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Advancements in Vaccine Drug Delivery Systems: A Comprehensive Review

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Abstract: *Vaccine drug delivery systems have undergone significant advancements, revolutionizing the landscape of preventive medicine. This review provides a comprehensive overview of various types of vaccine delivery systems, highlighting their mechanisms, advantages, and applications. Traditional vaccine administration methods, such as intramuscular and subcutaneous injections, are being supplemented by novel approaches aimed at improving efficacy, safety, and patient compliance. These include nanoparticle-based carriers, liposomes, microneedle patches, mucosal delivery systems, and DNA/RNA-based vaccines. Each delivery platform offers distinct advantages, such as targeted antigen delivery, controlled release kinetics, enhanced immunogenicity, and needle-free administration. Moreover, the emergence of mRNA vaccines has garnered significant attention for their potential to rapidly respond to emerging infectious diseases. Additionally, the integration of adjuvants and immunomodulatory agents further enhances the immune response, paving the way for next-generation vaccines. Understanding the diverse landscape of vaccine delivery systems is crucial for optimizing immunization strategies, overcoming existing challenges, and combating infectious diseases more effectively in the future.*

Keywords: Vaccine, Dna, Vaccination, Vaccine Drug Delivery, Immuniazation.

REFERENCES

[1]. Donnelly, R. F. (2017). Vaccine delivery systems. Human Vaccines & Immunotherapeutics, 13(1), 17–18.
[2]. Clem, A. S. (2011). Fundamentals of vaccine immunology. Global Infectious Diseases, 3(1), 73–78.
[3]. Federman, R. S. (2014). Understanding vaccines: A public imperative. Yale Journal of Biology and Medicine, 87(4), 417–422.
[4]. Sale, K. S., & Chaudhari, P. M. (2019). Overview of vaccine drug delivery system. Journal of Drug Delivery & Therapeutics, 9(3), 704-711.
[5]. Doherty, M., Buchy, P., Standaert, B., Giaquinto, C., & Prado-Cohrs, D. (2016). Vaccine impact: Benefits for human health. Elsevier, 34(52), 6707-6714.
[6]. Poland, G. A., Ovsyannikova, I. G., & Kennedy, R. B. (2018). Personalized vaccinology: A review. Vaccine, 36(36), 5350–5357.
[7]. DeStefano, F., Bodenstab, H. M., & Offit, P. A. (2019). Principal controversies in vaccine safety in the United States. Clinical Infectious Diseases, 69(4), 726–731.
[8]. Mohan, T., Verma, P., & Rao, D. N. (2013). Novel adjuvants & delivery vehicles for vaccines development: A road ahead. Indian Journal of Medical Research, 138, 779-795.
[9]. Arora, D., Rana, S., Gupta, G. D., Chaudhary, A., & Singh, B. (2019). Oral mucosal immunization recent advancement and exploit dendritic cell targeting. Journal of Drug Delivery & Therapeutics, 9(3), 704-711.
[10]. Criscuolo, E., Caputo, V., Diotti, R. A., Sautto, G. A., Kirchenbaum, G. A., & Clementi, N. (2019). Alternative methods of vaccine delivery: An overview of edible and intradermal vaccines. Journal of Immunology Research, 2019, Article ID 8303648
[11]. Noazin, S., Modabber, F., Khamesipour, A., Smith, P. G., Moulton, L. H., Nasseri, K., et al. (2008). First generation leishmaniasis vaccines: A review of field efficacy trials. Vaccine, 26(52), 6759–6767. https://doi.org/10.1016/j.vaccine.2008.09.085

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[12]. Huang, D. B., Wu, J. J., & Tyring, S. K. (2004). A review of licensed viral vaccines, some of their safety concerns, and the advances in the development of investigational viral vaccines. Journal of Infection, 49(3), 179–209. https://doi.org/10.1016/j.jinf.2004.05.018

[13]. Robinson, H. L., & Amara, R. R. (2005). T cell vaccines for microbial infections. Nature Medicine, 11(4 Suppl), S25–S32. https://doi.org/10.1038/nm1212

[14]. Clem, A. S. (2011). Fundamentals of vaccine immunology. Journal of Global Infectious Diseases, 3(1), 73–78. https://doi.org/10.4103/0974-777X.77299

[15]. Riedel, S. (2005). Edward Jenner and the history of smallpox and vaccination. Proceedings (Baylor University Medical Center), 18(1), 21–25.

[16]. World Health Organization. (2004). Releve´ e´pide´miologique hebdomadaire/Section d'hygie`ne du Secre´tariat de la Socie´te´ des Nations= Weekly epidemiological record/Health Section of the Secretariat of the League of Nations, 79(4), 27.

[17]. Ravanfar, P., Satyaprakash, A., Creed, R., & Mendoza, N. (2009). Existing antiviral vaccines. Dermatologic Therapy, 22(2), 110–128. https://doi.org/10.1111/j.1529-8019.2009.01224.x

[18]. Wellington, K., & Goa, K. L. (2003). Measles, mumps, rubella vaccine (Priorix; GSKMMR): A review of its use in the prevention of measles, mumps, and rubella. Drugs, 63(19), 2107–2126. https://doi.org/10.2165/00003495-200363190-00012

[19]. Bovier, P. A. (2008). Recent advances with a virosomal hepatitis A vaccine. Expert Opinion on Biological Therapy, 8(8), 1177–1185. https://doi.org/10.1517/14712598.8.8.1177

[20]. Nagill, R., & Kaur, S. (2011). Vaccine candidates for leishmaniasis: A review. International Immunopharmacology, 11(10), 1464–1488. https://doi.org/10.1016/j.intimp.2011.05.008

