

Mozuku (*Cladosiphon okamuranus*) a Brown Seaweed, Inhibits the Migration of Vascular Smooth Muscle Cells Co-cultured with Adipocytes

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Abstract

Background: The mortality rate of patients with arteriosclerosis-related vascular disease is extremely high. The central phenomenon that leads to the intimal thickening of arteries is the migration of vascular smooth muscle cells (SMCs) from the media to the intima and the subsequent proliferation of SMCs in the intima.

Aims: The aim of this study to establish the effect of Okinawa mozuku in preventing and ameliorating arteriosclerosis, it is necessary to first elucidate the effects of Okinawa mozuku on the transformation, proliferation, and migration of SMCs.

Study Design: This study was an in vitro experimentation, to evaluate the effect of the Okinawa mozuku extract on the migratory ability

of SMCs in the presence of adipocytes.

Methods: This study examined the effect of the Okinawa mozuku extract on the migratory ability of vascular SMCs in the presence of adipocytes. For this purpose, we first investigated the effect of Okinawa mozuku extract on the lipid droplet content in adipocytes. The accumulation of lipids in the adipocytes was evaluated with Oil Red O staining. The Boyden chamber method was used to evaluate the effect of adipocytes on migratory ability of the SMCs. Briefly, the upper chamber in which SMCs were seeded was inserted to the lower chamber in which adipocytes were cultured. Therefore, we performed SMC/adipocyte co-culture (SACC) using the Boyden chamber. Migrated cells that passed

through the membrane in the Boyden chamber were quantified on 0, 2, 4, 6, and 8 days of adipocyte differentiation. Moreover, in the adipocytokine assay, the effect of the Okinawa mozuku extract on the levels of active PAI-1 and the levels of adiponectin in the SACC medium were also measured.

Results: The results of this study demonstrated that the Okinawa mozuku extract suppressed the accumulation of lipid droplets in the mature adipocytes. Furthermore, the Okinawa mozuku extract suppressed the levels on active form of plasminogen activator inhibitor-1 (PAI-1), and increased the levels of the anti-inflammatory adipocytokine, adiponectin. Furthermore, using our original co-culture system (SACC), we investigated the effect of adipocyte on smooth muscle cell migration. The migratory ability of vascular SMCs in the presence of adipocytes increased as the adipocytes increasingly differentiated. The Okinawa mozuku extract decreased the levels on active form of PAI-1 in SACC, suppressing the migration of vascular SMCs.

Conclusion: Our study revealed that the Okinawa mozuku extract is effective in suppressing the progression of arteriosclerosis.

Key Words: the Okinawa mozuku, migration, vascular smooth muscle cells, adipocytes