# Chlorella vulgaris Modulates Genes and Muscle-Specific microRNAs Expression to Promote Myoblast Differentiation in Culture

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## Abstract

Background. Loss of skeletal muscle mass, strength, and function due to gradual decline in the regeneration of skeletal muscle fibers was observed with advancing age. This condition is known as sarcopenia. Myogenic regulatory factors (MRFs) are essential in muscle regeneration as its activation leads to the differentiation of myoblasts to myofibers. Chlorella vulgaris is a coccoid green eukaryotic microalga that contains highly nutritious substances and has been reported for its pharmaceutical effects. The aim of this study was to determine the effect of C. vulgaris on the regulation of MRFs and myomiRs expression in young and senescent myoblasts during differentiation in vitro. Methods. Human skeletal muscle myoblast (HSMM) cells were cultured and serial passaging was carried out to obtain young and senescent cells. The cells were then treated with C. vulgaris followed by differentiation induction. The expression of Pax7, MyoD1, Myf5, MEF2C, IGF1R, MYOG, TNNT1, PTEN, and MYH2 genes and miR-133b, miR-206, and miR-486 was determined in untreated and C. vulgaris-treated myoblasts on Days 0, 1, 3, 5, and 7 of differentiation. Results. The expression of Pax7, MyoD1, Myf5, MEF2C, IGF1R, MYOG, TNNT1, and PTEN in control senescent myoblasts was significantly decreased on Day 0 of differentiation ($p<0.05$). Treatment with C. vulgaris upregulated Pax7, Myf5, MEF2C, IGF1R, MYOG, and PTEN in senescent myoblasts ($p<0.05$) and upregulated Pax7 and MYOG in young myoblasts ($p<0.05$). The expression of MyoD1 and Myf5 in young myoblasts however was significantly decreased on Day 0 of differentiation ($p<0.05$). During differentiation, the expression of these genes was increased with C. vulgaris treatment. Further analysis on myomiRs expression showed that miR-133b, miR-206, and miR-486 were significantly downregulated in senescent myoblasts on Day 0 of differentiation which was upregulated by C. vulgaris treatment ($p<0.05$). During differentiation, the expression of miR-133b and miR-206 was significantly increased with C. vulgaris treatment in both young and senescent myoblasts ($p<0.05$). However, no significant change was observed on the expression of miR-486 with C. vulgaris treatment. Conclusions. C. vulgaris demonstrated the modulatory effects on the expression of MRFs and myomiRs during proliferation and differentiation of myoblasts in culture. These findings may indicate the beneficial effect of C. vulgaris in muscle regeneration during ageing thus may prevent sarcopenia in the elderly.

## Keywords

**KeyWords Plus:** SKELETAL-MUSCLE; MECHANISMS; MYOGENESIS; APOPTOSIS; CANCER; CELLS

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