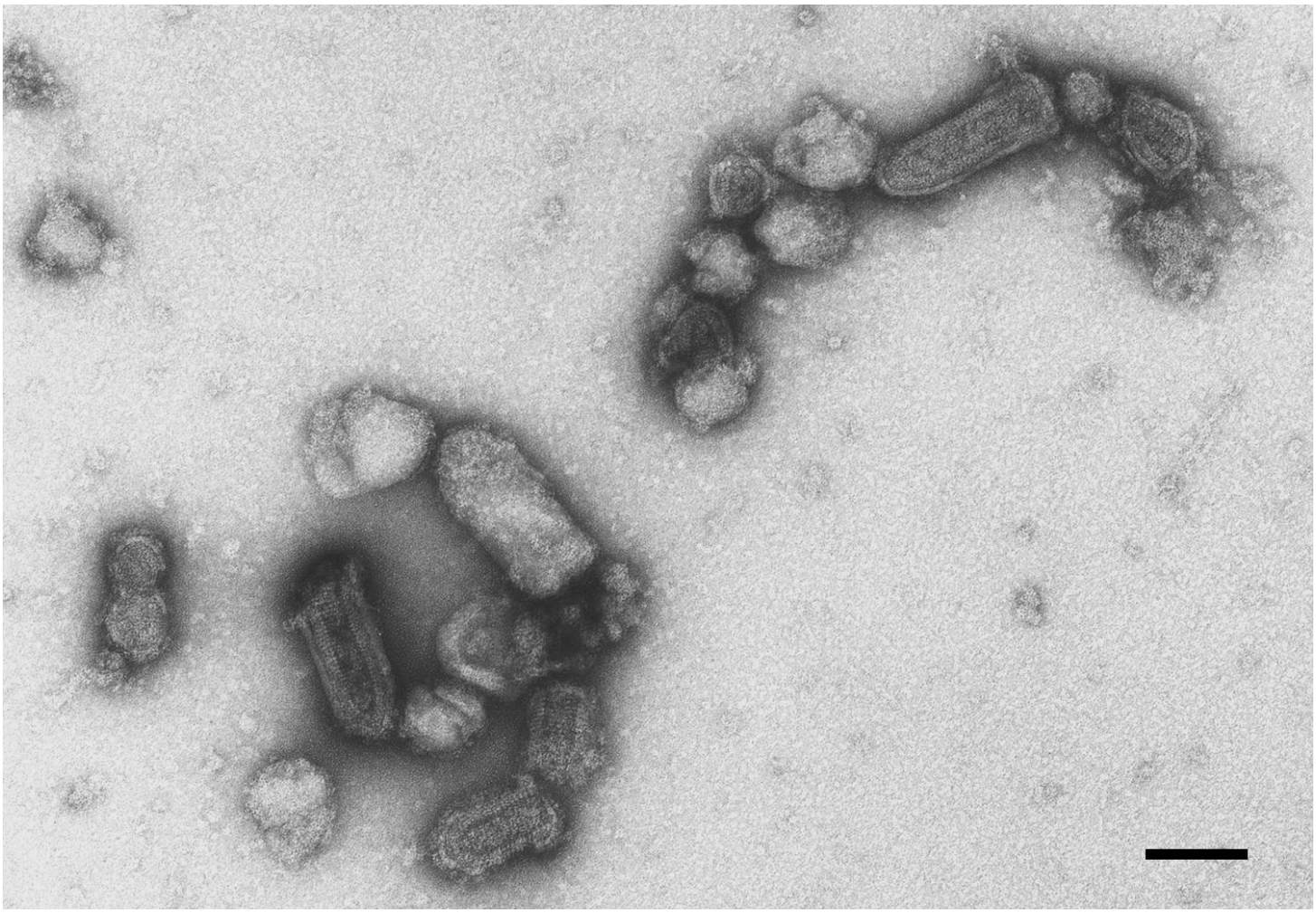
Rhabdoviridae



Vesicular stomatitis virus (VSV). Genus: Vesiculovirus. Negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