

Final report for Award DE-FG02-09ER64721

The original goal of this award was to develop a proteoglycan “chip” containing suitable oligosaccharides that could be used as substrates for glycosyltransferases involved in synthesis or proteoglycans in higher plant cell walls.

We had previously developed a suite of cloned enzymes that could be used to cleave most of the relevant glycosidic linkages in plant cell walls. The next step, supported by the previous award and this award, was to produce a series of transgenic plants in which synthetic proteins were introduced that contained each of the known sequence motifs that induce prolyl hydroxylation, and subsequent glycosylation. This work was completed and published in Estevez et al (2006). We then engaged on a series of experiments to define the properties of the prolyl hydroxylases that convert certain prolyl resides to hydroxyproline for subsequent glycosylation. This proved to be a challenging goal that required recruitment of an international team of complementary skills and several additional years of research. However, the effort was successful and has been published in Science recently (Velasquez et al., 2011).

In the course of this project, the postdoc supported by the award (Jose Estevez) was asked to provide technical assistance to a colleague at Stanford because of his expertise in marine polysaccharides. This led to the important discovery that marine algae have compounds that could be classified as lignin (Martone et al., 2009).

Publications supported by the award

Estévez, J.M., Kieliszewski, M.J., Khitrov, N., Somerville, C. (2006) Characterization of synthetic hydroxyproline-rich proteoglycans with AGP- and extensin-motifs in *Arabidopsis*. *Plant Physiol.*, 142,458-470

Martone, P.T., Estevez, J.M., Lu, F., Ruel, K., Ralph, J., Denny, M.W., Somerville, C.R. (2009) Discovery of lignin in seaweed reveals convergent evolution of cell-wall architecture. *Curr. Biol.*, 19, 169-175

Velasquez, S.M., M. Ricardi, M.M., Dorosz, J.G., Fernandez, P.V., Nadra, A.D., Pol-Fachin, L., Egelund, J., Gille, S., Harholt, J., Ciancia, M., Verli, H., Pauly, M., Bacic, A., Olsen, C.E., r Ulvskov, P., Petersen, B.L., Somerville, C., Iusem, N.D. & Estevez, J.M. (2011) O-glycosylated cell wall proteins are essential in root hair growth. *Science* 332,1401-1403