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Pathogen Report

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Cytomegalovirus-Retroviridae

Cytomegalovirus, otherwise known as CMV, is a very common virus. Most people don't know they have it because the virus rarely causes problems in healthy people (Mayo Foundation for Medical Education and Research, 2020). The virus is transmitted from one person to another through bodily fluids such as blood, saliva, urine, sperm, and breast milk (Mayo Foundation for Medical Education and Research, 2020). Hearing loss, which can be identified soon after delivery or develop later in childhood, is the most prevalent long-term health concern in newborns born with congenital CMV infection (Centers for Disease Control and Prevention, 2020). In the United States, roughly one in three children are infected with cytomegalovirus by the age of five (Centers for Disease Control and Prevention, 2020). By the age of 40, over half of all individuals have been infected with cytomegalovirus, and it remains in a person's body for the rest of their lives and can reactivate (Centers for Disease Control and Prevention, 2020).

The infection cycle of the viral pathogen, Retroviridae occurs in the early and late phases of the retrovirus life cycle are arbitrarily divided: the early phase refers to the steps of infection from cell binding to viral cDNA integration into the cell genome, whereas the late phase begins with viral gene expression and continues through to the release and maturation of progeny virions (Nisole, & Saïb, 2004).

The nuclear replication for the pathogen, Retroviridae is that the 1 SU glycoprotein helps the virus bind to host receptors. Fusion with the cell membrane is mediated by the TM glycoprotein (SIB Swiss Institute of Bioinformatics, 2022). 2 Internalization and partial uncoating are two terms used to describe the process of internalization and partial uncoating (SIB Swiss Institute of Bioinformatics, 2022). 3 The reverse transcriptase converts the ssRNA(+) genome into a linear dsDNA molecule (SIB Swiss Institute of Bioinformatics, 2022). 4 The viral integrase covalently and randomly integrates the viral dsDNA into the cell's genome (=provirus integration) after it enters the nucleus (SIB Swiss Institute of Bioinformatics, 2022). 5 Viral spliced and unspliced RNAs are produced during provirus transcription by Pol II (SIB Swiss Institute of Bioinformatics, 2022). 6 Incompletely spliced RNAs are exported from the nucleus (SIB Swiss Institute of Bioinformatics, 2022). 7 Env, Gag, and Gag-Pol polyproteins are produced by the translation of unspliced viral RNAs (SIB Swiss Institute of Bioinformatics, 2022). 8 The virion is assembled at the host cellular membrane, and the viral RNA genome is

packaged (SIB Swiss Institute of Bioinformatics, 2022). 9 Budding through the plasma membrane and release of the virions (SIB Swiss Institute of Bioinformatics, 2022). 10 Viral protease proteolytically processes the precursor polyproteins and matures the virions (SIB Swiss Institute of Bioinformatics, 2022).

In Houston, more than 32,000 babies were tested for cytomegalovirus by detecting the virus in their urine between 1982 and 1992 (Baylor College of Medicine Blog Network, 2014). These efforts have demonstrated a high incidence of congenital CMV in Houston (0.4-0.8% of newborns screened annually have been tested positive for the virus in the urine increase) (Baylor College of Medicine Blog Network, 2014).

The cytomegalovirus is a worldwide herpesvirus with a high prevalence (Al Mana, Yassine, Younes, Al-Mohannadi, Al-Sadeq, Alhababi, Nasser, Nasrallah, 2019). It is a virus that is found throughout the world with a prevalence of roughly 100% in Africa and Asia, and 80% in Europe and North America (Al Mana, Yassine, Younes, Al-Mohannadi, Al-Sadeq, Alhababi, Nasser, Nasrallah, 2019).

Some viruses caused by Retroviridae such as the West Nile Virus has been detected in Houston and the surrounding Harris County, Texas for several years (Martinez, Murray, Reyna, Arafat, Gorena, Shah, & Debboun, 2017). The greatest WNV outbreak to date occurred in 2014, with 139 cases and two deaths (Martinez, Murray, Reyna, Arafat, Gorena, Shah, & Debboun, 2017). In addition, 1,286 WNV-positive mosquito pools were verified, which is the highest number ever documented in a single mosquito season (Martinez, Murray, Reyna, Arafat, Gorena, Shah, & Debboun, 2017).

Washing hands thoroughly while avoiding touching the face, avoiding contact, avoiding sharing food or drinks, especially from the same utensils, disposing of contaminated items in a safe manner, and washing hands thoroughly while avoiding touching the face, cleaning objects and surface tops around the home and workplace, and practicing safe intercourse are all ways to prevent cytomegalovirus transmission (Mayo Foundation for Medical Education and Research, 2020).

Additional study subjects were enrolled when treatment for congenital CMV infection became available, to record the potential benefits of early antiviral treatment (Baylor College of

Medicine Blog Network, 2014). Infants born with CMV symptoms were given ganciclovir, an antiviral drug with activity against the virus (Baylor College of Medicine Blog Network, 2014). A newborn from Houston was one of the initial subjects in this national therapy trial, and she eventually graduated from college and is now a young adult with a thriving career (Baylor College of Medicine Blog Network, 2014). The original Houston Congenital CMV Longitudinal Study group is still being tracked in adulthood as part of the world's longest-running study on the long-term impact of congenital CMV infection (Baylor College of Medicine Blog Network, 2014).

The approval of letermovir for the treatment of cytomegalovirus (CMV) infections heralds a new era in CMV treatment, notably for the prevention of CMV illness in hematopoietic stem cell transplant recipients (National Library of Medicine, 2022). As very successful combination therapies are developed not only for the treatment of immunocompromised hosts but also for congenitally infected neonates, further medicines that inhibit novel molecular targets, such as letermovir, will be necessary (National Library of Medicine, 2022).

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