[21]. Mohebali, M., Hajjaran, H., Hamzavi, Y., Mobedi, I., Arshi, S., Zarei, Z., et al. (2005). Epidemiological aspects of canine visceral leishmaniosis in the Islamic Republic of Iran. Veterinary Parasitology, 129(3-4), 243–251. https://doi.org/10.1016/j.vetpar.2005.01.010

[22]. Sharifi, I., FeKri, A. R., Aflatonian, M. R., Khamesipour, A., Nadim, A., Mousavi, M. R., et al. (1998). Randomised vaccine trial of single dose of killed Leishmania major plus BCG against anthroponotic cutaneous leishmaniasis in Bam, Iran. The Lancet, 351(9115), 1540–1543. https://doi.org/10.1016/S0140-6736(98)09552-X

[23]. Plotkin, S. A. (2009). Vaccines: The fourth century. Clinical and Vaccine Immunology, 16(12), 1709–1719. https://doi.org/10.1128/CVI.00290-09

[24]. Coler, R. N., & Reed, S. G. (2005). Second-generation vaccines against leishmaniasis. Trends in Parasitology, 21(5), 244–249. https://doi.org/10.1016/j.pt.2005.03.006

[25]. Dudek, N. L., Perlmutter, P., Aguilar, M. I., Croft, N. P., & Purcell, A. W. (2010). Epitope discovery and their use in peptide based vaccines. Current Pharmaceutical Design, 16(28), 3149–3157. https://doi.org/10.2174/138161210793292447

[26]. Reed, S. G., Bertholet, S., Coler, R. N., & Friede, M. (2009). New horizons in adjuvants for vaccine development. Trends in Immunology, 30(1), 23–32. https://doi.org/10.1016/j.it.2008.09.006

[27]. O'Hagan, D. T. (2001). Recent developments in vaccine delivery systems. Current Drug Targets: Infectious Disorders, 1(3), 273–286. https://doi.org/10.2174/1568005014606008

[28]. Baker, P. J. (1992). T cell regulation of the antibody response to bacterial polysaccharide antigens: An examination of some general characteristics and their implications. Journal of Infectious Diseases, 165(Supplement 1), S44–S48. https://doi.org/10.1093/infdis/165-Supplement_1-S44

[29]. Kayhty, H., Karanko, V., Peltola, H., & Makela, P. H. (1984). Serum antibodies after vaccination with Haemophilus influenzae type b capsular polysaccharide and responses to relogic tolerance or memory. Pediatrics, 74(5), 857–865.

[30]. Konradsen, H. B. (1995). Quantity and avidity of pneumococcal antibodies before and up to five years after pneumococcal vaccination of elderly persons. Clinical Infectious Diseases, 21(3), 616–620. https://doi.org/10.1093/clinids/21.3.616

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[31]. Avery, O. T., & Goebel, W. F. (1929). Chemo-immunological studies on conjugated carbohydrate-proteins: II. Immunological specificity of synthetic sugar-protein antigens. Journal of Experimental Medicine, 50(4), 533–550. https://doi.org/10.1084/jem.50.4.533

[32]. Ward, J., Berkowitz, C., Pescetti, J., Burkart, K., Samuelson, O., & Gordon, L. (1984). Enhanced immunogenicity in young infants of a new Haemophilus influenzae type b (Hib) capsular polysaccharide (PRP)-diphtheria toxoid (D) conjugate vaccine. Pediatric Research, 18(287).

[33]. Plotkin, S. A. (2005). Vaccines: Past, present and future. Nature Medicine, 11(4 Suppl), S5–S11. https://doi.org/10.1038/nm1209

[34]. Palatnik-de-Sousa, C. B. (2008). Vaccines for leishmaniasis in the fore coming 25 years. Vaccine, 26(14), 1709–1724. https://doi.org/10.1016/j.vaccine.2008.01.023

[35]. Borja-Cabrera, G. P., Santos, F. B., Nico, D., Gravino, A. E., Manna, L., Palatnik, M., et al. (2012). The Leishmune®'s nucleoside hydrolase DNA vaccine as an aid in immunotherapy of canine visceral leishmaniasis. Procedia Vaccinology, 6, 64–73. https://doi.org/10.1016/j.provac.2012.04.009

[36]. Fındık, A., & Çiftci, A. (2012). Bacterial DNA vaccines in veterinary medicine: A review. Journal of Veterinary Advances, 2(4), 139–148.

[37]. Soltani, S., Farahani, A., Dastranj, M., Momenifar, N., Mohajeri, P., & DarbEmamie, A. (2018). DNA vaccine: Methods and mechanisms. Advances in Human Biology, 8, 132-139.

[38]. Van Oss, C. J., et al. (Year). Immunochemistry. In Immunochemistry of vaccines (pp. 533–550). Marcel Dekker, Inc.

[39]. Bhatia, R., & Ichhupunjani, R. (Year). Essentials of medical microbiology. In Immunoprophylaxis against infectious diseases (2nd ed., pp. 486–489). Jaypee Brothers Medical Publishers.

[40]. Kale, V. V., & Bhusari, K. P. (Year). Applied microbiology. In Immunological products (pp. 341–344, 347). Himalaya Publishing House.

[41]. Soni, K. J., Patel, R. P., Asari, V. M., & Prajapati, B. G. (2011). Recent advances in vaccine delivery. Journal of Applied Pharmaceutical Science, 1(1), 30–37.

[42]. Shetty, N. (Year). Immunology introduction textbook. In Immunization (pp. 211–213). Wiley Eastern Limited.

[43]. Joshi, K. R., & Osama, N. O. (Year). Immunology and serology. In Immunity (Student edition, pp. 64–70).

[44]. Jensen, M. M., & Wright, D. N. (Year). Introduction to microbiology for the health sciences. In Application of immune response (2nd ed., pp. 251–253). Prentice Hall International Inc.