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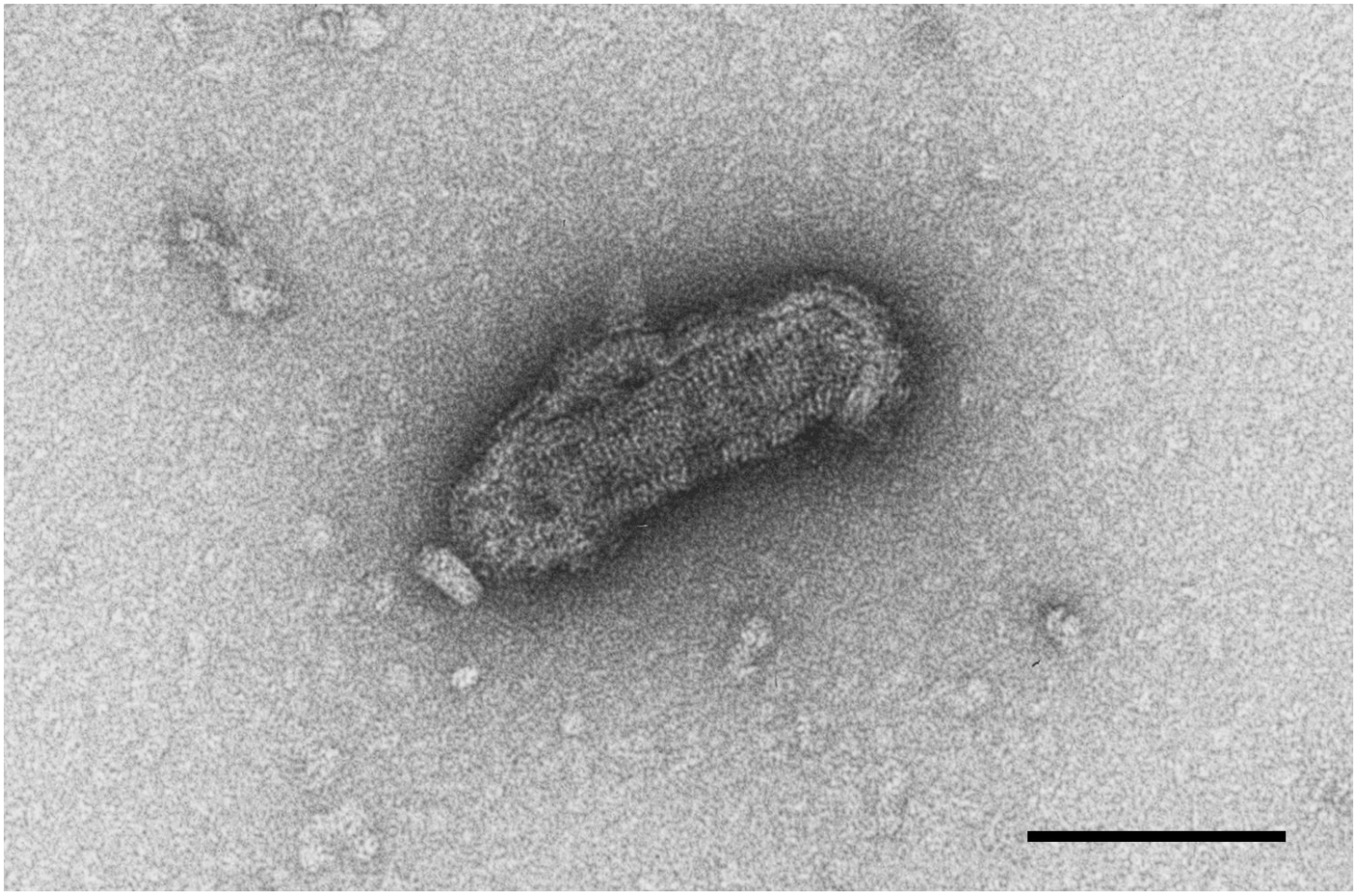
Rhabdoviridae



Rabies virus (RABV). Genus: Lyssavirus. Negative staining, UA.

