Final Report Summary

New ways of running PCR reactions

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The Polymerase Chain Reaction (PCR) is a method that allows detailed analysis of almost unimaginably small amounts of DNA, and the development of this method has had a huge impact in many areas of life science. The PCR reaction has thus allowed detailed analysis of minute amounts of DNA recovered from crime scenes and this, in turn, has allowed the perpetrators of serious crimes to be identified years after their cases had been considered “cold”. PCR technology has also revolutionised the diagnosis of genetic diseases and has many other applications including the rapid and accurate identification of potentially lethal food pathogens, a development which has important implications for the way in which health and safety regulations are implemented.

The PCR process is critically dependent upon repeated cycles of heating and cooling and, during a typical reaction, the temperature of the reaction mixture must thus be drive through a series of accurately controlled temperature steps 30 times or more, and the reaction will only proceed correctly if each of these temperature changes is precisely controlled. This requirement for accurate and repeatable temperature control is a significant barrier to the design of new PCR equipment, and the time taken to alternately heat and cool the mixture is the factor that normally limits the speed with which PCR reactions can be undertaken.

Photonase is currently developing a revolutionary method of driving the PCR process, which has the potential to significantly reduce the time taken to undertake PCR-based analyses, and the purpose of the TTOM-funded project was to establish a test system that would allow this new technology to be tested during development. Our initial studies defined a PCR reaction system that allowed us to achieve consistent amplification of a DNA sequence that defines a gene expressed by essentially all animal cells (β-actin). The reaction conditions were then modified to allow us to run reactions under conditions which precisely mimicked those achieved by Photonase’s new equipment. This system thus allows the performance of Photonase’s newly developed equipment to be directly monitor and compared with existing equipment.

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