Endogenous retrovirus sequences and their usefulness to the host
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Endogenous retrovirus sequences and their usefulness to the host

Mammalian genomes contain an estimated 1-5% of retrovirus-related sequences, a figure that reaches 10-30% if all retrotranscribed sequences are included. Considering the millions of years in which virus and host have coexisted, it seems likely that the retrotranscribed sequences are as well as to the virus.

Recent reviews by Garfinkel and Best in this journal have shed some light on the value of retrosequences in the host genome. Apart from the role of retroelements in repairing double-stranded breaks in genomic DNA, the recruitment of endogenous gag and env sequences into important genes will quickly be selected against. The higher level of expression of retroviral sequences in placental tissue could also be explained by these protective effects.

To expand its lifespan, integration into a host germ line is a good and safe option for a virus. Consequently, targeting to oocytes or the early embryo is common for at least some types of retroviruses. Another protective effect of retroviral expression in the placenta could arise from the immunosuppressive effects of the peptides encoded by the env gene of many retroviruses, which would contribute to the local suppression of the mother's immune system, which in turn inhibits foetus rejection.

Response from Stoye, Le Tissier and Best

We are in perfect agreement with Dr van der Kuyl concerning the potential ability of intact endogenous proviruses to restrict novel infection. Although both of our examples involve deletions of viral long terminal repeats (LTRs) and the use of cellular promoters for transcription, we did not state that such events were required and did not intend to imply that they might be. Indeed, the Fv1 open reading frame is transcribed at very low levels: in fact, lower than one might expect from a retroviral LTR.

The immunosuppressive properties of a peptide derived from the transmembrane region of an exogenous retrovirus were first described over ten years ago, and this potential property of endogenous proviruses has been invoked on many occasions. However, we are not aware of any experimental data showing a physiological role played by this region of an endogenous retrovirus. Experiments to address this issue in an incisive fashion, once and for all, would be very welcome.

References


In summary, some types of retroviruses and their host species have developed a symbiotic coexistence, with the virus finding shelter in the host genome, and the host using the viral sequences for defence against new infections.

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Letters