A trial on the isolation of electric pulse-induced *Escherichia coli* genes in the presence of Na^+

TAKASHI ANO AND MAKOTO SHODA
Research Laboratory of Resources Utilization
Tokyo Institute of Technology

Summary

According to the linkage map of *Escherichia coli*, the chromosome comprises 4,750 kilobase pairs and the genetic positions of 1,403 loci are now known. These results suggest that there may be over 1000 genes still waiting to be discovered.

Prokaryotic cells respond to environmental or chemical stresses by inducing specific sets of proteins characteristics to each stress. The proteins within each set and the genes that encode them constitute a regulon; well-characterized prokaryotic examples include heat shock, SOS response, and oxidation stress.

In this experiment, we employed an electric pulse in the presence of Na^+ ion as a stress on the *E. coli* and searched for the presence of a pulse-stimulated gene(s). The search of electric-pulse induced genes in *E. coli* was carried out by operon fusion techniques with a hybrid bacteriophage Mu, which creates transcriptional fusions of the structural gene of β-galactosidase to the host.

Among two hundred transductants tested, nine colonies showed higher expression of more than twofold when they were treated with electric pulses. An electric-pulse stimulated transductant was not stimulated by UV irradiation, which is known to induce an SOS response. Conversely, strain PQ37, which has an operon fusion in one of the SOS genes, did not respond to an electric pulse treatment. Alkaline phosphatase activities of pulsed and non-pulsed culture of PQ37 showed that no enhancement or reduction of protein synthesis occurred.

A possibility of the presence of the electric-pulse stimulated genes, which were not induced by DNA damages, was suggested. As the electric pulse did not damage DNA *in vivo*, a gene with an extremely higher induction ratio can be used as a new regulatory switch in the bio-industry.