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A COMPREHENSIVE REVIEW ON INTERVENTION AND TREATMENT OF HIV/AIDS THROUGH NANOTECHNOLOGY

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ABSTRACT

As of now, there is no cure for HIV/AIDS, and nothing has been developed as a vaccine or antibody to prevent this disease. Overall treatment has improved due to a range of combination antiretroviral drugs, but these drugs must be taken for life, have real side effects and are ineffective for people whose infections mutate to develop resistance to them. In the 21st centuries, Nanotechnology, an interdisciplinary science, is a novel aspect of medicine. It could essentially define HIV/AIDS prevention and treatment going forward. Here we review current challenges facing disease management and we discuss the impressive potential that nanotechnology holds for optimal therapy and immunotherapy, along with improved antiretroviral therapy for HIV/AIDS, prevention, microbicides and vaccination.

It Is known to be efficacious to hindering and treating the viral agents; such as, for various NPs, in vitro studies have showcased self-therapeutic activity opposing the viral agents. Antiretroviral therapy, AIDS, gene therapy, HIV, immunotherapy, vaccines, Nano medicine, nanoparticles and microbicides.

Keywords: Aids, anti-retroviral therapy, HIV, Immunotherapy, Nano medicine, nanoparticle, Nanotechnology vaccines.

Introduction

AIDS was first identified in 1981, and HIV was discovered to be the disease's cause in 1983. And HIV/AIDS, the most common infectious killer of adults worldwide, has a global footprint. By late October 2006 AIDS had killed 25 million people worldwide, and the HIV virus had infected more than 65 million. By late 2007, closer to 33 million people were infected, and 2 million people were dying each year from the virus. What has ensued has had devastating social and economic effects across the world, but most acutely in poorer Sub-Saharan African countries,[1]

HIV (human immunodeficiency virus) is a retrovirus that damages the immune system. It is a preventable disease. It is now a chronic disease that can be treated. There is no cure or vaccine for HIV, but antiretroviral therapy can slow the disease and, if begun soon enough, can raise an infected person's life expectancy to near-normal levels,. An individual who has HIV and is treated can expect to enjoy a normal lifespan and die with the virus, but not from it,[2] People who are positive for HIV (living with HIV) require medicine for a lifetime to suppress the virus and render the viral load undetectable. Without treatment it can cause many illnesses, including Aids.[3]

We have not found a cure for HIV/AIDS after almost three decades of research. The early treatments were dominated by antiretroviral drugs — only partially effective, in any case. Only didanosine and zidovudine are currently available in the United States as generics, [4] A total of 25 drugs have been approved since the first of these (zidovudine) was approved by the US FDA in 1987, and many of these drugs are available as fi xeddose combinations and on generic formulary for use in resource-poor settings. But treatment for HIV/AIDS was revolutionized dramatically with the introduction of the new protease inhibitor drug class and triple-drug therapy in the mid-1990s,[5]

Nanotechnology applications in the fields of HIV and/or AIDS prevention and/or therapy have also piqued interest in recent years; however, they remain to be in their early stages. Nanotechnology can not only improve existing treatments but also develop new therapies like immunotherapy and gene therapy. Nanomaterials, on the other hand, are therapeutic themselves, [6] Nanotech-based technologies can also inform vaccination and microbicide development. In this article, we will explore how nanotechnology can enhance current therapies, can be used to develop new therapeutic strategies, and also how nanotechnology could serve as a platform to develop alternatives to successful vaccine and/or microbicide development for HIV/AIDS.[7]

Symptoms

Some exposed individuals develop mild flu-like symptoms two to four weeks post-HIV infection. It can take a couple of days to weeks.[8]
Some of the probable signs and symptoms are:

- fever.
- A headache.
- •joint pain and muscle soreness
- Rash.
- Lesions in the mouth and throat.
- Nodes (swollen lymph glands) are mainly on the neck.
- Diarrhoea.
- Reduction of weight.
- Cough.

These symptoms can be so subtle, in fact, you won't realize they're happening. But right now, your viral load — the level of virus in your blood — is high. Thus, as a result, more individuals should come out infected in the first phase of infection than in the subsequent phase, [10]

HIV/AIDS prevention

HIV (Human Immunodeficiency Virus) and AIDS (Acquired Immunodeficiency Syndrome) prevention efforts involve diverse approaches to reduce the propagation of the virus.[11]
Safer Sexual Practice: Condom Use: Use of latex and polyurethane condoms correctly and consistently during all sexual acts (vaginal, anal, and oral) significantly reduces the risk of HIV and other STIs. Limit the Number of Sexual Partners: Fewer sexual partners means a lower risk of meeting an HIV-positive person or other STI that could increase the risk of transmission of HIV[12]
Avoid Needles: Do not share syringes, needles or any other injectable supplies. Always use brand-new, sterile injectable supplies and needles. syringe service organizations 行 available syringes and secure disposal solutions. Get an STI and care: Having other STIs may increase the risk of HIV transmission and infection. It is vital to have regular STI tests and be treated appropriately, [13]
Prevention of Mother to Child Transmission (PMTCT): ART can significantly reduce the risk of pregnant women living with HIV passing the virus to the unborn child during pregnancy, delivery, and breastfeeding.
For educational and awareness efforts. Distributing sterile needles and syringes and condoms. Expanding access to PrEP and PEP and to HIV testing and treatment services, [15]

