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PCR Cycle Number Analysis - Understanding Exponential Doubling of PCR Product

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Extended Abstract

How does polymerase chain reaction (PCR) create billions of copies of a piece of DNA in only a few cycles? The mechanism of PCR copies each DNA fragment with every cycle leading to exponential doubling of the number of fragments over time. In this hands-on workshop you will set up PCR reactions, remove the reactions for the thermal cycler at given time intervals, and then analyze the products on an agarose gel to demonstrate how students will gain an intuitive appreciation for the power of exponential amplification. Students will then be able to estimate the minimum number of cycles needed to detect a PCR product on an agarose gel. This laboratory experience will allow students to:

- Understand the molecular mechanisms of polymerase chain reaction (PCR) and how gel electrophoresis is used to analyze PCR products.
- Understand the purpose of each step in a PCR protocol and interpret a graph of temperature changes over time.
- Recognize that repeated doubling leads to exponential increase of a quantity.
- Identify dependent and independent variables in a scientific study.
- Recognize that every measurement has a detection limit, the minimum level of signal necessary to make a measurement.
- Interpret an electrophoresis gel using the concepts that brightness of a band is proportional to quantity of DNA and distance migrated is proportional to fragment size.
- Combine reagents in the correct proportions to set up a PCR reaction.
- Program and monitor a thermal cycler.
- Cast, load, and run an agarose gel to analyze products of a PCR reaction.
- Perform common laboratory calculations.

Keywords: polymerase chair reaction (PCR), scientific study, electrophoresis

Mission, Review Process & Disclaimer

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