



Post-mortem human immunodeficiency virus (HIV) transmission precipitating and palliating factors

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Introduction

Human immunodeficiency virus (HIV) is a retrovirus that attacks the host's immune system. Specifically, the virus attacks the CD4 lymphocytes, and uses their machinery to multiply and divide.^{9,12} This virus has no cure and can progress through three stages with the third stage being called acquired immunodeficiency syndrome (AIDS). This virus originated in chimpanzees in Africa and has subsequently spread across the globe with it rising in prevalence in the mid to late 1970s in the United States. This virus is largely transmitted via sexual contact, sharing needles, and birth/breastfeeding. The signs and symptoms of the disease include flu-like symptoms like sore throat, fever, night sweats, fatigue, etc.² Although HIV/AIDS has no cure, controlling the viral load via antiretroviral therapy (ART) prevents it from multiplying within host cells and reduces the overall amount, and its transmissibility.¹³ Understanding the mechanism of the retrovirus HIV and its transmission characteristics is very important for pathologists and assistants to prevent harm and spread of HIV from the decedent to the practitioner.

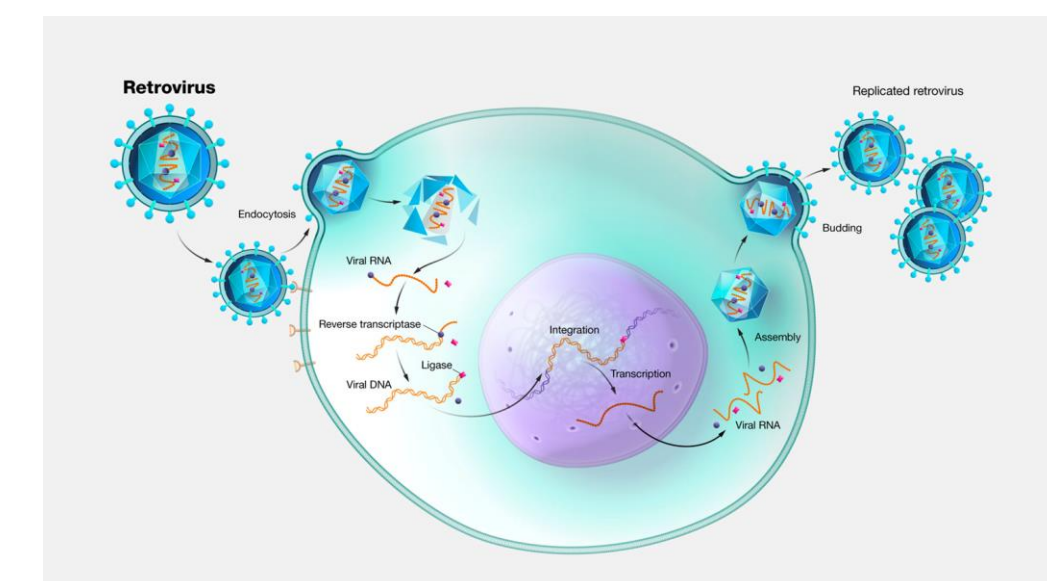


Fig. 1. Image of the retrovirus cycle within the host cell utilizing the host cell machinery

Note. By National Human Genome Research Institute. (2023, June 7). *Retrovirus*. Genome.gov. <https://www.genome.gov/genetics-glossary/Retrovirus>

Materials and Methods

This research comprised of discussion with staff at ForensicDx regarding to HIV/AIDS transmission from the decedent to the practitioner. The staff discussed the importance of proper procedure and personal protective equipment (PPE) needed for adequate protection from transmissible diseases. Additionally, they discussed their own personal experience with needlestick and blood contamination, and the procedure that they use for clean-up and healthcare follow-up to treat and detect possible transmissible diseases that may have been acquired from the decedent.

The remaining research consisted of a literature review examining available resources regarding the mechanism of action of HIV transmission in humans, palliating factors that reduce transmission risk from decedent to practitioner, precipitating factors that may increase transmission risk from decedent to practitioner, and overall risk to the pathologist/assistants.

