OPEN ACCESS Freely available online

Journal of Antivirals & Antiretrovirals

Short Communication

Enhancement of Immunogenic Adjuvant Influenza Virosomal Vaccine Formulations

Ellen Farzaneh*

Department of Medical Microbiology, University of Guelph, Guelph, Canada

DESCRIPTION

Virosomes are like non-replicating 'artificial viruses' that can be used to deliver vaccine antigens directly to host cells. Virosomes are basically liposomes coated with viral envelope glycoproteins. Virosomes are vesicular particles reconstituted from the viral envelope. They generally involve detergent-mediated degradation of viral membranes, followed by the separation of viral capsids containing genetic material from dissolved membrane components, and the optional addition of excess lipids followed by the final removal of detergents. It can also be generated in many ways, including the Membrane component that induces the remodeling of membrane vesicles carrying viral surface proteins. Due to the fact that the reconstituted viral envelope closely mimics the outer surface of the virus from which it is derived, virosomes provide a highly useful antigen presentation system for inducing antibody responses against native viruses. These vesicles greatly benefit from the unique delivery properties of the influenza virus (efficient cell adhesion, internalization, and cytosolic release) and immunogenicity.

Virosomes, first described in 1975, consist of reconstituted viral membranes and contain hemagglutinin and neuraminidase in addition to lipids [1]. Virosomes have proven to be a highly effective vaccine delivery method with a low incidence of adverse events. Injection of toxoid-containing virosomes also caused less painful reactions at the injection site. Moreover, the delivery of antigen was so efficient that the use of virosomes allowed us to reduce the amount of toxoid injected, further reducing side effects in vaccinated mice.

Virosomes are reconstituted viral envelopes that serve as vaccines and as vehicles for the cellular delivery of various macromolecules. The prospect of virosome-based drug delivery and targeting systems is an interesting area of research and development [2]. As virosomes are biocompatible, biodegradable, non-toxic, and non-auto immunogenic. Attempts have been made to use them as vaccines or adjuvants and as a therapeutic drug and biological agent delivery systems. Influenza virus is the most common selection virus and the virosome is a reconstituted influenza virus envelope, devoid of an internal nucleic acid core and therefore devoid of genetic information. The particulate structure and function of the surface hemagglutinin protein, which binds to cellular receptors, mediate pH-dependent membrane fusion that results in the delivery of encapsulated biologically active molecules to cells [3]. Viruses are heavily loaded with various proteins, peptides, and antimalarial drugs that are not delivered to specific sites and fail to provide a targeted drug delivery system.

Influenza viruses are most commonly used for virosome production. Virosomes are spherical unilamellar vesicle structures with an average diameter of 150 nm and are not replicable but are purely fusion-active vesicles.

Compared to liposomes, virosomes contain functional viral envelope glycoproteins, influenza virus hemagglutinin, and neuraminidase inserted into the phospholipid bilayer membrane [4]. Different bilayer components of virosomes have different properties.

Intravenous (IV) models for the administration of prophylactic or therapeutic agents remains a daunting challenge for designers of pharmaceutical formulations. With over 240 million confirmed cases and over 4 million deaths as of October 2021, the COVID-19 pandemic continues to disrupt human activity around the world [5]. Virosomes are reconstituted membranes of influenza viruses that form particles of 100-150 nm and are composed of a lipid bilayer membrane containing influenza hemagglutinin and neuraminidase glycoproteins.

Virosomes represent one of the optimal drug delivery systems and can be optimized for maximum drug uptake or best physiological effect by altering the lipid content or type within the membrane. Numerous ligands such as cytokines, peptides, and monoclonal antibodies are incorporated onto the surface of virosomes. Additionally, tumor-specific monoclonal antibody fragments can be conjugated to virosomes to target carriers to tumor cells of choice. Virosomes selectively recognize target cells through binding molecules for the targeted release of encapsulated active ingredients. Virosome induces receptor-mediated uptake of virosomes into endosomes within target cells [6].

Correspondence to: Ellen Farzaneh, Department of Medical Microbiology, University of Guelph, Guelph, Canada, E-mail: farrelle@edu.ca

Received: 02-Jan-2023, Manuscript No. JAA-23-21894; **Editor assigned:** 06-Jan-2023, PreQC No. JAA-23-21894 (PQ); **Reviewed:** 25-Jan-2023, QC No JAA-23-21894; **Revised:** 01-Feb-2023, Manuscript No. JAA-23-21894 (R); **Published:** 10-Feb-2023, DOI: 10.35248/1948-5964.23.15.251

Citation: Farzaneh E (2023) Enhancement of Immunogenic Adjuvant Influenza Virosomal Vaccine Formulations. J Antivir Antiretrovir. 15:251.

Promising drugs are often stopped during development due to their inability to adequately deliver to target cells, tissues, or organs. A new generation of therapeutics for cancer and neurodegenerative diseases requires delivery systems that target drugs to specific cell types and host tissues through receptor-mediated uptake and controlled release. Virosome technology represents a novel and sophisticated delivery system to address these challenges. Virosomes are reconstituted viral envelopes containing membrane lipids and viral spike glycoproteins but lack viral genetic material. The outer surface of the virosome resembles that of a virus particle, with spike proteins protruding from the membrane, but its interior is empty. One of the major drawbacks of using virosomes is the rapid degradation of virosome preparations. By optimizing stability, virosome-based thermostable vaccines can be developed and administered through the mucosa. Additional advantages of using virosomes include the use of different routes of administration and can also be combined with other adjuvants.

CONCLUSION

Virosomes are therefore a promising medicine for the development of effective nano-vaccines. The preparation method is simple and the delivery route is versatile. Many virosome products are now approved by various national authorities. The immunological properties of virosomes have been extensively studied only as human influenza vaccines. Vaccination with influenza virosomes elicited high titers of influenza-specific antibodies, indicating that Hemagglutinin (HA) and Neuraminidase (NA) reconstituted in the membrane environment display potent immunogenicity.

REFERENCES

1. Carneiro FA, Bianconi ML, Weissmüller G, Stauffer F, Da Poian AT. Membrane recognition by vesicular stomatitis virus involves enthalpy-driven protein-lipid interactions. J Virol. 2002;76(8): 3756-3764.
2. Mizuarai S, Ono KI, Yamaguchi K, Nishijima KI, Kamihira M, Iijima S. Production of transgenic quails with high frequency of germ-line transmission using VSV-G pseudotyped retroviral vector. Biochem Biophy Res Commun. 2001;286(3):456-463.
3. Bron R, Ortiz A, Dijkstra J, Stegmann T, Wilschut J. Preparation, properties, and applications of reconstituted influenza virus envelopes (virosomes). Methods Enzymol. 1993;220:313-331.
4. Droual R, Bickford AA, Charlton BR, Kuney DR. Investigation of problems associated with intramuscular breast injection of oil-adjuvanted killed vaccines in chickens. Avian Dis. 1990:473-478.
5. Huckriede A, Bungener L, ter Veer W, Holtrop M, Daemen T, Palache AM, et al. Influenza virosomes: combining optimal presentation of hemagglutinin with immunopotentiating activity. Vaccine. 2003;9(21):925-931.
6. Amacker M, Smardon C, Mason L, Sorrell J, Jeffery K, Adler M, et al. New GMP manufacturing processes to obtain thermostable HIV-1 gp41 virosomes under solid forms for various mucosal vaccination routes. NPJ Vaccines. 2020;5(1):41.