PCR Pandemonium: A Study of Thermophilic Bacteria DNA Polymerases and Their Application in PCR

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This research examined the potential of thermophilic bacteria found in the Utah-Idaho portion of the Great Basin Region and their respective DNA polymerases' potential for application in PCR. PCR is a critical tool in both in medical research and criminal justice, stemming from PCR's low cost and high efficacy. Research shows that even the smallest changes, like a more effective DNA Polymerase, make a large difference in the overall efficacy of PCR. This research pursued an experiment designed to collect thermophilic bacteria for the sole purpose of DNA polymerase extraction for use in PCR. This included visiting seven different hot springs in the Utah-Idaho portion of the Great Basin Region to collect water samples to plate on LB and Blood Agar plates. The isolated bacteria from the agar plates were then grown independently of one another in broth to get a high density of individual bacteria strains to then extract the DNA polymerase from. That DNA polymerase was then run through PCR, using Bio-Rad's PV92 PCR Informatics Kit, to be compared to the industry standard of Taq DNA polymerase. This information was processed using endpoint analysis, looking specifically at the clarity and appearance of the DNA bands in the gel run through electrophoresis. It was found that several of the isolated bacteria species possessed DNA polymerase that operated just as well as, and in a few cases better than, Taq DNA polymerase. In addition to highlighting the potential of several new DNA Polymerases, the study shows the need for further research into the mechanics and relationship between DNA polymerase and its host organism, as well as the need for DNA Polymerase analysis using qPCR to quantitatively establish that the isolated DNA Polymerases did outperform Taq DNA polymerase.

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