



E! 6143 MiniTEM

Development of benchtop equipment for automated characterization of viruses and other biological nanoparticles

3 years from 7.2011 to 6.2014



The Eurostars Programme is powered by EUREKA and the European Community



Brno - Palackého tř.

headquarters, R&D,
special fabrication
technologies, assembly,
testing

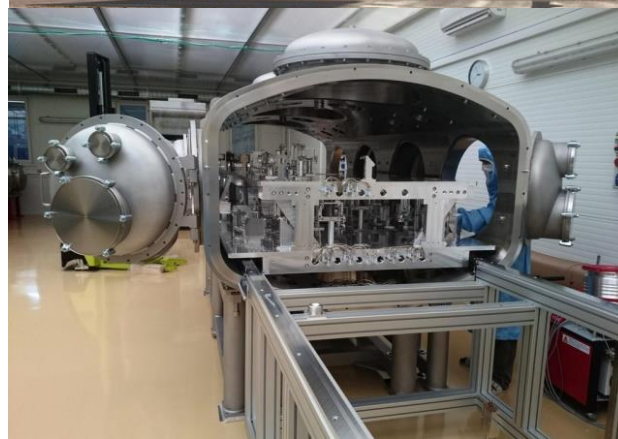
Brno - Purkyňova

Large equipments
assembly and testing

Boskovice

fabrication,
complex technology

80 people



Production structure 2017

Electron optics and (ultra)high vacuum

Components

manufacturing / 26%

OEM products / 28%

- Semiconductor industry
- Analytical instruments
- Laser application
- Nanostructures
- Vacuum systems
- Cathodoluminescence

End user products / 46%

- LVEM5
- LVEM25
- DIGUN

Established 1990

Long tradition of electron optics and
microscopy in Brno:

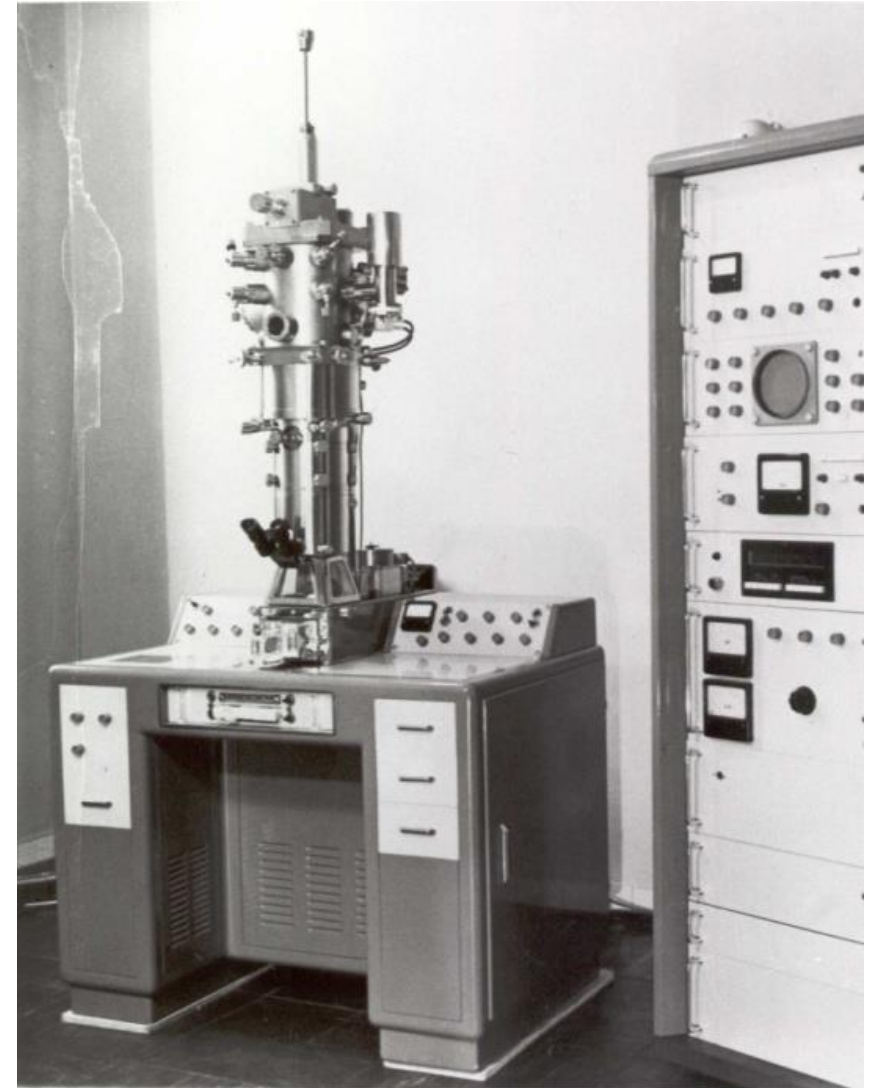
Tesla Brno,

Institute of Scientific Instruments Cz AS.

2 big electron microscopy companies in the
city.

Over 30% of EMs are produced there.

How to break through?



The project story

The need to strengthen the end-user products part of our portfolio.

The low voltage electron microscopy:

Desk-top EM LVEM5 – 5 keV – design by prof. Delong.

Deep experience with various e-beam equipments:
e-guns, e-beam columns, e-beam lithography ...

The idea of making a TEM – bigger brother of the
LVEM5,

but still small and easy to operate, based on the
same technology of the desk-top solution.

Stronger application orientation, rapid virus detection
e.g.



The project story

2008 – contact from Vironova, biotech company, Sweden.

Vironova came with a clear proposal of a combination of our TEM technology with their image recognition and processing software of the virus detection, recognition and classification.

The energy of the LVEM5 (5 keV) was too low to image bigger virus species, thus the plan of a co-operative development of a TEM with a software package perfectly fitted into our ideas.

Due to necessary development investments, we needed a grant.

Succeeded in 2010 as 2 companies and Centre for Image Analysis in Uppsala.

The project proposal was evaluated as the 2nd best in the call.

The results - TEM

The transmission electron microscope combines the modes of TEM and STEM and works with the accelerating voltage of 25 kV.

The resolution power down to 1 nm.

Designed specially for biological applications – negatively stained viruses and thin tissue sections.

Easy operation, small installation space in an ordinary lab without the necessary blackouts and cooling water. It needs only an ordinary 110-230V socket. The microscope body is about 90 cm high.



The results - TEM

It can be installed in one working day.

It communicates via TCP/IP protocols, thus it can be easily controlled by an „external“ software.

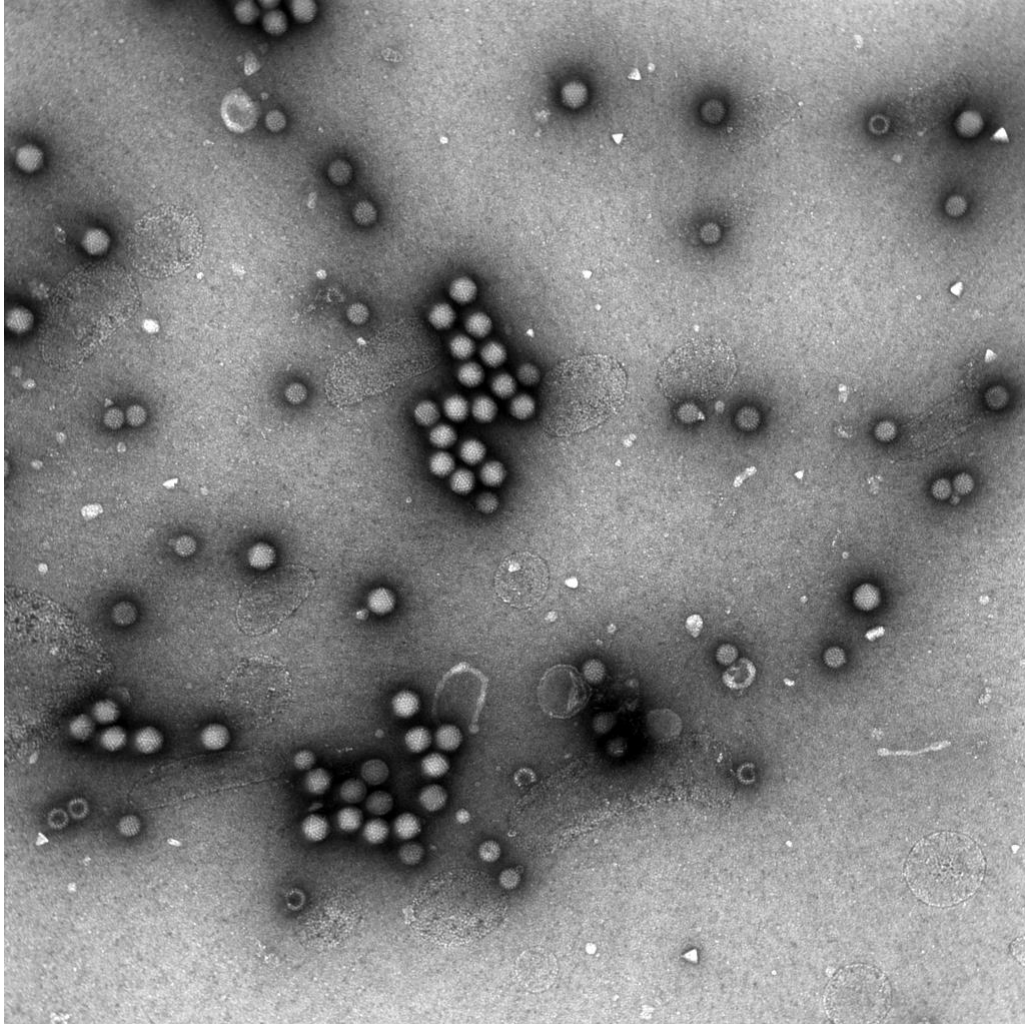
This is the way how the Swedish partners connect their software to the microscope.