Image source: Chang-Ok Han , Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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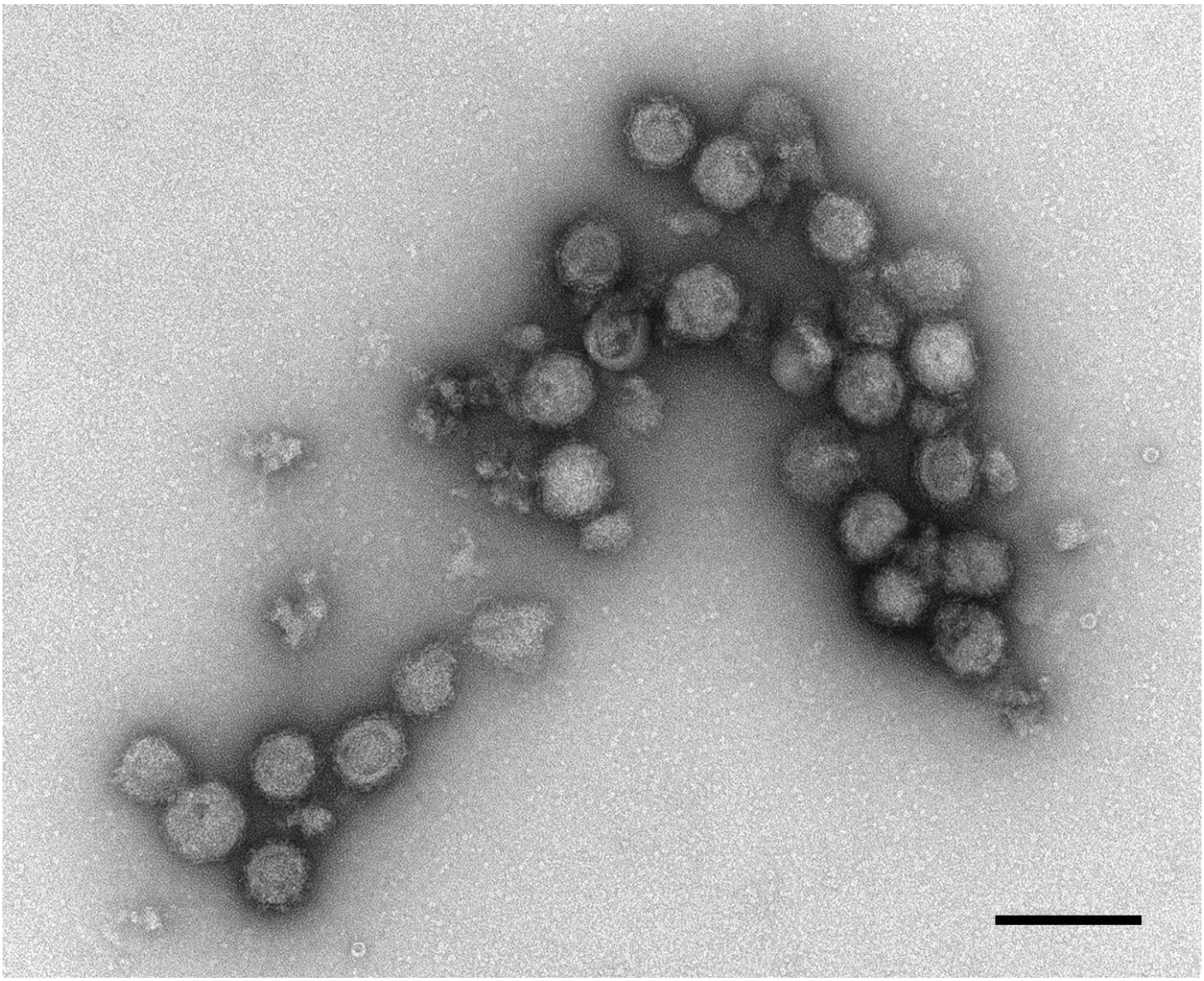
Togaviridae



Sindbis virus (SINV). Genus: Alphavirus. Negative staining, UA.

