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Inhibitory activities of microalgal extracts against Epstein-Barr virus DNA release from lymphoblastoid cells*

Yih-Yih KOK[1], Wan-Loy CHU[†‡1], Siew-Moi PHANG[2], Shar Mariam MOHAMED[1], Rakesh NAIDU[3,4], Pey-Jiun LAI[3], Shui-Nyuk LING[1], Joon-Wah MAK[1], Patricia Kim-Chooi LIM[5], Pauline BALRAJ[5], Alan Soo-Beng KHOO[5]

([1]*Division of Human Biology, International Medical University, 57000 Kuala Lumpur, Malaysia*)
([2]*Institute of Biological Sciences, Faculty of Science, and Institute of Ocean and Earth Sciences (IOES), University of Malaya, 50603 Kuala Lumpur, Malaysia*)
([3]*Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur, Malaysia*)
([4]*School of Medicine and Health Sciences, Monash University, 46150 Petaling Jaya, Selangor, Malaysia*)
([5]*Molecular Pathology Unit, Institute for Medical Research, Jalan Pahang, 50588 Kuala Lumpur, Malaysia*)
[†]E-mail: wanloy_chu@imu.edu.my

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Abstract: This study aimed to assess the inhibitory activities of methanol extracts from the microalgae *Ankistrodesmus convolutus*, *Synechococcus elongatus*, and *Spirulina platensis* against Epstein-Barr virus (EBV) in three Burkitt's lymphoma (BL) cell lines, namely Akata, B95-8, and P3HR-1. The antiviral activity was assessed by quantifying the cell-free EBV DNA using real-time polymerase chain reaction (PCR) technique. The methanol extracts from *Ankistrodesmus convolutus* and *Synechococcus elongatus* displayed low cytotoxicity and potent effect in reducing cell-free EBV DNA (EC_{50}<0.01 μg/ml) with a high therapeutic index (>28000). After fractionation by column chromatography, the fraction from *Synechococcus elongatus* (SEF1) reduced the cell-free EBV DNA most effectively (EC_{50}=2.9 μg/ml, therapeutic index>69). Upon further fractionation by high performance liquid chromatography (HPLC), the sub-fraction SEF1'a was most active in reducing the cell-free EBV DNA (EC_{50}=1.38 μg/ml, therapeutic index>14.5). This study suggests that microalgae could be a potential source of antiviral compounds that can be used against EBV.

Key words: Microalgae, *Ankistrodesmus convolutus*, *Synechococcus elongatus*, *Spirulina platensis*, Lymphoblastoid cells, Epstein-Barr virus (EBV)
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1 Introduction

Epstein-Barr virus (EBV) is a γ-herpes virus that infects 90% of the adult human population and is prevalent among Asians, especially the Chinese (Klein, 1994). The virus is able to coexist within its host almost asymptomatically. However, EBV infection may lead to the emergence of lymphoproliferative disorders, such as Burkitt's lymphoma (BL) and Hodgkin's lymphoma (HL) and many neoplasms, especially undifferentiated nasopharyngeal carcinoma (NPC) (Rickinson and Kieff, 1996; Rezk and Weiss, 2007). Infection of B lymphocytes by EBV may also cause infectious mononucleosis and post-transplantation lymphoproliferative disorder (PTLD) (Kurth *et al.*, 2000; Krenauer *et al.*, 2010).

Both the microalgae and macroalgae (seaweeds) are potential sources of antiviral compounds, with sulfated polysaccharides being the major active

‡ Corresponding author
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