

## **Efficient gene substitution in the moss *Ceratodon purpureus***

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In the moss *Physcomitrella patens*, homologous recombination is a powerful tool for gene targeting. However, *Physcomitrella* is the only moss species for which efficient homologous recombination has been demonstrated. Here we show that gene targeting is possible also for the moss *Ceratodon purpureus*, a species often used as model organism for phototropism and gravitropism. For gene replacement studies, we chose the *Ceratodon* mutant *ptr116*. The phenotype of this mutant is caused by a single point mutation that results in a stop codon within the coding region of the heme oxygenase gene. As a result, the biosynthesis of the phytochrome chromophore is blocked in this mutant. Therefore, the phytochrome-controlled phototropic response is inhibited and the chlorophyll level is down-regulated in *ptr116*. The mutant was transformed with the wild-type heme oxygenase gene in which two silent mutations had been introduced to generate new nuclease restriction sites. After transformation, lines with a rescued phenotype were found at a rather high frequency. Restriction digest of PCR products indicated that in 75% of analysed lines the rescue resulted from gene replacement. This was confirmed for selected transformants by Southern blot. These results show that efficient gene substitution *via* homologous recombination in *Ceratodon* is possible.