

Genetic transformation of the green microalga *Haematococcus pluvialis* by
Agrobacterium tumefaciens

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A unicellular green alga, *Haematococcus pluvialis*, has been focused as a microbial source of astaxanthin production. *H. pluvialis* accumulates the highest level of astaxanthin (up to 4%/g DCW) and seems to be a very promising source of natural astaxanthin. Astaxanthin is the most important from the biotechnological point of view, a high-value carotenoid which is used as a pigmentation source in fish aquaculture and a food supplement for humans has been suggested. A promising strategy for further improving the astaxanthin yield of *H. pluvialis* is genetic engineering of the carotenoid biosynthesis pathway. To date there have been no reports of a dominant selective transformation system for *H. pluvialis*. *Agrobacterium tumefaciens*, a soil bacteria, cause crown gall disease in a wide range of plants by transferring the T-DNA from its Ti plasmid to the genome of plants. *A. tumefaciens* is the trans-kingdom gene transporter. We report transfer of T-DNA of *A. tumefaciens* carrying the genes coding for green fluorescent protein (gfp) and hygromycin phosphotransferase (hpt) to the nuclear genome of the *H. pluvialis*. We developed a simple genetic transformation protocol of this green alga by *A. tumefaciens*.