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Editorial

Insights of Antiretrovirals: A New Drug Delivery Systems

Ashu Berg*

Department of Psychology, University of Gothenburg, Sweden

SUMMARY

Antiretroviral drugs are the drugs that are used to fight retrovirus infections which mainly include HIV. Different classes of antiretroviral drugs act on different stages of the HIV life cycle. A retrovirus is a single-stranded RNA virus with a DNA intermediate. Common antiretroviral drugs include: Lamivudine, Abacavir, Zidovudine, Stavudine, Didanosine, Emtricitabine, Tenofovir, etc.

The efficacy of antiretroviral therapy is significantly compromised by medication non-adherence. Long-acting enteral systems that can ease the burden of daily adherence have not yet been developed. Here we describe an oral dosage form composed of distinct drug–polymer matrices which achieved week-long systemic drug levels of the antiretrovirals dolutegravir, rilpivirine and cabotegravir in a pig. Simulations of viral dynamics and patient adherence patterns indicate that such systems would significantly reduce therapeutic failures and epidemiological modelling suggests that using such an intervention prophylactically could avert hundreds of thousands of new HIV cases. In sum, weekly administration of long-acting antiretrovirals via a novel oral dosage form is a promising intervention to help control the HIV epidemic worldwide.

Antiretrovirals have transformed disease management for human immunodeficiency virus (HIV)-infected individuals1. With reliable life-long adherence to combination antiretroviral therapy (ART), HIV+ individuals have a lifespan comparable to that of uninfected individuals. Additionally, antiretrovirals may be taken by high-risk uninfected individuals to prevent infection, a strategy known as pre-exposure prophylaxis (PrEP)3. When used consistently, PrEP reduces HIV acquisition rate by 90%4. Despite these developments, the burden of HIV remains high worldwide. In 2015, 2.1 million people became newly infected with HIV, and there were 1.2 million HIV-related deaths. These findings underscore the need to bridge the disconnect between availability of effective antiretrovirals and efficient disease control.

Novel drug delivery systems present an opportunity for formulation scientists to overcome the many challenges associated with antiretroviral (ARV) drug therapy, thereby improving the management of patients with HIV/AIDS. This paper provides a comprehensive review of the various ARV delivery systems that have been developed for achieving sustained drug release kinetics, specifically targeting drugs to the macrophages, brain and gastric mucosa, and for addressing formulation difficulties such as poor solubility, stability and drug entrapment. Studies on the potential of systems for alternative routes of ARV drug administration, i.e., transdermal, buccal and rectal, are also highlighted. The physico-chemical properties and the in vitro/in vivo performances of various systems such as sustained release tablets, ceramic implants, nanoparticles, nanocontainers, liposomes, emulsomes, aspasomes, microemulsions, nanopowders and PheroidTM are summarised. Further studies that remain to be undertaken for formulation optimisation are also identified. This review highlights the significant potential that novel drug delivery systems have for the future effective treatment of HIV/AIDS patients on ARV drug therapy.

CONCLUSION

HIV/AIDS continues to be one of the most challenging individual and public health concerns of our days. According to the latest UNAIDS data, in 2018, roughly 37.9 million individuals were infected with HIV globally, while around 770,000 people died of AIDS-related illness. During that same year, an estimated 1.7 million new infections occurred, mainly due to unprotected sexual intercourse. Investment in the field has been considerable, but a cure to the infection remains elusive. Nonetheless, tremendous advances have been made over the last 36 years since HIV-1 was identified, namely in prevention, diagnostics, and treatment. The development of antiretroviral drugs and the introduction of highly active antiretroviral therapy (HAART) in the mid-1990s—currently referred to as combination antiretroviral therapy (cART)—led to a dramatic shift of AIDS from a fatal disease into a chronic and often stable medical condition. In fact, cART contributed decisively to a steady decrease in the number of HIV-related deaths since the first years of the new millennium. Antiretroviral drugs have also been found useful in the prevention field, particularly in post-exposure prophylaxis or mother-to-child transmission.

Correspondence to: Ashu Berg, Department of Psychology, University of Gothenburg, Sweden, E-mail: Ashuberg@gmail.com

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