Genetic Vaccines

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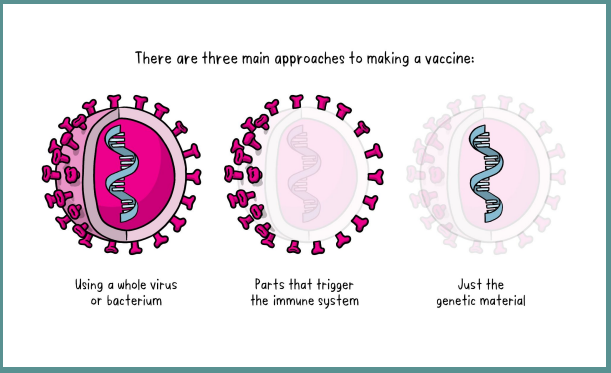
Overview

History
What are genetic vaccines?

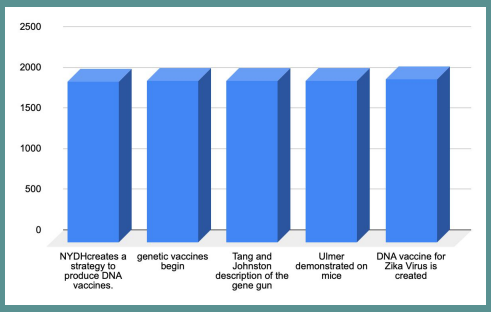
- Conventional contain the virus.
- Genetic vaccines contain genetic information (DNA mRNA).
- Introduced to body creating immune reaction.
- Genetic information codes for cellular production.



Conventional vaccines typically contain a very small amount of the virus in the vaccine. These vaccines are introduced into the body creating an immune reaction. Genetic vaccines are different from conventional vaccines in that they contain genetic information that codes for cellular production. Also containing DNA or mRNA to create new cells that identify the virus.

history

- 1983 NYDH create a strategy to produce DNA vaccines.
- Genetic vaccines started during 1990s
- Tang and Johnston description of gene gun.
- Transformed smallpox vax by adding genes.
- 1993 Ulmer demonstrated on mice
- 2016 DNA vaccine for Zika Virus



DNA vaccines burst into the scientific limelight in the early 1990s. Tang and Johnston described the delivery of DNA into the skin of mice using a 'gene gun', in an attempt to deliver human growth hormone as a gene therapy. The authors felt that this could be a useful technique to generate antibody responses against specific transgene products. At the same time, three presentations at the annual vaccine meeting at the Cold Spring Harbor Laboratory in 1992 reported the use of DNA vectors to drive both humoral and cellular immune responses against pathogens or tumour antigens *in vivo*. (DNA vaccines: ready for prime time?).

In 1983 Enzo Paoletti and Dennis Panic at NYDH created a strategy to produce DNA vaccines.

DNA Vaccines started during the early 1990's when Tang and Johnston described and injection of gene therapy into mice using a "gene gun".

Transformed smallpox vax by adding genes from other viruses.

1993, Ulmer demonstrated on mice.

2016, DNA vaccine was created for the Zika virus.

Plan and Implementation

- The main goal for genetic vaccines is to find a way to create vaccines more effectively with genetic information in the form of DNA or mRNA.
- Created by taking the Genetic information from viruses into an injectable vaccine.
- Rapid development.

A quote from the WHO mentions “The field of DNA vaccination is developing rapidly.”

Pros to the advancement

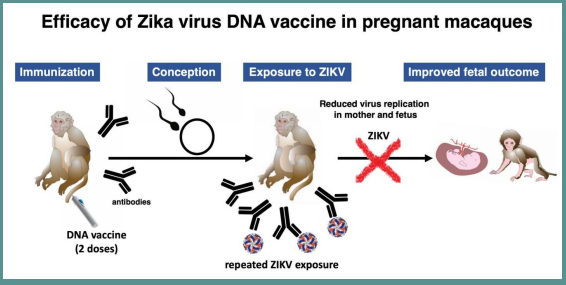
- Focus immune reaction in the antigen of interest.
- More control over development and production.
- Cost of effectiveness.
- saline or gene gun injection.
- Animals against west nile virus.
- Limited refrigeration required.

DNA vaccines have produced enticing results in a wide array of applications, from prophylactic vaccine strategies that target viral, bacterial or parasitic infections to potential therapeutics used to treat infectious diseases, cancers, Alzheimer disease, allergy and autoimmune disorders.

“The generic nature of the technology will facilitate the development of new vaccines; DNA vaccines are stable and will not require continuous cold storage.” (Simons).
This quote mentions that vaccines greeted genetically don't require refrigeration.

Cons to the advancement

- Vaccines are limited to protein based
- Cross contamination during manufacturing.
- The DNA in pregnant mice reaches fetus
- Tolerant individuals more susceptible to infection, carriers.



“Moreover, DNA injected intravenously into pregnant mice reaches fetuses[1]. If after vaccination DNA is taken up by fetal or germ–line cells, immunological tolerance may be induced in the progeny (and descendants) of the vaccinated individual.” (Simons).
This quote describes the dangers of DNA vaccinations.

“Tolerance resulting from DNA vaccination would produce consequences both for the individuals and for the population, as tolerant individuals are expected to be more susceptible to infection and/or they may become carriers, a potentially much more serious problem.” (Simons).

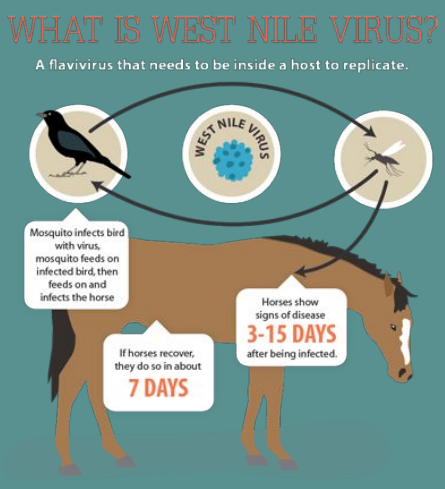
Summary

- Genetic vaccines,a way to create vaccines with genetic information (DNA, mRNA).
- Strategies for development have emerged during the 80's and 90's.
- Testings and demonstrations, mice.
- This DNA is encoded in the antigens.

Overall, genetic vaccines are a way to create vaccines using genetic information. They use DNA and mRNA to create an immune response to the virus.
Many strategies and development of genetic vaccines have emerged throughout the 80's and 90's including demonstrations and testing on mice. More advancements to genetic vaccines occur today. For example, the genetic vaccine for zika virus has been developed as recent as 2016.
Genetic vaccines are beneficial because of the protection of animals such as horses. More control can be taken over genetic vaccines during production and they dont always need to be refrigerated, however these vaccines are limited to protein based viruses and have some risk for contamination.

summary

- Provide protection for animals against west nile.
- More control during production, less refrigeration requirements.
- Limited to protein based viruses.



References

Dangers of DNA vaccines

DNA vaccines: ready for prime time?

DNA Vaccines (WHO)

DNA Vaccine (Wiki)