Treatment

1)Current treatment: HAART, or Highly Active Antiretroviral Therapy, the most recent generation of HIV/AIDS therapies, uses a combination of three or more antiviral drugs given at the same time to expand the antiviral spectrum against the HIV virus. Most of the time, concomitant drugs are from different classes and act differently. There are many issues that still need to be addressed, despite the excellent results of the modern HAART therapy for HIV/AIDS. Therapy failure, often due to patient non-compliance, has been the major hurdle,[18]

2)Gene therapy for HIV/AIDS
Now antiretroviral drugs are actually getting better, not just looking for new options to HIV/AIDS treatment. I import the gene into the cell as part of the potential alternative method called gene therapy to block viral Infection or viral Replication. Nucleic acid-based compounds, such as DNA, siRNA, RNA decoys, ribozymes, and aptamers; protein-based compounds, such as fusion inhibitors and zinc-finger nucleases, can halt viral propagation by binding with the various stages of the viral life cycle,[19]

3) Nano therapy for HIV/Aids
Nano carriers in Imaging and Therapy Nanotechnology Platforms in Drug Delivery Nanotechnology–based platforms for drug delivery are changing the medical landscape of ImEv across various arenas of disease management. So far, cancer patients have been the biggest beneficiaries of this revolution, which has brought so much progress in recent decades. [21]Use of nanotech in drug delivery systems has already proved as major advantage as there have been many systemic cancer treatment nanotechnology has either been FDA approved or clinically trialed. This excellent progress can be related to its unique characteristics. Nanotechnology has allowed optimized delivery of poorly water soluble drugs; selective drug delivery to specific cells or tissues, along with the intracellular delivery of macromolecules Presentation Skills.,[22]

It is possible that nanotechnology-based antiretroviral drug delivery systems may offer similar benefits. Controlled-release delivery systems can prolong the circulation time of a drug at therapeutic levels especially when considering that a drug's half-life relates directly to its rate of elimination. This would be a significant improvement in patients' adherence to medication. Also, due to their small nanoscale delivery systems can fine-tune and adjust the distribution of hydrophobic (water-loving) and hydrophilic (non-water-loving) drugs into (and in) various tissues.[23]

HIV/AIDS complications

HIV (Human Immunodeficiency Virus) infects a type of white blood cell essential to the immune system, called a CD4+ T cell. Increased susceptibility of many infectious and non-infectious diseases is caused by reduced number of CD4+ T cells in the body. AIDS (Acquired Immunodeficiency Syndrome) is the most advanced stage of HIV infection that comes with a severely weakened immune system, as well as opportunistic infections and some cancers.24 Since people infected with HIV/AIDS have a not-so functional immune system that makes it difficult to fight viruses that can cause CANCER or abnormal cell growth hence making them more likely to develop certain cancers.

Many complications from HIV/AIDS occur following 25. These matters can be grouped into broad categories. Opportunistic Infections (Ols): Follow Up by Bacteria, Funghi, Viruses and Parasites that do not infect healthy cases. These infections can be severe and also fatal among people with HIV/AIDS27

HIV can affect the nerve system in several ways that can lead to neurologic issues, including: HIV–associated neurologic disorders (HAND): several diseases that affect cognitive abilities like thought, memory, and attention. In severe cases, it may lead to AIDS dementia complex.28

Diarrhoea, fatigue or fever lasting longer than 30 days — with unintentional weight loss above 10% of body weight, a "wasting syndrome." It is possible to lose both fat and muscle. 4. Cancers: People with HIV/AIDS have a higher risk for certain types of cancer.30

Conclusion

HIV/AIDS continues to pose a risk to global population health. The relative increase in recent publications has given a strong indication of the interests on the employment of nanoparticles for HIV therapy and prevention. The attenuation of viral products directed at the other regions they want to target, especially in brain tissues and macrophages are poor due to the slow, continuous replication of the viral agent inside the cells. Different NPs can carry ART drugs within cells and extracellularly. In addition, some non-peptide nanoparticles (NPs), including fullerenes, inorganic NPs and dendrimers exhibit anti-HIV activity in vitro.

Nanotechnology might play a role in many novel strategies for HIV/AIDS treatment and prevention.. The controlled release of a drug potentially improved patient adherence to a medication regimen and thereby could increase treatment efficacy. Nanoparticles functionalized with ligands (mannose, galactose, tuftsin and fMLF peptides) that are capable of changing macrophage surface receptors to target these cells (one of the most common HIV viral reservoir).

