A review on cytomegalovirus causing cancer in human

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Abstract

Cytomegalovirus is a kind of herpes virus, HHV-5. It primarily causes congenital infections and the fetal abnormalities during pregnancies. Sometimes, very serious complications and consequences may occur. As human cytomegalovirus is a ubiquitous virus occurring worldwide in nature their infections are very common in human. It has got lifelong latency in human with their reactivation causing cancer in future. The present paper deals with the study of causes and consequences of disease complex and the development of cancer by primary infection and the reactivation of HCMV in human.

Keywords: Human cytomegalovirus, Congenital infection, Disease complex, Reactivation, Cancer.

INTRODUCTION

Cytomegalovirus, also known as human herpes virus-5 is an enveloped, double stranded linear DNA virus belonging to the family Herpesviridae. It is one of the TORCH infections developing different diseases including cancer in human. Human cytomegalovirus (HCMV) is a ubiquitous herpes virus whose frequency of infection ranges from 50 % to 100 % in the general adult population. It causes significant morbidity and mortality in children during pregnancy (Michaelis et al. 2009 and Georges and Amit 2014) [1, 2]. If a female contracts the virus for the first time while pregnant or reactivated the same hidden virus she has, her unborn baby is at higher risk of receiving the virus vertically (Leung et al. 2003) [3]. The virus produces several anomalies in the developing fetus and the child thus delivered might be suffering from certain diseases including cancer in future. Griffith 2002, Rawlinson and Scott 2003, Michaelies et al. 2009) [1, 4, 5]. The present paper discusses the human cytomegalovirus primary infection, reactivation and the development of various diseases and cancer in the light of recent researches done so far in the field of viral origin of cancer. The present paper is prepared on the basis of researches done so far in the field of viral origin of cancer. The authors have gone through several original research papers in order to explore the facts regarding the cytomegalovirus causing different diseases including cancer in human.

CMV belongs to the group 1 (ds DNA), order Herpesviridae, family herpesviridae and the subfamily Betaherpesvirinae. This is a very common asymptomatic infection in human adults (Schottstedt et al. 2010) [6]. This is usually developed during pregnancy as congenital infections or in the patients who are immunosuppressed. According to an estimate by CDC approximately one of every 150 newborn child is being already infected from her mother at birth. Similarly, every hour a child is disabled due to congenital CMV infections. These infections may cause fatal abnormalities in newborn children as premature birth with low birth weight (Guillaume et al. 2013 and Kristen et al. 2014) [7, 8]; yellowing of the skin with rashes as petechie and purpura (John et al. 2017) [9]; dysphagia, diarrhea, colitis, splenomegaly, liver and spleen failure (Taniwaki et al. 1997, Kaufman et al. 1999, Patra et al. 1999, Dinesh et al. 2013, Talwani et al. 2013 and D’cruz et al. 2018) [10-15]; hearing loss (Kristen et al. 2014) [8]; r tinitis, blurred vision and blindness (David et al. 2007) [16]; nervous disorders, microcephaly, mental retardation, cerebral palsy, cerebral calcification, decreasing I.Q. levels causing psychomotor retardation, neuromotor loss, seizures, lack of coordination, weakness and numbness in legs (Anders and Goebel 1999 and Natacha et al. 2014) [17, 18].

Further, the relationships between cytomegalovirus infection and the development of Gullain Barry Syndrome and the association of CMVs with veneral diseases have also been established (Jordan et al. 1973 and Lunn and Hughes 2011) [19, 20]. In addition, thrombocytopenia is also caused by the cytomegalovirus (Simpson et al. 2016) [21]. The CMV infection of the heart is common in patients with fatal myocarditis. It may cause heart failure (Schonian et al. 1995, Kyto et al. 2005, Magno et al. 2016) [22-24]. Similarly, cytomegaloviruses sometimes, developed gastrointestinal infections causing enterocolitis (Patra et al. 1999, Kaufman et al. 1999) [11, 12], inflammatory bowel disease (Rowan and Cannon 2018) [25], gastric mucosal lesions (Himoto et al. 2009) [26], multiple ulcers of the ileum (Taniwaki et al. 1997)
Acquired CMV are spreading through liquid transmission via body fluids such as saliva semen, blood, urine, vaginal fluids and breast milk. It is known to infect most organs of the human body including brain, breast, colon, eye, kidney, liver and lungs. But healthy people very rarely become significantly sick from CMV infection. Although, CMV may be found at any part of the adult human body, their most preferable place has been reported to be the salivary glands (Koichi et al. 2007) [31]. HCMV remains latent within the body throughout life but it may reactivate at any time causing mucoepidermoid carcinoma of salivary gland (Melnick et al. 2011) [33] and other malignancies like prostate cancer in men (Geder et al. 1977) [32] and breast cancer in women (Georges and Amit 2014 and Richardson et al. 2019) [2, 34]. Similarly, HCMV significantly accelerated the development and progression of glioblastoma, a deadly form of brain cancer (Price et al. 2013, Wolfgang and Michael 2014, Christian et al. and Rahman et al. 2019) [35-38].

Further, anti CMV antibodies produced as IgM and/or IgG could be used as a marker for acute (IgM) or chronic infections (IgG) of the same virus in the body. A definitive diagnosis is done by culturing the virus or by detecting its DNA or specific protein namely pp65 produced. In addition, tissue biopsy of the affected organ gives the inclusion bodies visible as look like an “owl’s eye” under the microscope (Mattes et al. 2000)[39]. Lastly, there is no vaccine available for CMV infection. However, an antiviral drug named ganciclovir (cytovene) is a drug of choice these days (Baldanti 2003, 2003, Lake 2003, Bennekov et al. 2011) [6, 20-30].

REFERENCES