Thus they can not just take the images, they can fully control the operation of the microscope.

The last 4 pieces batch of 20 units is being assembled. Few units have been sold independently of Vironova under the mark LVEM25, but they mostly go to Sweden to be completed into the MiniTEM units.

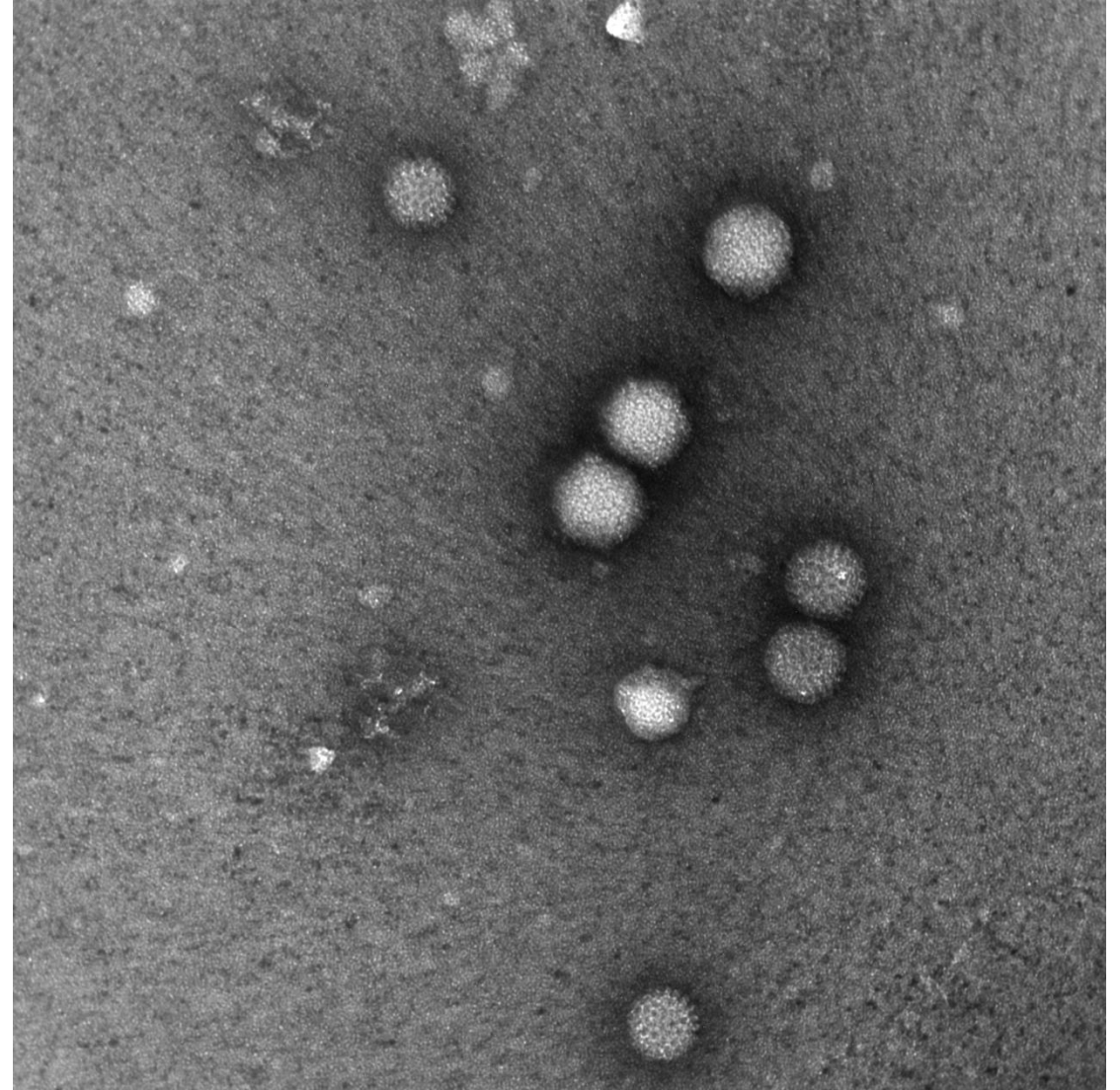


Examples: Adeno - and rotavirus



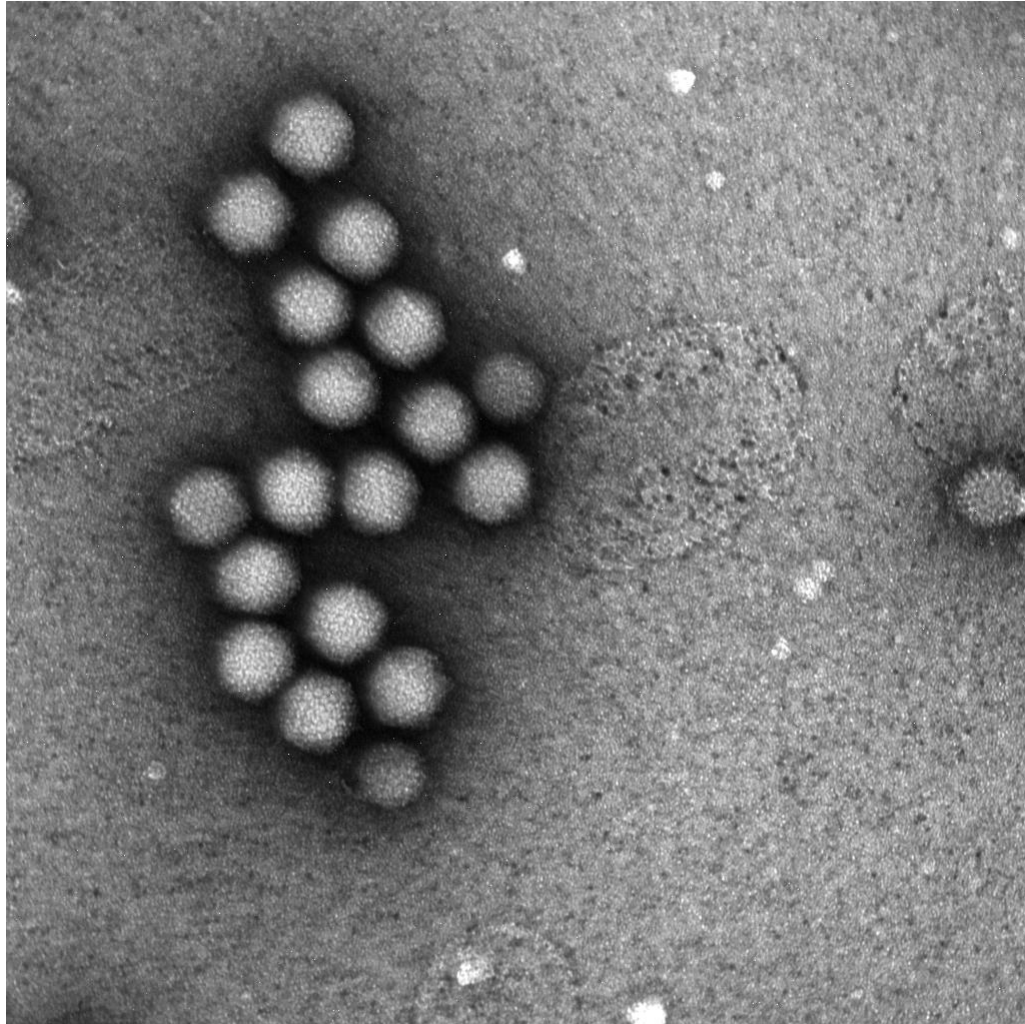
500 nm

FOV 3780 nm



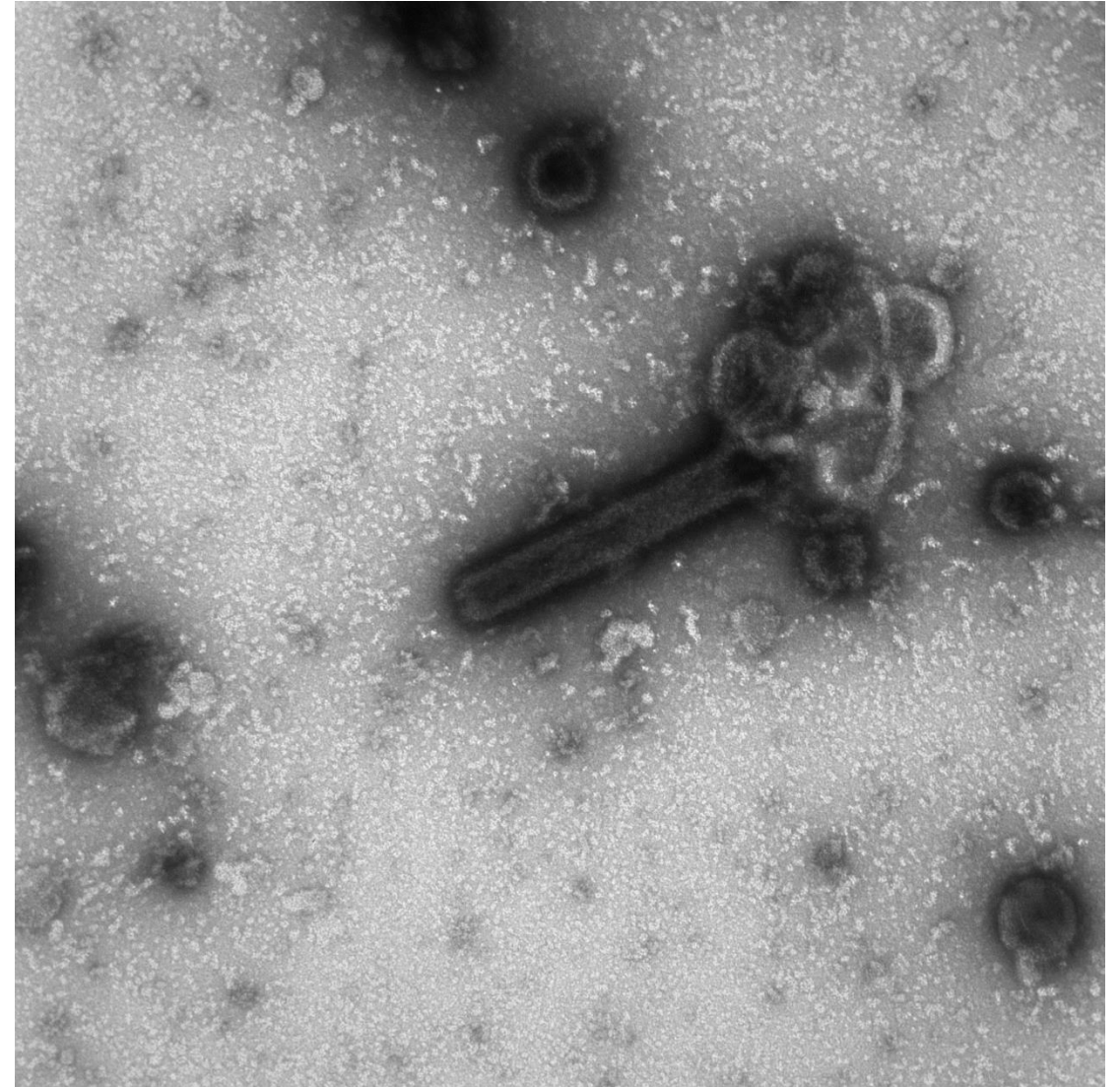
100 nm

FOV 1280 nm



100 nm

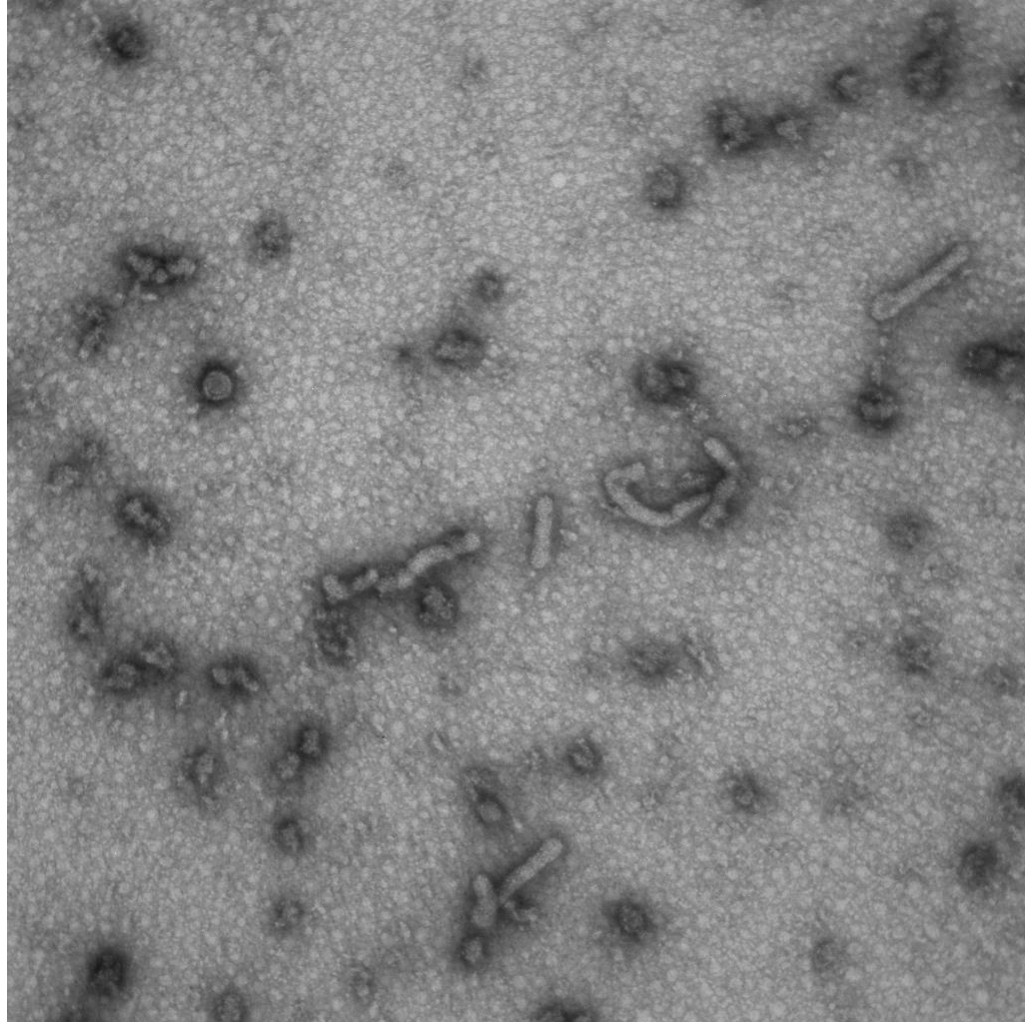
