Non-microbial indicators for validation of ultrafiltration membranes

Validation of pathogen removal by ultrafiltration (UF) is a critical step in the delivery of water recycling projects. This is performed by challenge tests using appropriate surrogates to validate LRV values. The challenge test applied for membrane validation involves spiking microbial pathogen indicators in the feed at high concentrations and measuring the removal efficiency across the membrane. Validation of membrane processes for virus removal is generally performed with model virus, MS2 bacteriophage.
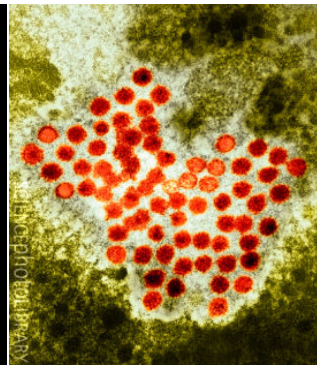
Notwithstanding the MS2 challenge method's high sensitivity and accuracy, incorporating this test in a full scale plant on a regular basis is attended by high cost and time to cultivate, dose and enumerate the MS2. Consequently, the water industry has identified the need for non-biological indicators as a high priority.
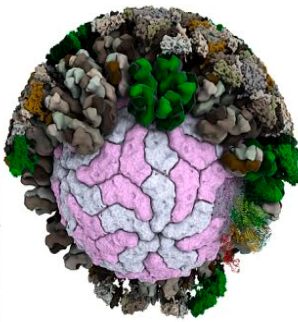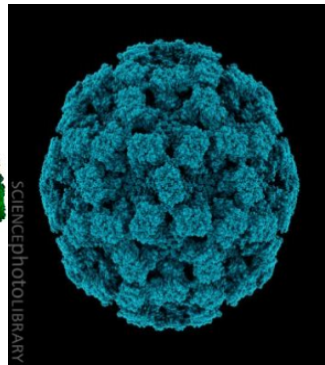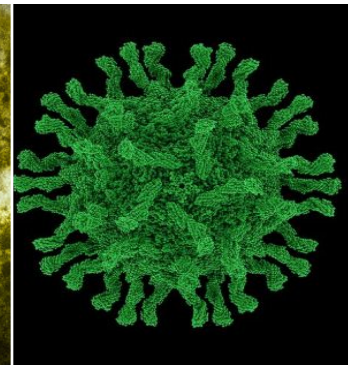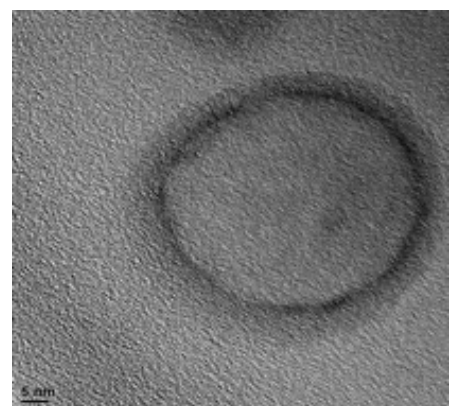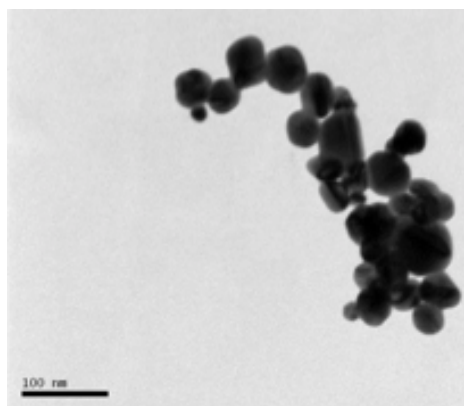

Rotavirus   Norwalk   Hep A   Poliovirus

At UNSW, we demonstrated the suitability of new 'citrate stabilised silver nanoparticles' as virus surrogates in terms of shape, size, rigidity, charge and ease of detection and demonstrated close to 3.0 log10 LRV for intact UF membranes. These nanoparticles are spherical, zerovalent, negatively charged and highly stable. The effectiveness of intact UF membranes to remove virus sized particles was established using nanoparticles as an alternative to bacteriophages, without affecting the hydraulic performance of the membranes.
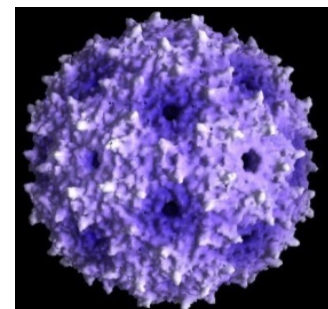
MS2 bacteriophage (Model virus)

"...nanoparticles as an alternative to bacteriophages, without affecting the hydraulic performance of the membranes."

Non-microbial alternative