RNA Replication

Introduction

- Many eukaryotic viruses use RNA is genetic material
- These include most plant viruses (TMV, tomato bushy stunt virus)
- And also many animal viruses (polio, rabies, flu, reovirus, HIV)
- RNA can be single-stranded (TMV, polio) or double stranded (reovirus)

Without DNA intermediate

- "+" RNA is coding, while "-" RNA is not
- Viruses containing "+" RNA (polio)
  - The "+" strand is translated directly
  - This makes more polymerase immediately
  - The polymerase replicates the "+" strand, making a "-" complimentary strand which can be used to make more "+" strand
- Viruses containing "-" RNA (rabies)
  - Strand is anti-sense and cannot be used to make polymerase - problem, since the host can't supply it
  - Therefore, the infectious virion brings some pre-made polymerase with it when it infects the cell
- Viruses containing double-stranded RNA (reovirus)
  - Again, these bring polymerases with them
  - Polymerase cannot bind to double starded RNA, so single stranded must be made
- In all cases, the first step is connversion to "+" RNA

Via DNA intermediate

- RETROVIRUSES (Rous Sarcoma, Feline leukaemia, HIV) contain a "+" strand of RNA, but also ~50 molecules of RNA-DEPENDENT DNA POLYMERASE (or REVERSE TRANSCRIPTASE)
- Reverse transcriptase uses a ceulluar tRNA primer to synthesize a DNA complement from the "+" RNA
- The RNA strand is degraded, and another DNA strand is synthesised (using a primer as usual)
- The resulting double-stranded DNA then integrates into the host chromosome, where it can be transcribed etc... to produce new virion particles
- However, this unusual RNA > DNA conversion may be their Achilles hell and is the target of some of the more successful anti-HIV therapies
  - AZT (Azidothymidine)
  - DdC (Dideoxycytidine)
  - Both target reverse-transcriptase

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