FOV 1260 nm



200 nm

FOV 2020 nm

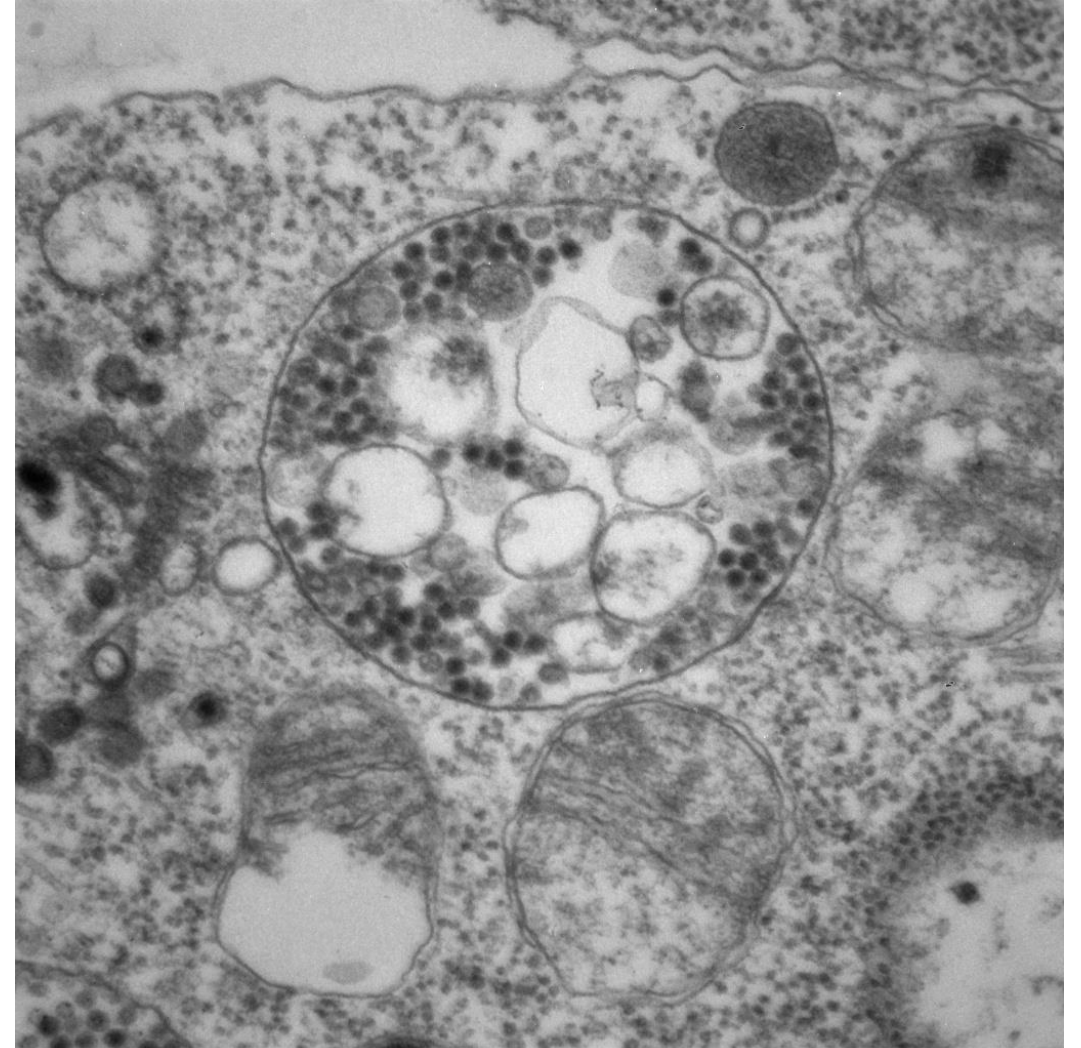
Virus Hepatitis B



200 nm

FOV 1820 nm

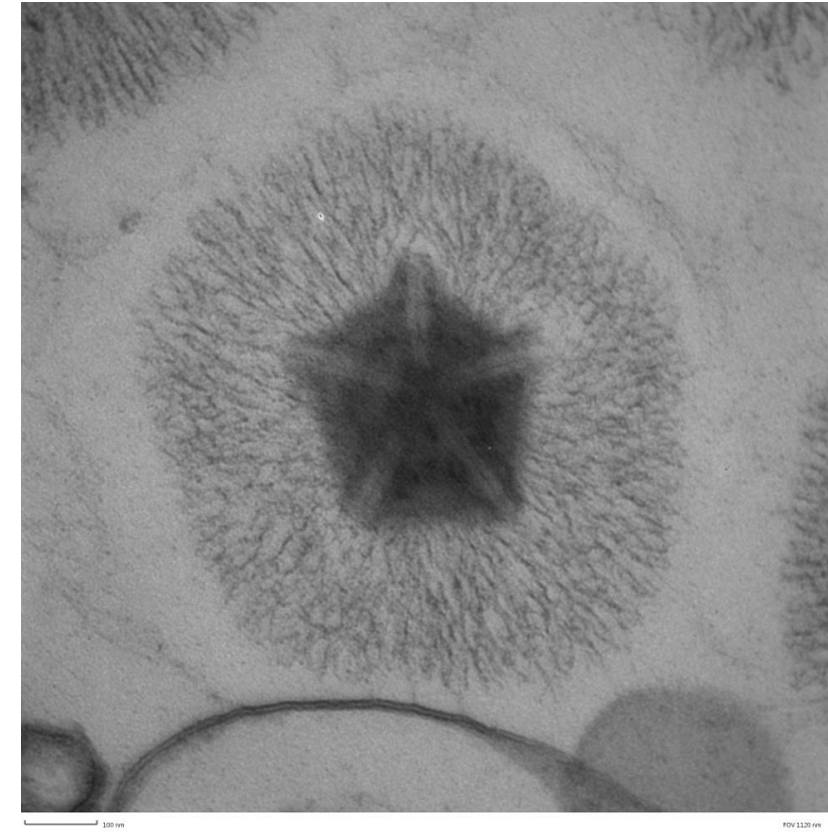
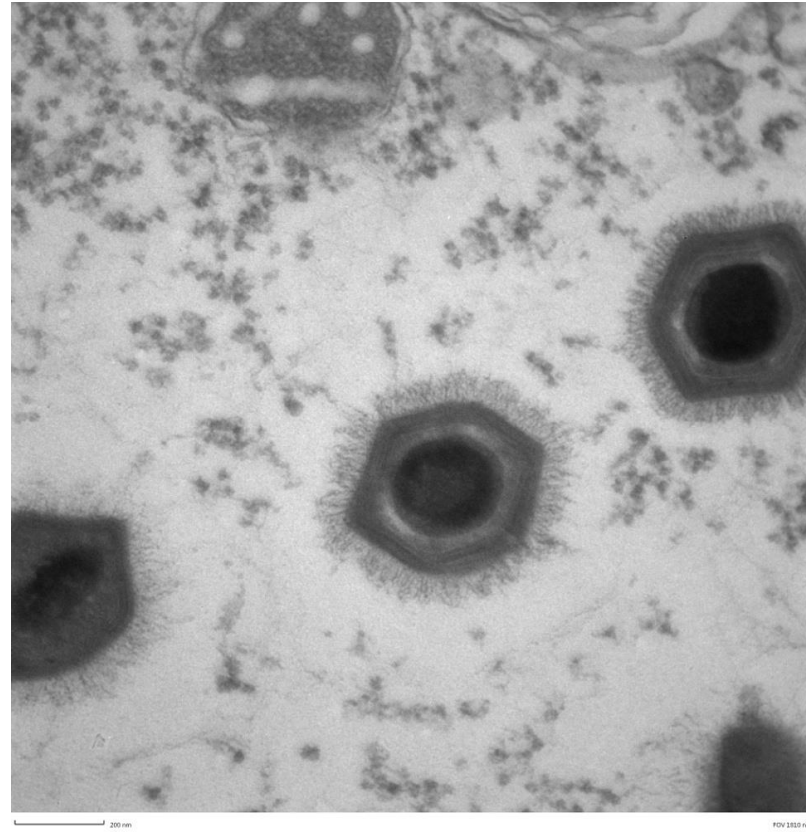
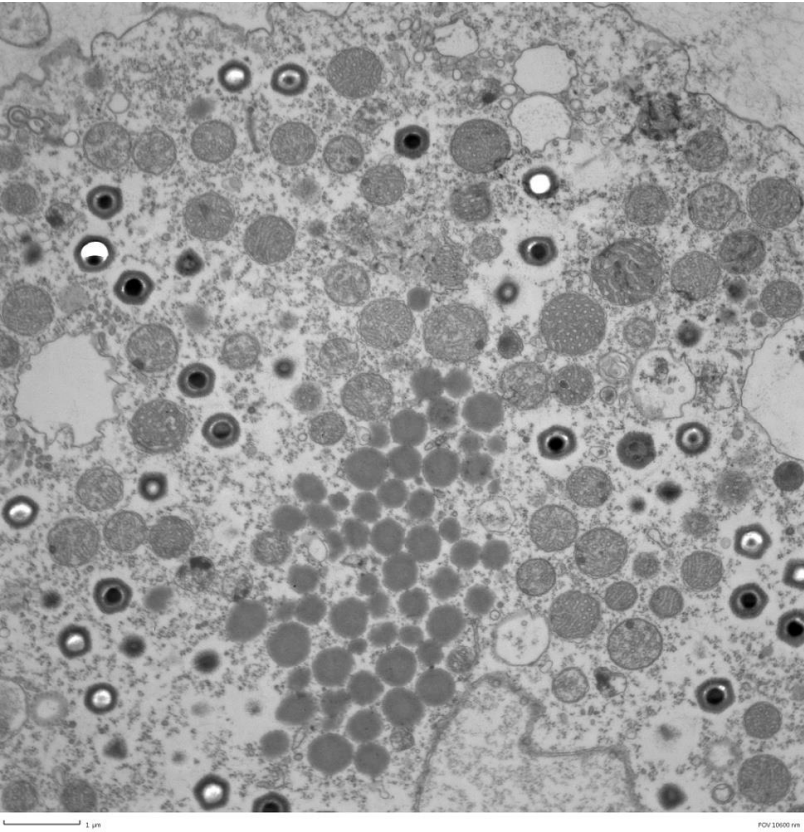
Flavivirus in tissue section