Undetectable Viral Load

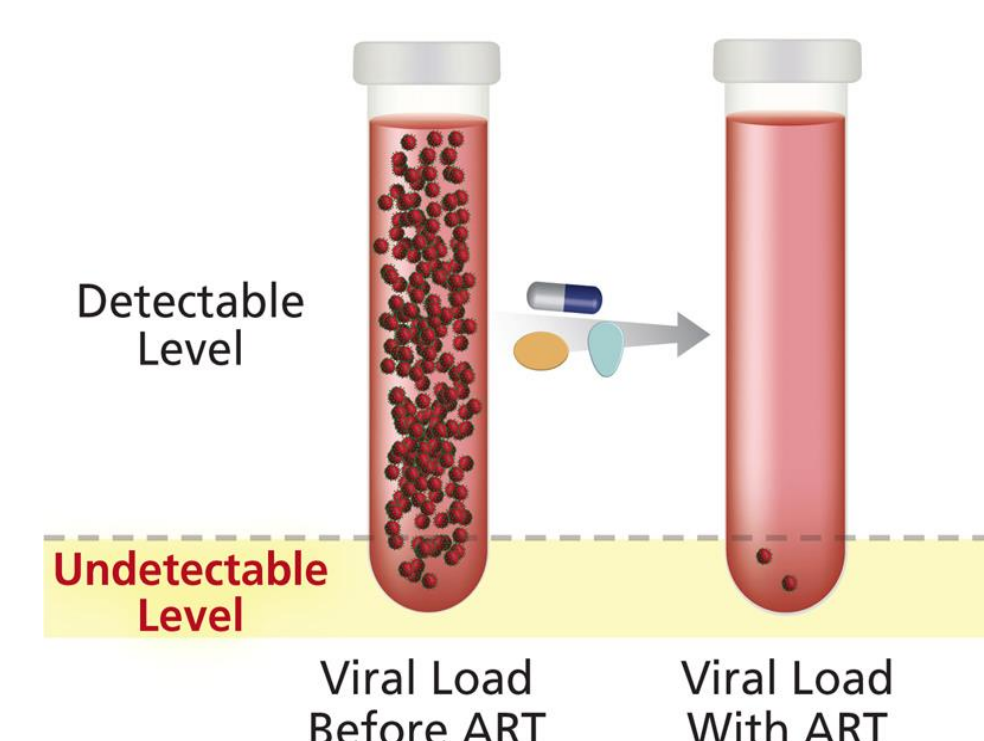


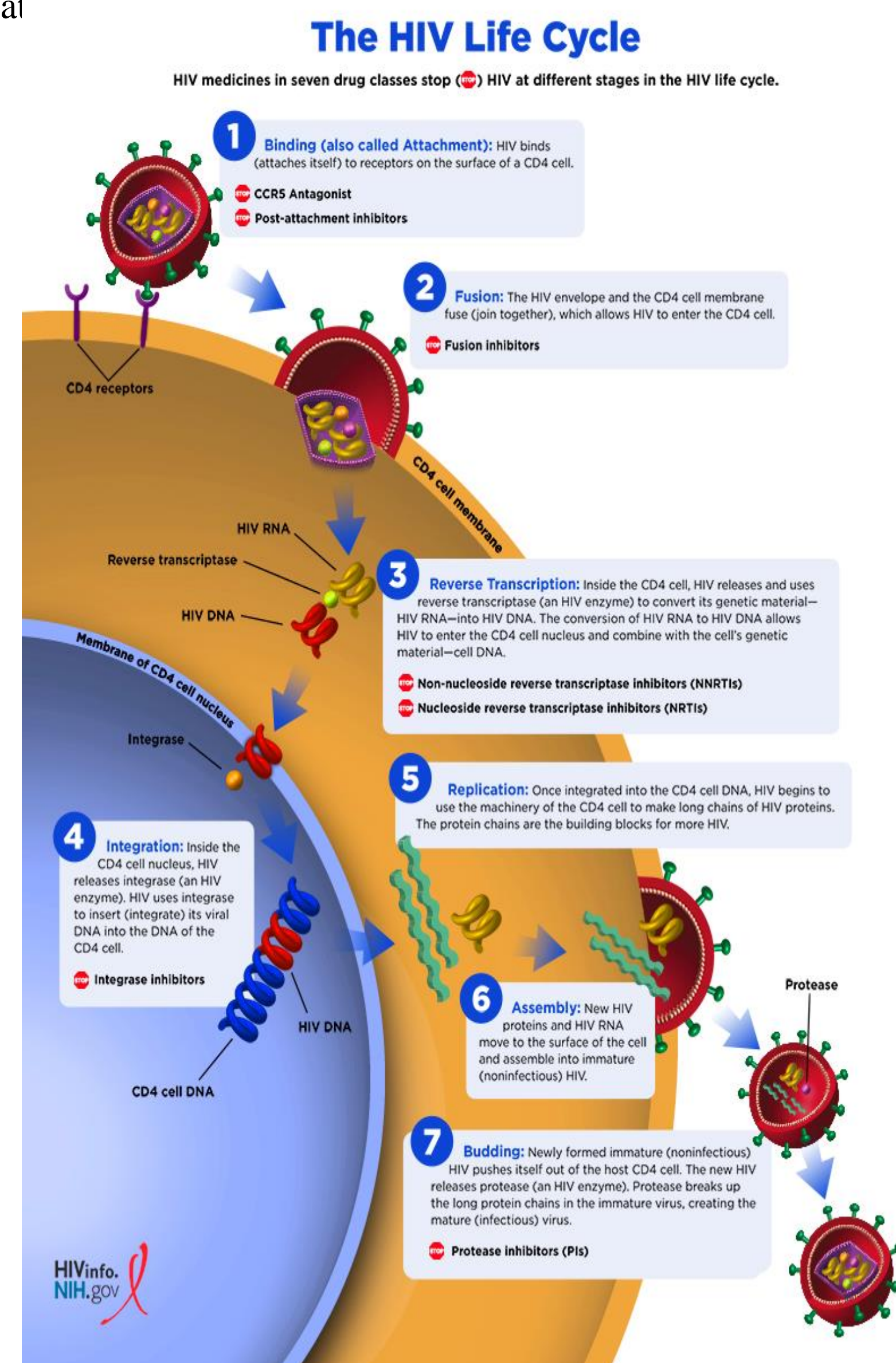
Fig. 2. Image of viral load in blood in relation to ART therapy

