

GUEST EDITORIAL

Why do viruses keep their genome small?

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Professor Lynne Webber has research interests in blood-borne viruses, which mostly include HIV, hepatitis B and hepatitis C viruses. A number of research initiatives are taking place within the oral, facial and maxillo-surgery settings and the forensic medicine disciplines.

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Although this specific title excludes prions, which differ considerably from viruses, it explains some of their survival strategies. It may also explain their considerable clinical infection and disease diversity.

From a viral viewpoint, the larger the genome, the longer the time needed to replicate. This will possibly cause chronicity and latency. The larger the genome the larger the outer covering of the virus, which may explain why some viruses are restricted to a certain region of the human body. The larger viral genome affects a higher probability of mutations, which explains the perpetual changing nature of viruses such as influenza A and B.

Viruses do, however, have no choice but to be intracellular parasites. This is because they cannot carry out their own protein synthesis and produce any discrete form of energy, thus depending on the host. However, viruses have derived four powerful strategies to ensure a smaller genome, namely:

- All viruses use cellular machinery to generate their energy.
- Some viruses use the same regions of their nucleic acid to code for different protein sites, e.g. hepatitis B virus and HIV-1.
- Some viruses only need to produce one large protein, enabling them to be transmitted throughout the human host body in a variety of modes.
- Some viruses produce a single large piece of RNA, e.g. the influenza viruses.

Therefore viruses can be transmitted using the following routes:

- the respiratory route
- the oral-faecal route
- mother-to-child transmission (*in utero* or during delivery)
- breast milk
- close physical contact
- mechanically, by penetration of the skin
- sexual transmission; and
- as a viral zoonosis.