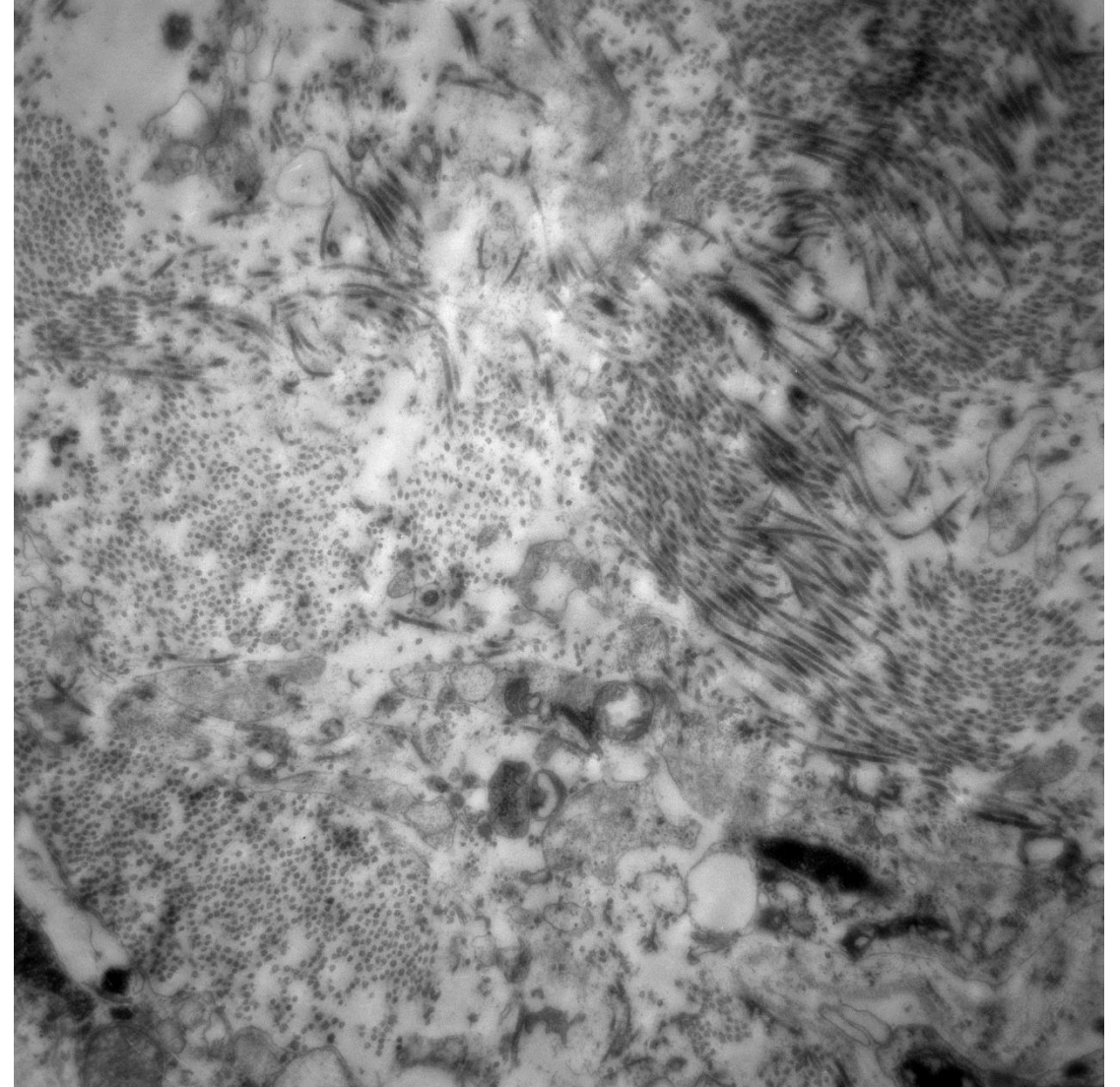
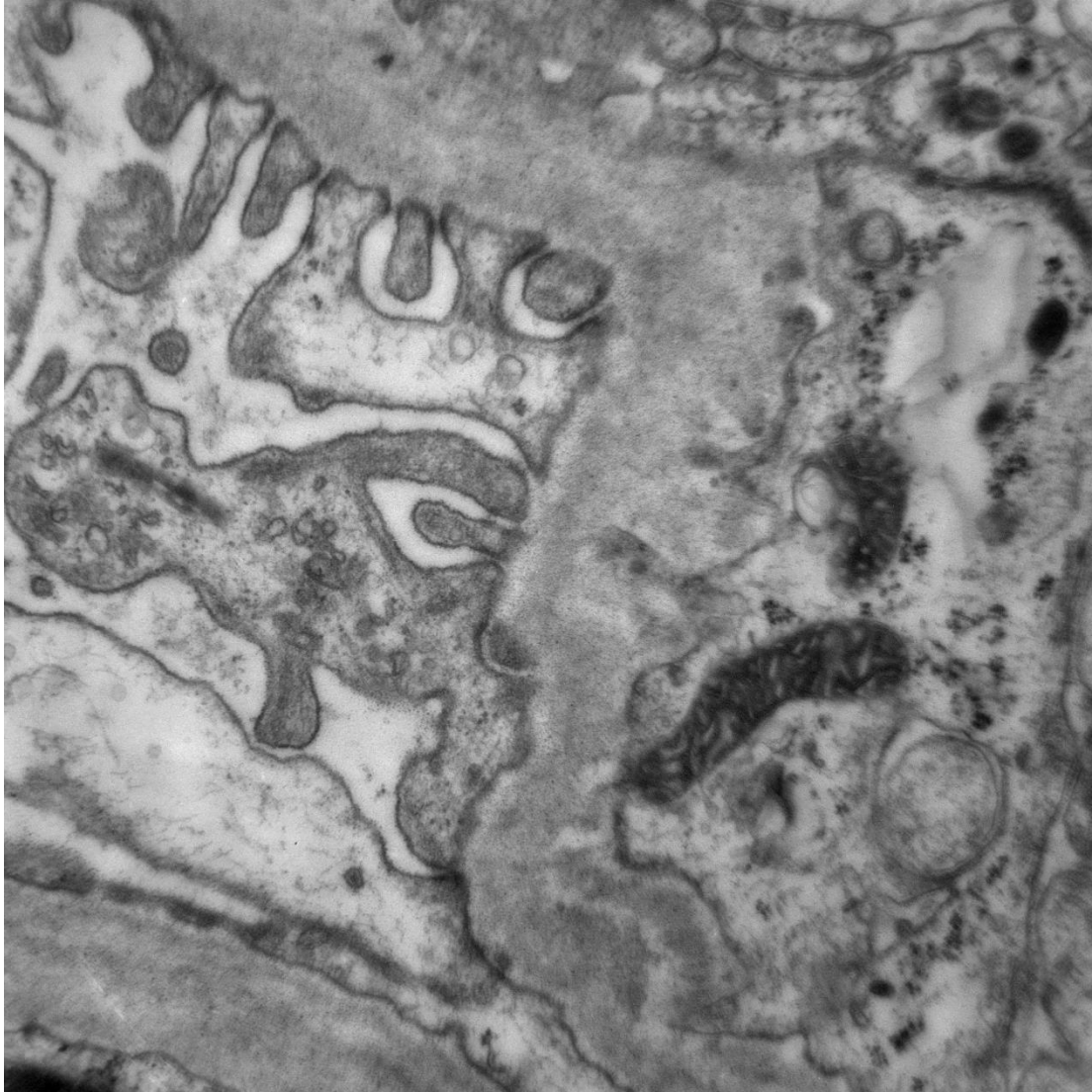
200 nm