Note. By Undetectable viral load: NIH. Undetectable Viral Load | NIH. (n.d.). <https://clinicalinfo.hiv.gov/en/glossary/undetectable-viral-load>

Results and Discussion

The literature review found that there are many different ways to prolong the life of the virus in the decedent, shorten virus life in the decedent, and mitigate the risk of acquiring the virus during an autopsy.

The literature review found that HIV/AIDS is transmitted by blood/blood products, sexual contact, vertical transmission, aerosols, and needle stick injuries.¹ If HIV is present in the individual, it will most likely be found, and transmitted from, the amniotic fluid, blood, cerebrospinal fluid, exudative material from tissues, human breast milk, pericardial fluid, peritoneal fluid, pleural fluid, saliva, semen, synovial fluid, unfixed human tissues and organs, vaginal secretions, and any other body fluids.⁵ This transmission during autopsy often occurs during needle stick or knife-cut.¹⁰ HIV/AIDS has a spore form which is very difficult to kill within the decedent body.⁶ It remains active and alive in the decedent kept at 2°C from 6-15 days.⁹ The cooler temperatures have been found to enhance the survival of HIV in syringes or within the body.³ At these cooler temperatures, conditions within the decedent change slowly resulting in the virus dying gradually.¹⁰ In unrefrigerated bodies, HIV can survive for 24-36 hours after death



Note. By U.S. Department of Health and Human Services. (n.d.). *The HIV life cycle*. National Institutes of Health. <https://hivinfo.nih.gov/understanding-hiv/fact-sheets/hiv-life-cycle#:~:text=The%20seven%20stages%20of%20the%20HIV%20life%20cycle%20are%3A%201.%20imagine%20what%20HIV%20looks%20like>

Fig. 3. Figure 3 illustrates the complicated life cycle of the HIV retrovirus. Note that there are seven stages of the cycle including: binding, fusion, reverse transcription, integration, replication, assembly, and budding. All these steps allow the RNA based HIV retrovirus to incorporate into the host cell DNA to allow for replication and dispersion of new virions throughout the host to allow for further infection.