Image source: Hans R. Gelderblom, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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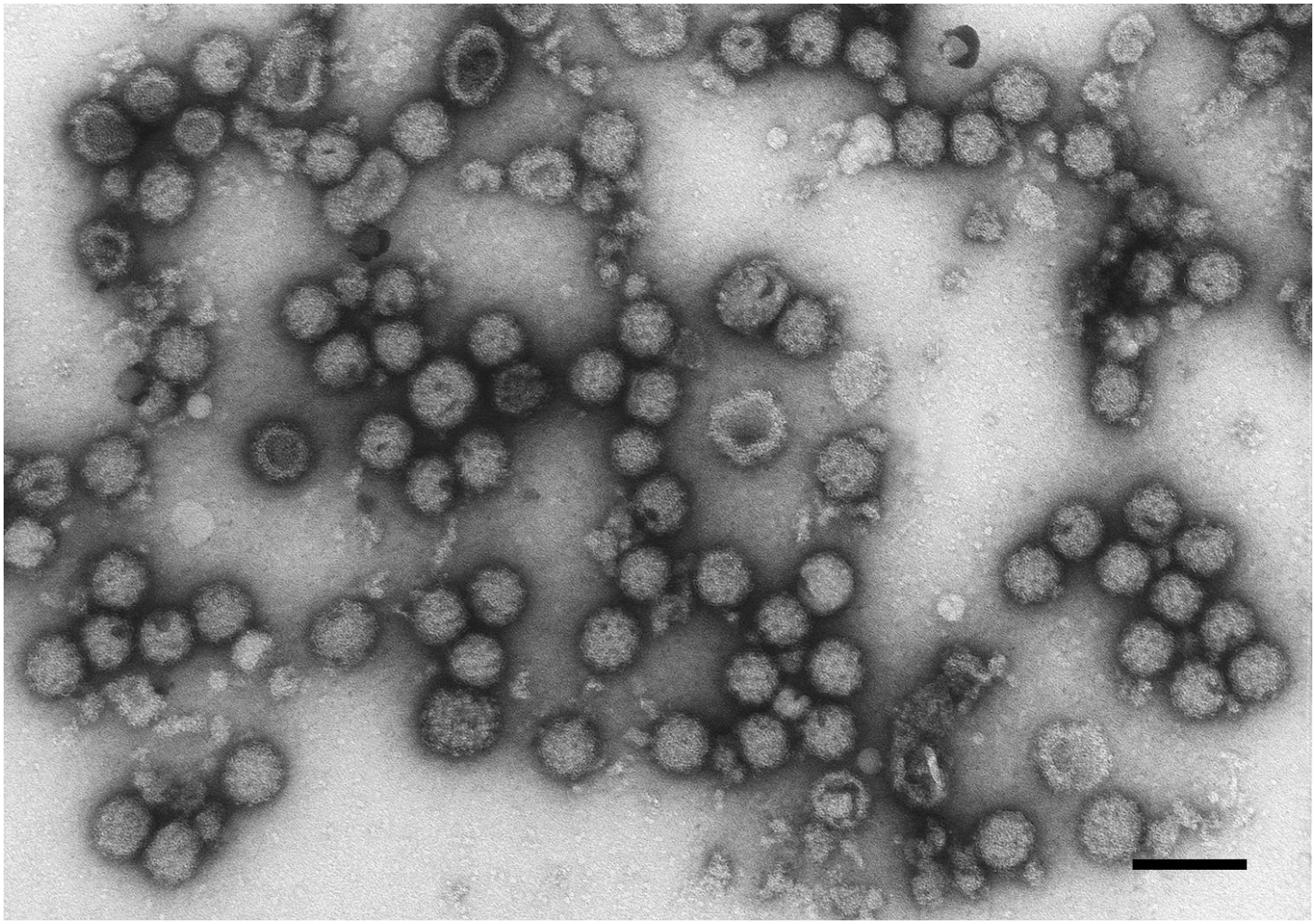
Togaviridae



Semliki Forest virus (SFV). Genus: Alphavirus. Negative staining, UA.

