VIRAL PURIFICATION FOR METAGENOMIC ANALYSIS

A necessary step to obtain high quality results.

Shotgun sequencing of purified viral particles, also known as viral metagenomics, has allowed further exploration of viral communities including genetic potential, community structure, and biogeography of environmental viruses[3]. In addition viral metagenomics allows us to assess viruses from many different mediums if the viral particles are purified effectively.

PHYSICAL

Physical purification techniques include homogenization, centrifugation, and filters. They are generally useful as an initial step for purification especially if dealing with a highly viscous medium such as mucus or tissue, but may also be used in conjunction with chemical or enzymatic steps to enhance purification. To the right is a homogenizer, a device that can be used to break up tissues or mucus so that viral particles may be extracted. Other useful physical purification tools include filters and centrifuges.


CHEMICAL

Chemical purification techniques may use chemicals such as polyethylene glycol or cesium chloride in purification.
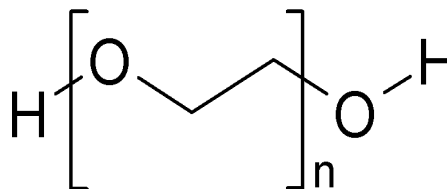
These can force viral particles to condense, making them easier to extract from the original sample. Extraction can then be achieved using centrifugation. Above is the structure of polyethylene glycol.

ENZYMATIC

Enzymatic purification techniques rely on enzymes such as DNase I to remove non-viral DNA from a sample. DNase I for example is an endonuclease that acts on single and double stranded DNA and chromatin. DNase I is often used in viral and bacterial purification for metagenomic analyses. Below is a model of DNase I with the binding loop in green .
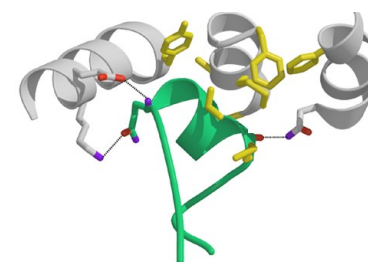
All of these techniques have been used in viral purification, but as in any research endeavor, the best technique for the specific goals of the project should be sought out. When choosing a purification technique it is important not just to consider what has worked best in the past or what is easiest, but what works best on your sample type and how you can use that to your advantage.

Kleiner, Manuel, Lora V. Hooper, and Breck A. Duerkop. "Evaluation of methods to purify virus-like particles for metagenomic sequencing of intestinal viromes." BMC genomics 16.1 (2015): 7.
Lim, Yan Wei, et al. "Purifying the Impure: Sequencing Metagenomes and Metatranscriptomes from Complex Animal-associated Samples." *Journal of visualized experiments: JoVE* 94 (2014).