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Construction of biosensors using *lux* operon

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The *lux* operon is the cluster of genes that encode luminescence in light emitting bacteria. Expression of this operon or parts of it can be utilized in the construction of biosensors, which are genetically modified organisms, often bacteria that can be used to detect and measure environmental chemical factors such as pollutants. This type of biosensors is constructed in such a way that light emission occurs due an environmental signal 'sensed' by a 'sensor gene element'. The sensor element acts as a promoter that triggers on the expression of a reporter gene element, for example *lux* genes, fixed immediately downstream to it. The intensity of the light emission can be measured using a luminometer and it gives not only a quantitative measurement of the environmental factor but also an indication of the bioavailability of the factor.

The *lux* operon is consisted of seven genes, i.e. *luxR*, *I* and *CDABE*. Each of the genes is responsible for a specific function. The *luxR* and *luxI* products act as the auto inducer for the gene expression, which are not needed in a biosensor because there is the sensor element to act as the promoter.

The plasmid pSB2025 constructed previously by another research group and which contains sections of the *lux* operon modified for the expression in both Gram negative and positive bacteria, provides a promoter-less gene sequence that can be used in the construction of biosensors with a suitable promoter of choice. Promoters of genes of various bacteria that are expressed upon exposure to heavy metals or DNA damaging factors, would be ideal sensor elements in the construction of biosensors that can be used to detect and monitor environmental pollution caused by such factors. Such biosensors would provide a tool cheaper than chemical analysis of pollutants.

Keywords: Bioluminescence, *lux* operon, Biosensors