ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 11, Special issue 1, 2018

Online - 2455-3891
Print - 0974-2441

Research Article

VIRGIN COCONUT OIL MODULATES TCD4+ AND TCD8+ CELL PROFILE OF DOXORUBICIN-INDUCED IMMUNE-SUPPRESSED RATS

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Received: 15 August 2017, Revised: 30 September 2017 and Accepted: 22 October 2017

ABSTRACT

Objective: Doxorubicin (DOX) is a drug of choice in many cancer therapies. Virgin coconut oil (VCO) is one of nutraceutical which has many biology activities. This current study was carried out to investigate the VCO activity in modulating TCD4+, and TCD8+ cells profile toward rats which induced by DOX.

Methods: A total of 15 Sprague-Dawley rats were divided into three groups consisting of five rats each as follows: Group 1, receiving oral saline 10 mL Kg BW (control group); Group 2, receiving oral saline 10 mL/kg BW; and Group 3, receiving VCO 5 mL/kg BW. Group 2 and 3 were administered with DOX intramuscularly at dose 4.67 mg/kg BW at day 1 and 4 to suppressed immune functions.

Results: Treatment of VCO 5 mL/kg BW succeeded in reducing a side effect of DOX based on increasing the TCD4+ and TCD8+ blood level.

Conclusion: The results reveal that VCO could increase the level of TCD4+ and TCD8+ in rats which induced by DOX.

Keywords: Virgin coconut oil, Immune, Doxorubicin, TCD4+, TCD8+.

 DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11s1.26562

INTRODUCTION

Virgin coconut oil (VCO) is oil which obtained from coconut milk which prepared from fresh and mature coconut meat (*Cocos nucifera*). VCO is composed with high medium chain fatty acid (MCFA) especially lauric acid. Lauric acid is a MCFA which contains 12 carbon atoms. This acid is bound in the form of triglycerides in the VCO. In the human body, triglycerides of VCO are converted into monoglycerides and lauric acid, which have antibacterial, antifungal, antiviral, hypoglycemic, increase absorption of magnesium and calcium, prevent obesity, and hence, decrease the incidence or prevent diabetes, and induce insulin sensitivity [1-6].

There are several approaches used to treating cancer patients including chemotherapy, and one of the most popular chemotherapeutic agents is doxorubicin (DOX). Although synthetic drugs are effective in killing the cancer cells they may cause negative side effects also (Parthiban, et al, 2015). DOX is an anthracycline antibiotic which is commonly used in breast cancer therapy. However, DOX clinical use is limited due to the side effect in high and repeated dose, DOX-induced cardiotoxicity and affected the immune functions [7,8]. Therefore, several efforts have been done in order to minimize these side effects such as by combination of DOX with herbal extract (Satria, *et al*, 2015).

DOX was suppressed the production of interleukin (IL-2) and interferon-γ, NK cell cytotoxicity, lymphocyte proliferation, and TCD4+/TCD8+ ratio in tumor-bearing mice [9]. DOX on rats was increased production of pro-inflammatory cytokines [7]. Immunological assess on advanced patients with breast cancer that treated by DOX showed decreasing plasma level of IL-10, IL-1, and tumor necrosis factor-α [10]. The use of chemotherapy agent is often combined with an immunostimulant to protect and increase the patient's immune function during chemotherapeutics treatment.

MATERIALS AND METHODS

Materials

The chemicals used in this study were VCO (Palem Mustika) and DOX (Kalbe Farma).

Animal

Wistar rats (weighing 150-200 g) were housed and maintained under the standard conditions of 12-h light/dark cycle, 25°C±2°C were fed with standard rat chow and water *ad libitum*. The experimental protocol was conducted in accordance with the Guideline for Care and Use of Animals Laboratory.

Experimental animals

Fifteen normal rats were divided randomly into three groups of five rats each group and used in the experiments. Group I served as normal rats received vehicle (normal saline 0.9%), Group II served as DOX-treated rats (4.67 mg/kb body weight on day 1 and 4) and were administered normal saline 0.9% orally once daily for 7 consecutive days; and Group III received VCO5 mL/kg body weight of the rats. The rats were administered VCO once daily for 7 consecutive days and DOX doses of 4.67 mg/kg body weight on day 1 and day 4 [11,12].

