Gene Therapy: Implications for Pharmacy Practice

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Disclosures

- I have not been bribed
- I have not been corrupted
- I have no hidden alliances with rich people
- My motives are pure
Learning Objectives

- Define the foundation and general principles of gene therapy
- Review practices and handling of gene therapy products
- Describe issues that pharmacists should address now and in the future

Gene therapy involves the introduction of genetic material into an individual, or the modification of the individual’s genetic material, in order to achieve a therapeutic objective

The World Health Organization
Therapeutic options

- Single genetic conditions
- Multifactorial genetic conditions
- Acquired genetic conditions

Vectors

- Viral
- Liposomal
- Artificial Chromosomal
- Other nucleic acid (plasmid, RNA technology)
# Viral vectors

- **Retrovirus**
  - High transfection efficiency in vivo and ex vivo
  - Can infect dividing and non-dividing cells
  - Wide host cell range
- **Adenovirus**
  - Only infects dividing cells
  - Limited insert size capacity
  - Potential safety risk of insertional mutagenesis
- **Adeno-associated virus**
  - Can infect dividing and non-dividing cells
  - Reasonable duration of expression
  - Low immunogenicity

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<thead>
<tr>
<th>Vector</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Adenovirus</td>
<td>High transfection efficiency in vivo and ex vivo</td>
<td>Limited insert size capacity</td>
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<td>Can infect dividing and non-dividing cells</td>
<td>Short duration of expression</td>
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<td>Wide host cell range</td>
<td>Immunogenic (repeat dosing therefore ineffective)</td>
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<tr>
<td>Retrovirus</td>
<td>No immune response</td>
<td>Only infects dividing cells</td>
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<td>Reasonable duration of expression</td>
<td>Limited insert size capacity</td>
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<td></td>
<td>Integrates into host cell genome</td>
<td>Potential safety risk of insertional mutagenesis</td>
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<td>Adeno-associated virus</td>
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<td>Inefficient large scale virus production</td>
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Technical Limitations

- Identification
- Manufacturing
- Introduction
- Expression

Patient Safety

- Toxicity
- Fatality
- Interactions
- Latent effects
Ethics

- Selection
- Repair versus improvement
- Consequences

Follow-up
Biosafety Levels

- Biosafety Level 1
- Biosafety Level 2
- Biosafety Level 3
- Biosafety Level 4

Biosafety Level 2

- Standard Microbiological Practices
- Special Practices
- Safety Equipment
- Laboratory Facilities (Secondary Barriers)

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Pharmacy Handling

- Receipt and storage
- Preparation
- Dispensing
- Disposal
- Decontamination of spills
- Accidental exposure
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Conclusion

- Increased availability leads to increase in knowledge
- Increased knowledge leads to decreased uncertainty.
- Decreased uncertainty leads to confidence to select the appropriate level of caution
- Advisory Group on Gene Therapy
References