Image source: Muhsin Özel, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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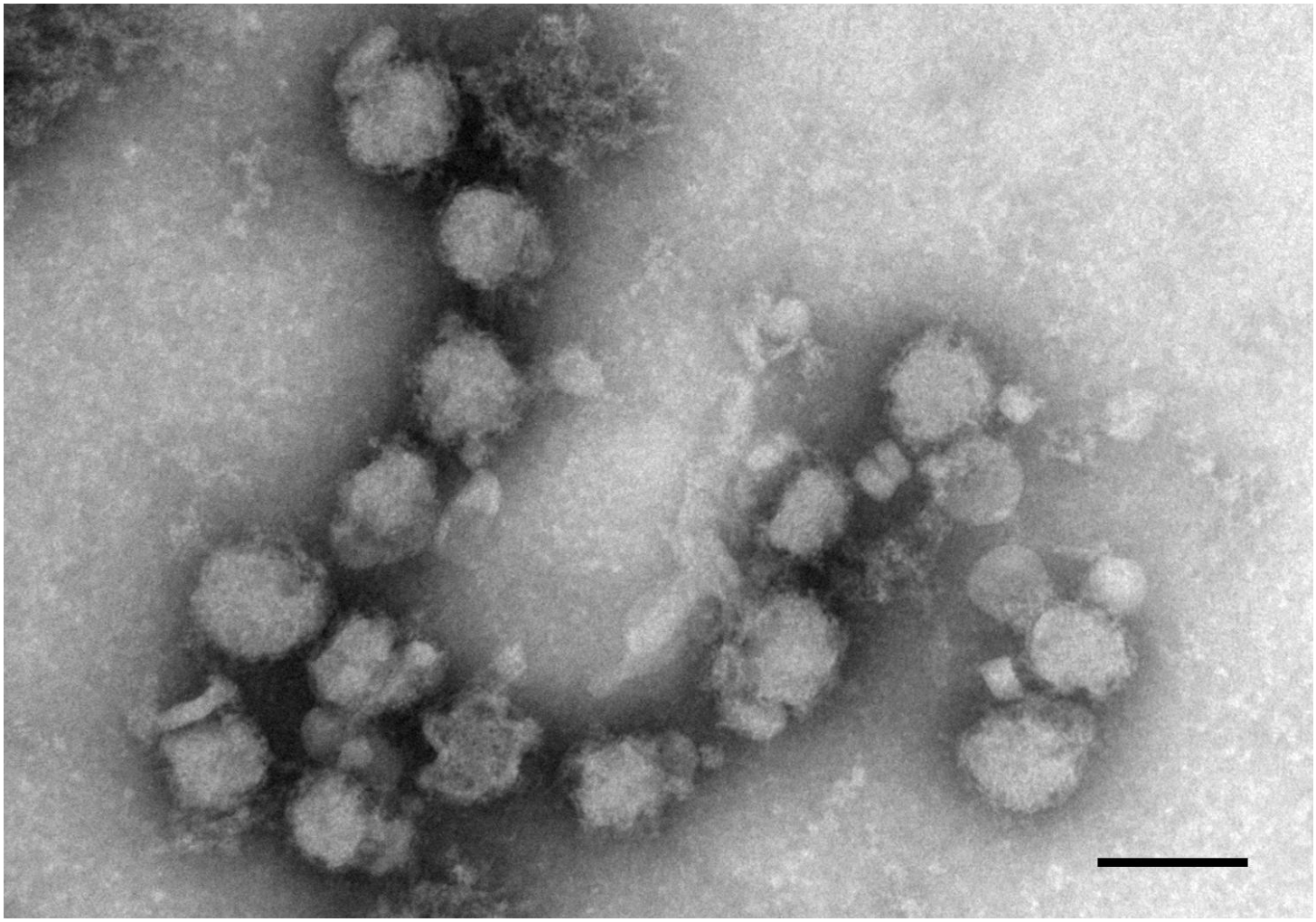
Togaviridae



