PRODUCTION OF LONG CHAIN POLYUNSATURATED FATTY ACIDS IN TRANSGENIC PLANTS: A NEW SOURCE OF FISH OILS

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There is now a considerable body of evidence as to the importance of $n$-3 long chain polyunsaturated fatty acids (such as eicosapentaenoic acid and docosahexaenoic acid) in human health and nutrition. Unfortunately, the primary dietary source of these LC-PUFAs, marine fish stocks, is a diminishing natural resource. We are interested in “reverse-engineering” LC-PUFA biosynthesis into transgenic oilseeds, with the goal of making these fatty acids in a sustainable system. Our work is therefore focussed on identifying the primary biosynthetic genes required for LC-PUFA biosynthesis, and optimising the activities they encode. In particular, we have used the so-called “alternative pathway” to efficiently reconstitute LC-PUFA synthesis in transgenic plants. This approach utilises a $C_{18} \Delta 9$ elongating activity combined with a $C_{20} \Delta 8$-desaturase, and this appears to be more efficient in transgenic plants compared with the conventional pathway $C_{18} \Delta 6$-desaturase and $C_{18} \Delta 6$-elongase. However, there levels of $C_{20}$ LC-PUFAs produced by either pathway indicate some room for optimisation. We have therefore sought additional approaches and activities with which to enhance the heterologous reconstitution of LC-PUFA biosynthesis in transgenic plants. These will be outlined in my presentation, along with the long-term prospects for “fish oils” in transgenic plants.