FOV 2360 nm

Amoeba – Mimivirus in tissue section



Kidney – section



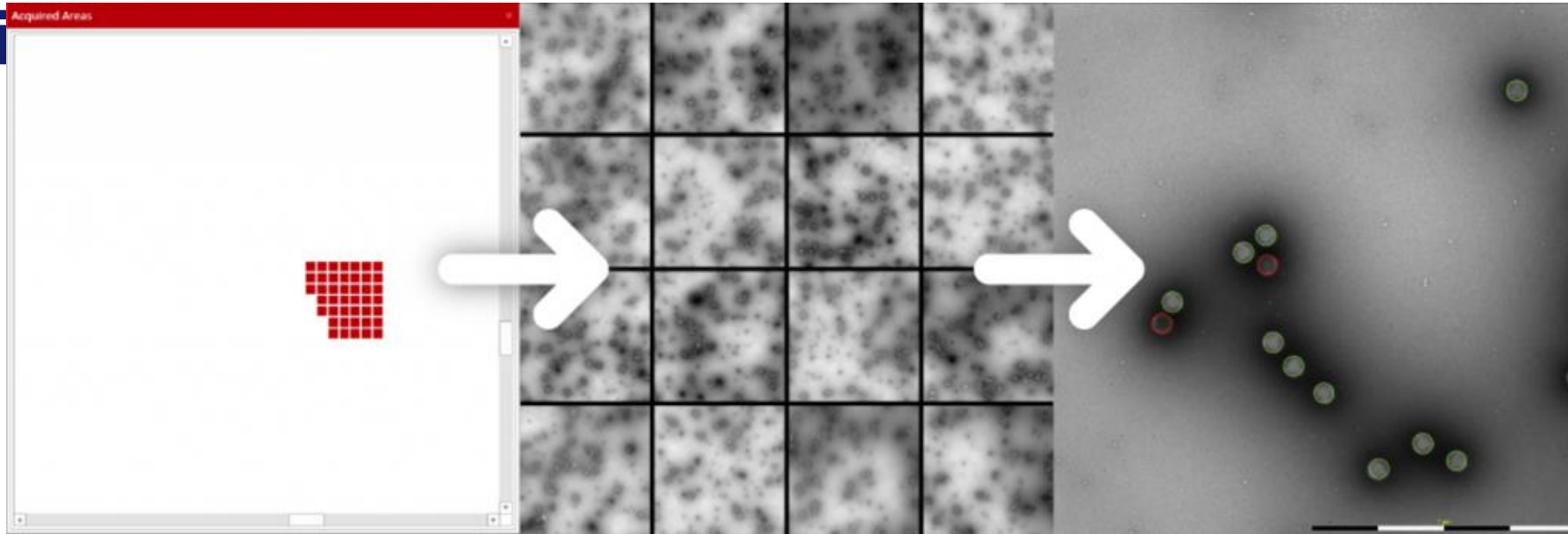
Designed for automated nanoparticle characterization

- Meaningful particle morphology, size distribution and purity data
- High resolution images
- Easy to use and place

MiniTEM™ is a low-voltage transmission electron microscope system. The high resolution images it acquires reveal particle morphologies that can be transformed into accurate metrics.



Automated imaging, particle detection and classification

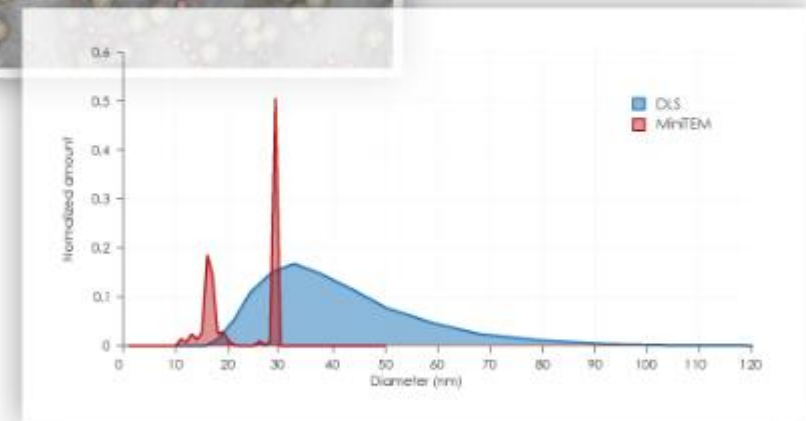
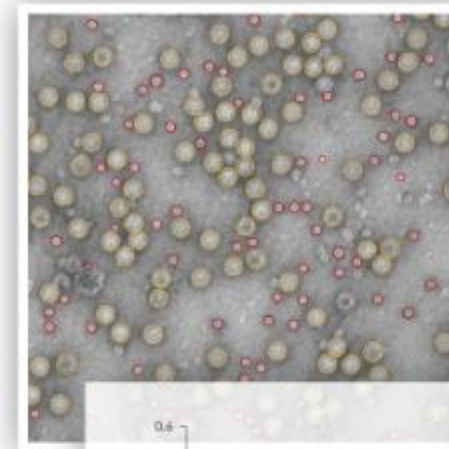


Automation is enabled by using a pre-configured MiniTEM software script, easily designed by dragging and dropping building blocks.

Images are automatically acquired in selected grid areas. The MiniTEM image analysis software detects and classifies particles with defined morphological characteristics. The particle classification data can then be transformed into accurate metrics.