Rubella virus (RUBV). Genus: Rubivirus. Negative staining after airfuge concentration, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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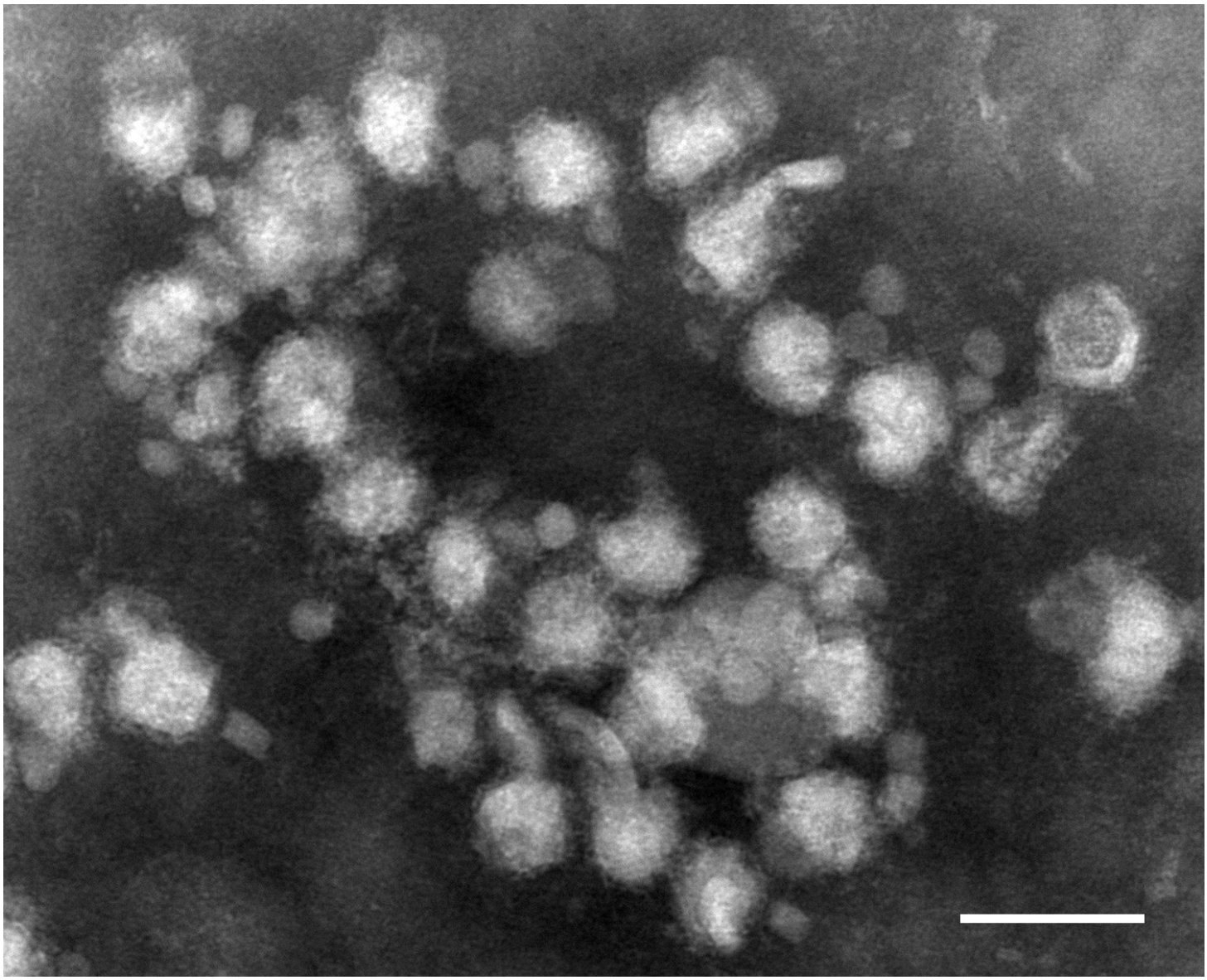
Togaviridae



Rubella virus (RUBV). Genus: Rubivirus. Negative staining, PTA.