Nanotechnology may improve the drug delivery of newer treatment approaches such as gene therapy and immunotherapy. [17] Nonsilencing Interaction of Silica Nanoparticles with Cationic Liposomes: Uncovered Mechanism for a Nanoparticle-Mediated Synergistic Effect and New Possibilities for Nonviral siRNA Delivery. Though siRNA targeting HIV cells have been delivered, this field of study is still in its infancy, and no safe and effective RNAi nanotechnology has been translated to clinical application in HIV/AIDS. Nanotechnology is a significant nanotechnology field, as it's a growing field to be utilized in the field of immunotherapy.

The end of the technology era is finally passing and joining hands with the future making it exciting times for the nanotechnology research. And nanotechnology encounters will provide notable developments in medicine and prevention of HIV/AIDS with further financing.

REFERENCES

1)AIDS (W, Gallo RC, Temin ; †. Science, 241(4865):515515516 (1988)

2)Gallo RC. Essay on history. HIV/AIDS's early years. 002 Sci. 298(5599):1728–1730 (2002)

3)HIV as the cause of AIDS. N Engl J Med. 2003;349(24):2283–2285.

4) L. Essay. History. HIV discovery history. Science. 2002;298(5599):1727–1728

5) JJ, al. It was an HIV treatment scale-up case study from around the world. New York: Academic Sciences; 2008: 1136: 12–20.

6)l JJ, al. It was an HIV treatment scale-up case study from around the world. New York: Academic Sciences; 2008: 1136: 12–20.

7)The Joint United Program on HIV/AIDS.) UNAIDS, the Joint United Nations Program on HIV/AIDS. 2008 Geneva, Switzerland. Report on the HIV/AIDS pandemic worldwide.

8)Richman DD. Chemotherapy for HIV. Nature410(6831):995–1001, 2001.

9)The failure of the Ledford H. Merck HIV vaccine :3–4 in Nat. 2008).

10)Ledford H. Even against high-profile failures, HIV vaccine developers continue to fight. 591–592. 2008;26(6).

11) K. The future of HIV vaccines post-step study: Is it time to occult HIV infection? 2008;4(8).

12)Research on AIDS Cohen J 319(5866):1026-1027 HIV microbicide does not protect against HIV

13)Granit RM, et al. Microbicides: to wear or not to wear? 2008;321(5888):532–534. Science

14) OC. Nanotechnology: The Ideal Partnership in Drug Delivery Drug Delivery Specialist. 2008;5(9):927–929.

15) DH. BARRIERS IN HIV-1 VACCINE DEVELOPMENT Nature 2008;455(7213):613–619.

16) Antigen presenting cells – Dendritic cells. Immunol. Ann Rev. 2002; 20:621–667.

17.Mitsuyasu RT, TC, A, et al. Ribozyme gene therapy study in autologous CD34+ cells, phase 2. 2009;15(3):285–292; Nat Med.
18. EE, MA. Gene delivery using vectors. 2009;109(2):259–302;
Chem Rev. Moreno PM, Simonson OE, Lundin KE, et al. methods for gene transfer using nanotechnology. 2009;137(1):47–56; .
19. Liu DX, gene delivery: Current understanding and future directions. E92–E104 in AAPS
20.J. 2007;9(1).
21.Montgomery MK, Fire A, Xu S, and Mello CC. Double-stranded RNA exhibits strong and targeted genetic interference in . Nature, 391(6669):806–811 (1998).
22. Whitehead KA. Breaking down obstacles: Developments in siRNA Delivery. 129–138 in Nat Rev Drug, 2009; 8(2)
23 HIV-AIDS gene treatment that is long-lasting. 161–170 Expert Biol Ther.
24. WI, Yeager M, - BK. HIV Assembly's structural biology. 203–217 in Curr Opin Struct Biol. 2008; 18(2)
.25.BK, Kelly BN, O, et al. HIV capsid building block X-ray structures. Cell. 2009;137(7):1282–1292.
26. Friedman SH, GL, Decamp DL, RP, G, and F. Fullerene derivatives' inhibition of the HIV-1 protease: model-building research and experimental confirmation. 1993;115(15):6506–6509; J Am Chem Soc.
27.Dendritic cells provide antigens and stimulate T lymphocytes. Immunol. Ann Rev. 2002; 20:621–667.
28 In vitro and in vivo cell biology of antigen processing. Immunol. Ann Rev. 2005;23:975–1028. -Williams MG, -Williams LJ,
29 Formation of antigen-specific memory cells. Immunol. Ann Rev. 2005;23:487–513
30.Demento SL, Caplan MJ, I, Saltzman WM, Fahmy TM. Design prospects for vaccines utilizing actively targeted nanoparticles. 2008;3(3):343–355, Nanomed. 1