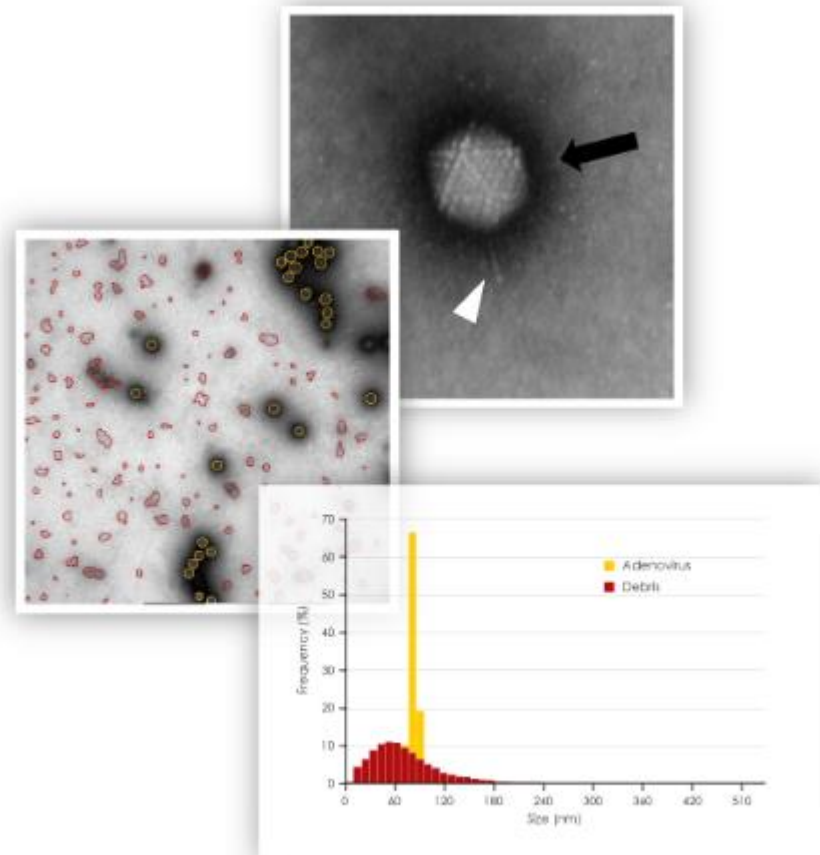
Particle size distribution analysis

Adeno-associated virus (AAV) particles contaminated by proteasomes.
Comparing MiniTEM with DLS and NTA.



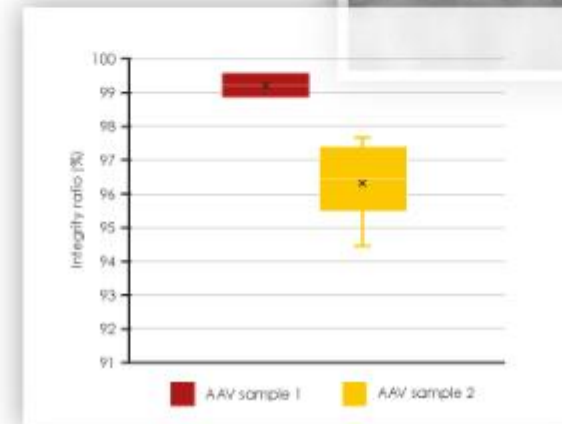
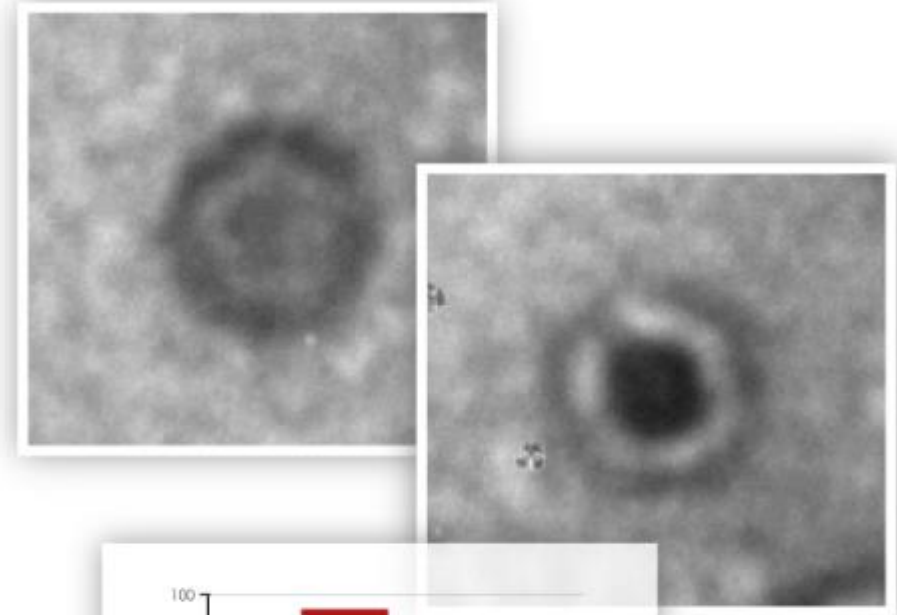
Particle purity analysis

Comparing purity of two different samples of Adenovirus



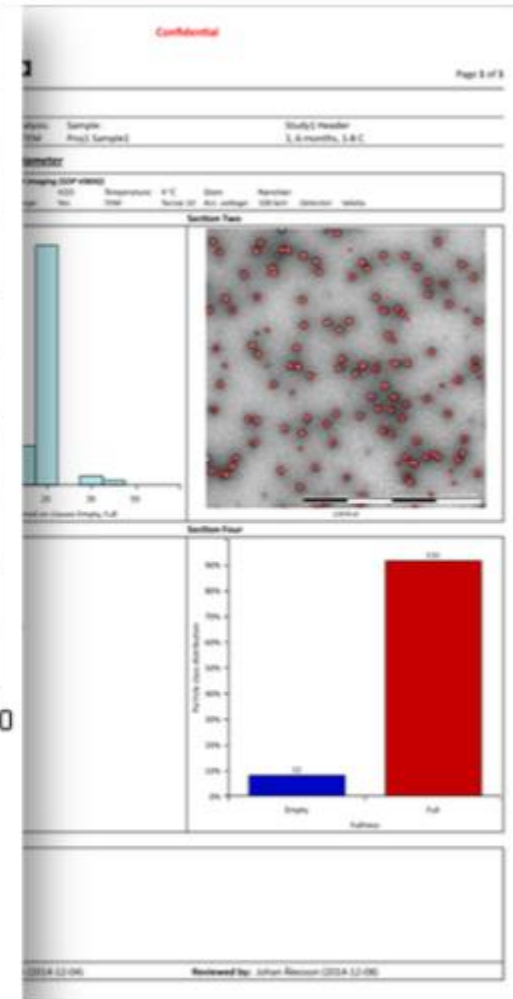
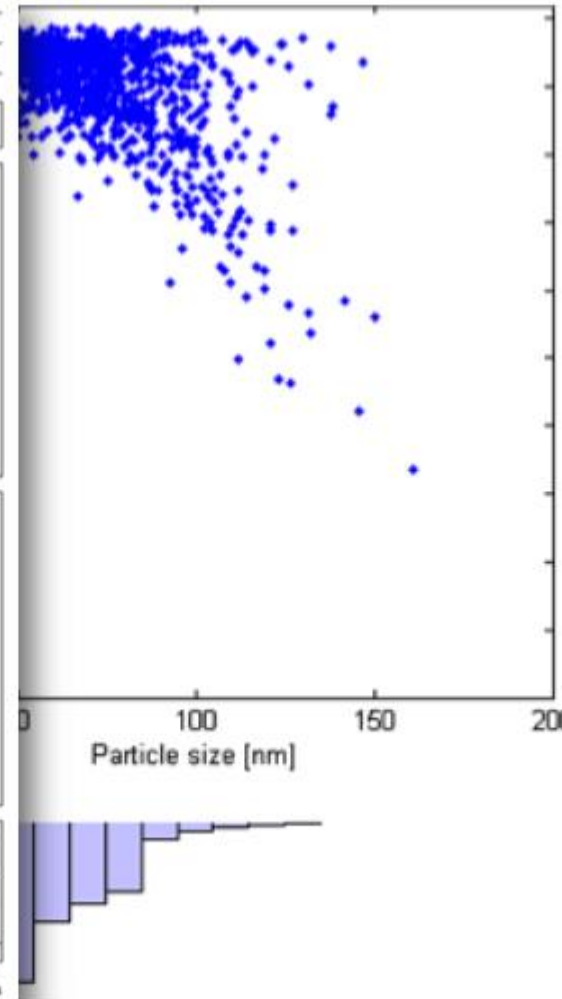
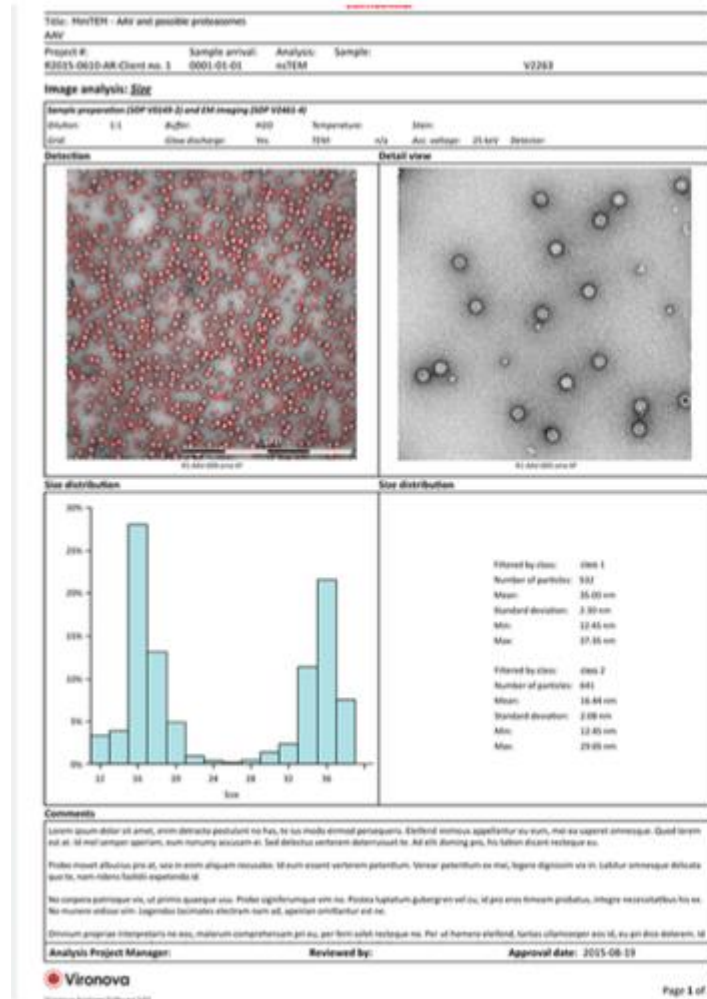
Particle morphology analysis

