Volume 47(1-4):77, 2003
Acta Biologica Szegediensis
http://www.sci.u-szeged.hu/ABS

DISSERTATION SUMMARY

Adaptation of synthetic oligonucleotide-based inhibition in plant systems

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Antisense oligonucleotides have gained an ever-increasing significance during the last few years. Beyond a therapeutic application, antisense oligonucleotides have proven to be a very useful research tool in the molecular level analysis of life processes, as it is possible to selectively decrease the production of the targeted protein via sequence-specific inhibition.

The aim of this research was to set up an experimental system that enables us to trace the slightest change in the activity of the reporter gene – the luciferase of the firefly, *Photinus pyralis*. First of all, the cellular system and the factors influencing gene expression were optimized. The oligonucleotides exhibited the strongest effect after overnight incubation following transfection.

Our strategy for selecting an oligonucleotide was to choose some functional element of gene expression, such as stability, we used chemically modified oligonucleotides. However, as thioesther bonds are toxic beyond a certain threshold, it was necessary to optimize the number of such bonds within the molecules. In the application step, the uptake of the molecules was first checked, and then measurements were made to investigate the inhibitory effect on the marker genes.

We have found that antisense oligonucleotide-based inhibition is applicable to plants; however, the efficiency of inhibition is somewhat lower as compared to other systems.

Since antisense oligonucleotides exert their inhibitory effect specifically even on the level of the organism, therefore we have attempted to apply the technique to intact plants. Our results show that the inhibition is inducible, but again with less efficiency.

Our other approach gene silencing was through the use