

Mobilization of human CD34⁺CD133⁺ and CD34⁺CD133⁻ stem cells in vivo by consumption of an extract from *Aphanizomenon flos-aquae*—related to modulation of CXCR4 expression by an L-selectin ligand?[☆]

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Abstract

Objective: The goal of this study was to evaluate effects on human stem cells in vitro and in vivo of an extract from the edible cyanobacterium *Aphanizomenon flos-aquae* (AFA) enriched for a novel ligand for human CD62L (L-selectin).

Experimental approach: Ligands for CD62L provide a mechanism for stem cell mobilization in conjunction with down-regulation of the CXCR4 chemokine receptor for stromal derived factor 1. Affinity immunoprecipitation was used to identify a novel ligand for CD62L from a water extract from AFA. The effects of AFA water extract on CD62L binding and CXCR4 expression was tested in vitro using human bone marrow CD34⁺ cells and the two progenitor cell lines, KG1a and K562. A double-blind randomized crossover study involving 12 healthy subjects evaluated the effects of consumption on stem cell mobilization in vivo.

Results: An AFA extract rich in the CD62L ligand reduced the fucoidan-mediated externalization of the CXCR4 chemokine receptor on bone marrow CD34⁺ cells by 30% and the CD62L⁺ CD34⁺ cell line KG1A by 50% but did not alter the CXCR4 expression levels on the CD34⁻ cell line K562. A transient, 18% increase in numbers of circulating CD34⁺ stem cells maximized 1 hour after consumption ($P < .0003$). When 3 noncompliant volunteers were removed from analysis, the increase in CD34⁺ cells was 25% ($P < .0001$).

Conclusion: AFA water extract contains a novel ligand for CD62L. It modulates CXCR4 expression on CD34⁺ bone marrow cells in vitro and triggers the mobilization of CD34⁺ CD133⁺ and CD34⁺ CD133⁻ cells in vivo.

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Keywords:

L-selectin; Ligand; Human; Adult stem cell; CD34; CD133; KG1a; K562; Bone marrow; Mobilization; Blue-green algae; Cyanobacteria; *Aphanizomenon*; In vivo; In vitro

Abbreviations: AFA, *Aphanizomenon flos-aquae*; PBMC, Peripheral blood mononuclear cells; PMN, Polymorph-nucleated cells.

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