Image source: Lars Möller, Robert Koch Institute. Scale bar (if not stated otherwise): 100 nm

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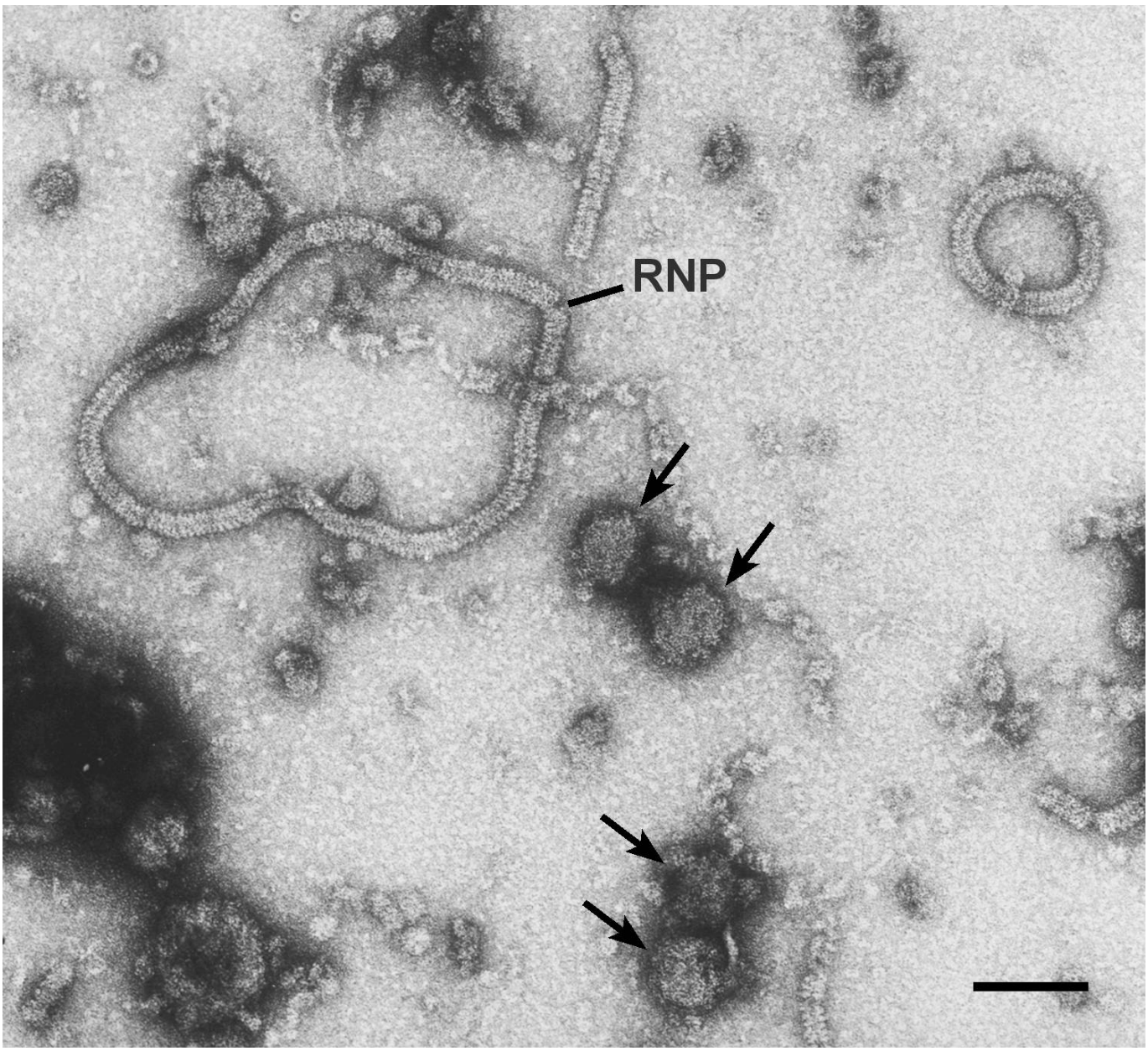
Togaviridae



Paramyxovirus ribonucleoprotein (RNP) and Semliki Forest virus (SFV, Togaviridae, Genus: Alphavirus; arrows). Negative staining, UA.