Determination of TCD4+ and TCD8+ profiles by flow cytometry

Blood samples were collected from treated rats on day 8 under anesthetized condition and kept in a vacutainer containing ethylenediamine tetra-acetic acid. Sample preparation was performed by mixing 5 µL of whole blood, and 10 µL was rat antibody and then was vortexed gently and allowed to stand in a dark room for 15 min. For dilution, lysing reagent was added, then allowed to stand in a dark room for 15 min. After immunolabeling, cells were analyzed on a FACS calibur flow cytometer (Becton Dickenson, Mountain View, CA, USA) [11-13].

RESULTS

TCD4+ and TCD8+ lymphocytes are a T lymphocyte that attacks infection and abnormal cells [14]. In the study, VCO was evaluated for its effect on TCD4+ and TCD8+ profile usung a FACS flow cytometer and the results presented in Fig. 1. Doxorubicin (4.67 mg/kg BW) administration at the day 1 and 4 markedly suppressed TCD4+ and TCD8+ by 7.72% and5.45% in comparison to that of the control group (17.89% and 11.87%). Treatment of 7 consecutive days VCO concomitantly with DOX

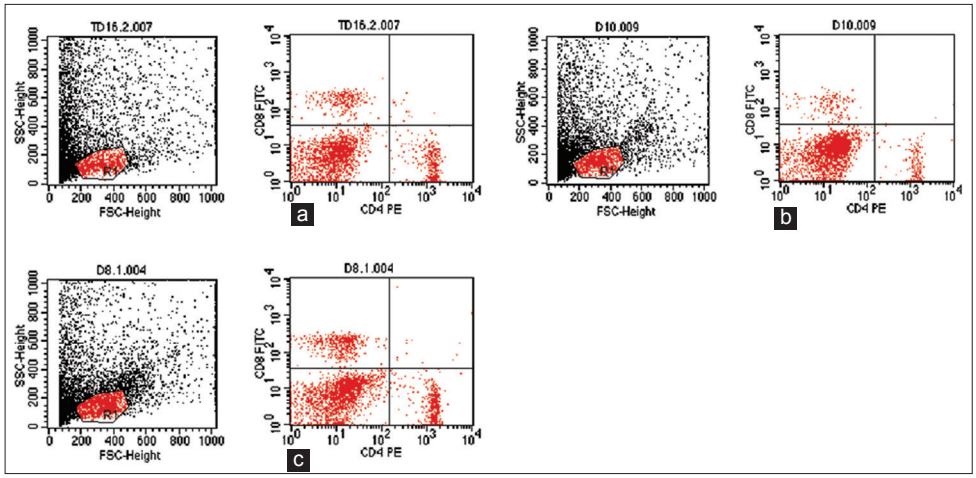

Fig. 1: Effect of virgin coconut oil (VCO) on TCD4+ and TCD8+ in rats induced by doxorubicin (DOX). (a) Normal saline 0.9%, (b) DOX 4.6 mg/kg BW, (c) VCO 5 mL/kg BW

could improve the decrease of TCD4+ and TCD8+ (20.18% and 16.00%) due to DOX administration.

DOX suppressed immune system on DOX-treated rats, shown by inhibition of lymphocyte proliferation, suppression of phagocytosis activity and capacity of macrophages, suppression of TCD4+ and TCD8+ and downregulation of IL-10. DOX caused DNA damage on bone marrow cells [15] and also induced apoptosis on lymphocyte cycle by decreasing T in spleen, lymph nodes, and thymus [16]. DOX induced ROS generation that leads to protein and lipid peroxidation, DNA damage, and mitochondrial dysfunction and increased anti-inflammatory cytokine, e.g., IL-10 [7]. DOX treatment inhibits lymphocyte proliferation in cancer mouse model [17].

VCO contains about 50% of lauric acid containing 12 carbons atom belongs to MCFA present in the form of triglycerides so that this oil called medium chain triglycerides oil. In the body, triglyceride is hydrolyzed by lipase enzyme specifically active on sn-1,3 positions and converted into monoglycerides and free fatty acids mainly as 2-monolaurin and lauric acid that have many pharmacological activities including increase the number of TCD4+ and TCD8+ [2,4,18].

CONCLUSION

Based on the results, we concluded that VCO and DOX provided beneficial effects. VCO activities by stimulate the TCD4+ and TCD8+.

ACKNOWLEDGMENTS

We gratefully thank Research Center University of Sumatera Utara through Hibah Talenta "Hibah Penelitian Unggulan Universitas" Research Grant 2017 "No: 5338/UN5.1.R/PPM/2017" for financial support in the study.

CONFLICTS OF INTERESTS

Declared none.

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