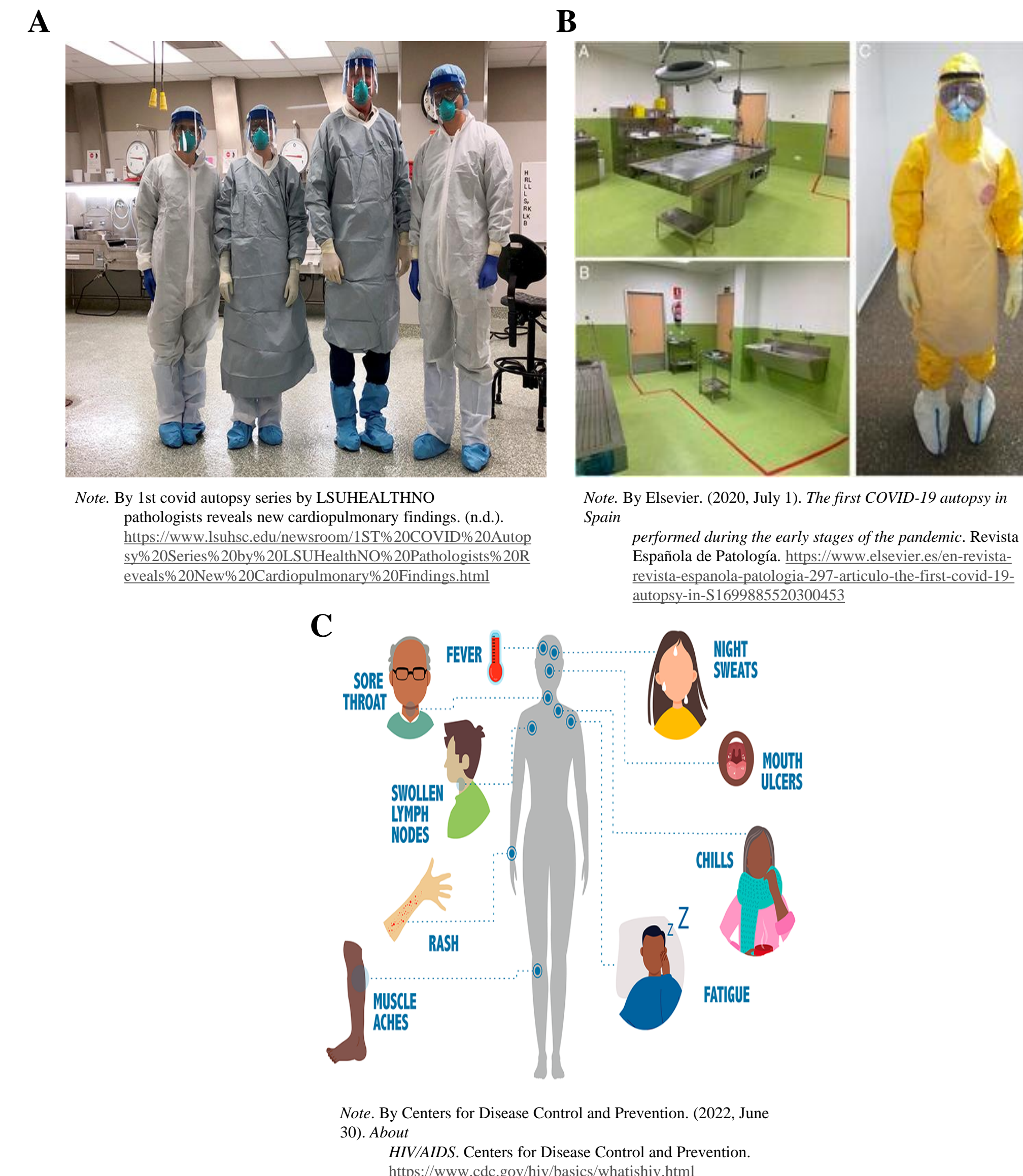


Fig. 4 (A-C). Figures A and B show different PPE options that can be used with transmissible diseases like HIV/AIDS, COVID-19, etc. that may be transmitted during autopsies. Figure C illustrates some of the symptoms that may be present, or expected, upon acquisition of HIV/AIDS.

Increasing the body temperature of the decedent can increase viral death and decrease risk of transmission.³ Additionally, it was found that embalming fluids and household bleach can kill HIV outright.⁸ Once the virus leaves the human body, it dies within minutes due to external environment being unsustainable and inhospitable.¹⁰ As a result, there is no risk of transmission to the practitioner if body fluids are not directly introduced into a person's bloodstream.¹⁰

HIV/AIDS is not transmitted via air, water, saliva, sweat, tears, closed-mouth kissing, insects, pets, or sharing toilets, foods, or drinks.² As a result, proper precautions including a face shield, water repellent protective clothing, gown, cap, plastic apron, double/triple layers of good quality gloves, and strips of bandage applied to every finger can make the HIV risk negligible.⁶ In regards to collected tissues, all tissues should be placed in saline for fixation and disinfection and the body bag and linens should also be cleaned and labeled as "HIV-RISK".¹

In a live individual, HIV viral load in the body can be reduced down to an undetectable level using PrEP resulting in no risk of transmission of HIV to an HIV-negative partner or autopsy practitioner.¹³

Discussion

The proper use of PPE is widely practiced and is important in both the hospital setting and in forensic pathology. Although the use of PPE has established standards in both these settings, it is always important to continue to research further ways to prevent transmission from a decedent to an examiner while still performing a thorough exam. Further research into disease transmission from a decedent to an alive examiner is necessary to further mitigate disease spread as well as continuing to update PPE standards and best practices.

Conclusions

The research found that transmission of communicable disease, including HIV, is a very important topic of consideration when it comes to performing autopsies. The major risk of HIV/AIDS to the autopsy practitioner comes from exposure to body fluids, needle sticks, and knife cuts. These risks can be mitigated by proper PPE. Another risk includes the temperature of the decedent during storage, and the temperature at which the autopsy is performed. A colder temperature prolongs the life of the virus while a warmer temperature diminishes the life of the virus within the decedent's body.

Understanding how diseases are transmitted from a patient/decedent to a practitioner and appropriate use of PPE is very important for remaining safe in the healthcare setting and mitigating risk of acquiring various communicable diseases.

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For further information

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