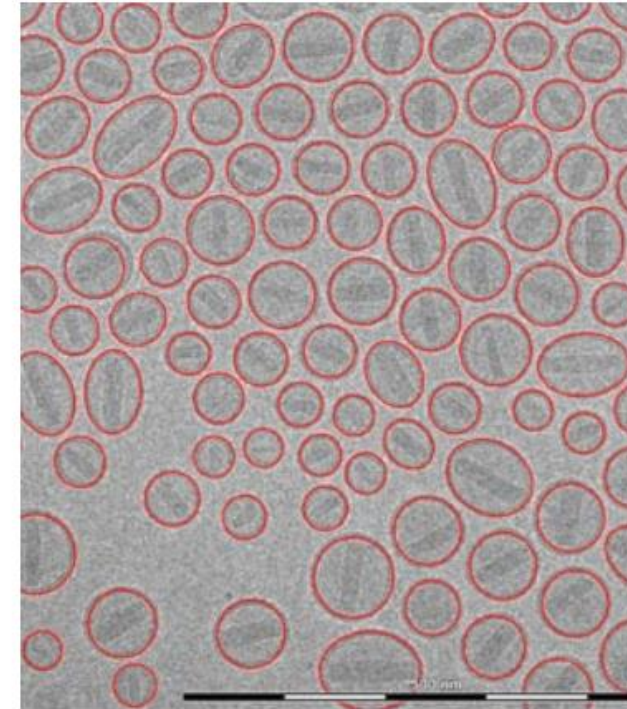
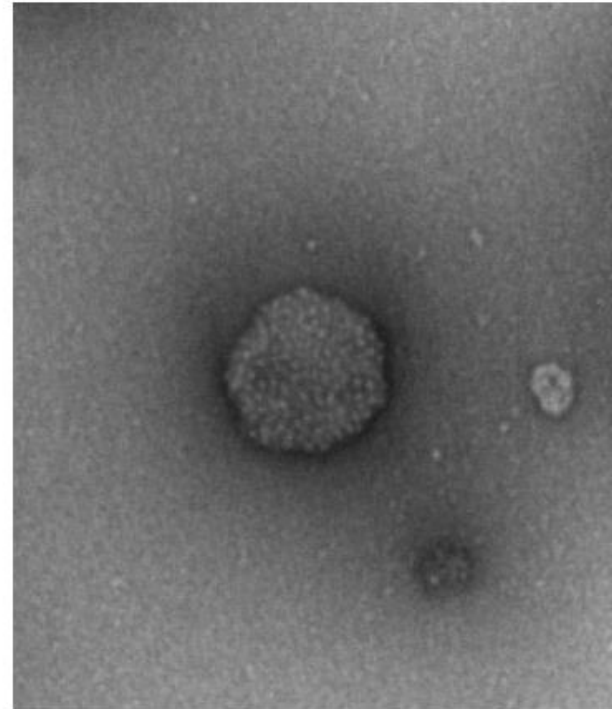
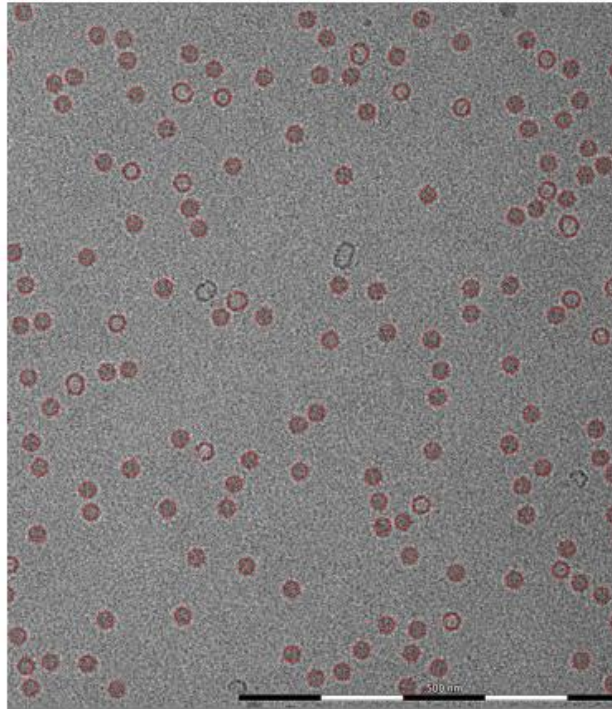
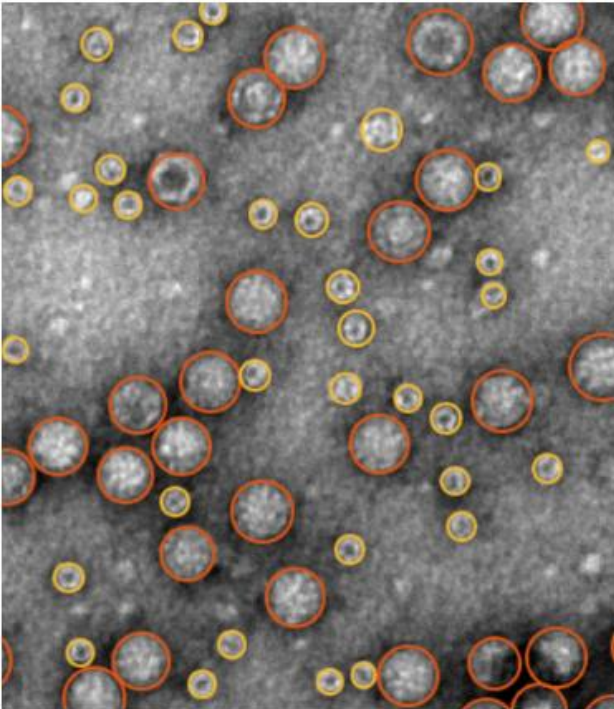
Comparing the ratio of intact vs broken AAV and Adenovirus particles in different samples



Traceability and report generation

In addition to the features in MiniTEM you can also use Vironova Analyzer Software (VAS) for your acquired images to get full traceability of all data plus an automated report generator function.





Vironova offers services useful in development of particles for vaccines, drug delivery and gene therapy as well as viral safety testing and material quality control (pharmaceutical industry), and/or the MiniTEM as a product with the services.

Thank you.

DELONG INSTRUMENTS

a.s.

Palackého třída 3019/153 b
612 00 Brno

www.delong.cz

Tel: +420-549 123 511

Informace: info@dicomps.com