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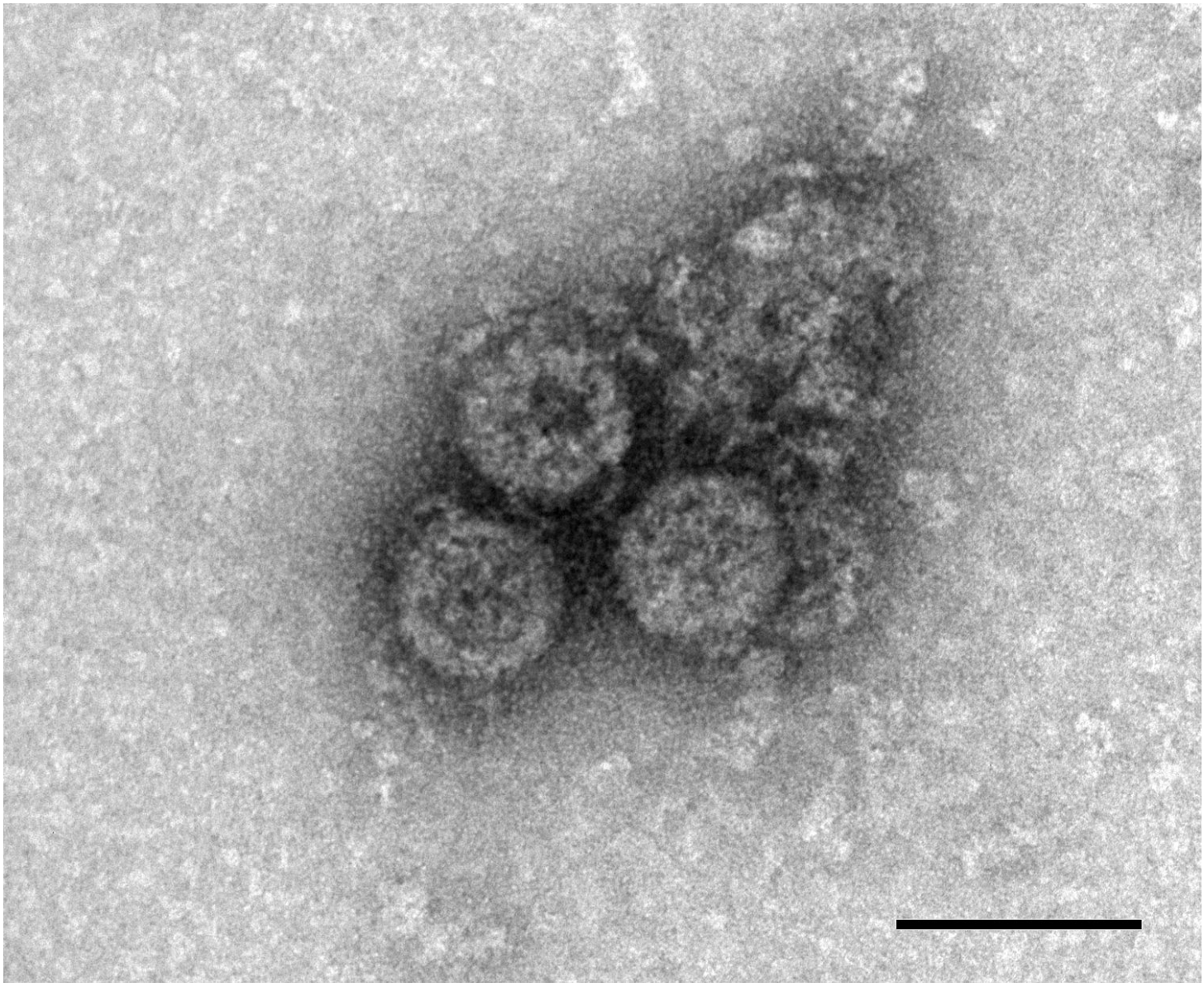
Togaviridae



Chikungunya virus (CHIKV). Genus: Alphavirus. Negative staining, UA.

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