A multitude of immunological laboratory methods are employed in nursing research to better understand complex biological concepts. The enzyme-linked immunoassay (ELISA), polymerase chain reaction (PCR), single nucleotide polymorphism (SNP) genotyping and immunohistochemistry (IHC) are among several methods commonly used in research.\(^1\) While these methods have revolutionized the interpretation and application of laboratory data, there are many factors involved in these methods that increase the chance for error, reducing accuracy and precision.\(^2\) Researchers must consider these issues when creating research designs and incorporate measures to reduce errors.

**Methods**

Articles were identified with Medline using select keywords. Studies available in English including reviews, commentaries, and original research published were searched. Bibliographies of pertinent articles were used to identify relevant studies that were not initially identified by the original database searches.

**Enzyme-Linked Immunoassay**

ELISA measures either a single protein (singleplex) or multiple proteins (multiplex) in a single sample. Either the antibody or the analyte (antigen) could be adsorbed to a solid surface and still participate in specific high affinity binding. ELISA is fast, highly specific, sensitive, and requires minimal training. The major disadvantage of ELISA is the expensive kit.

**Immunohistochemistry**

IHC is a method for demonstrating the presence and location of proteins in tissue sections. Although less sensitive quantitatively than ELISA, it allows witnessing disease progression in intact tissue and observation of treatment success or failure for diseases such as cancer.

**Polymerase Chain Reaction**

PCR characterizes DNA fragments found in sample types such as: blood, buccal cells/saliva, hair, paraffin-embedded tissue, and urine. PCR detects infectious agents directly in tissues and improves genetic counseling and disease treatment, such as targeted gene therapy. A significant issue with PCR is contamination.

**Real Time Polymerase Chain Reaction**

Real time PCR, or quantitative PCR, is designed to detect and quantify sequence-specific PCR products as they accumulate in “real-time” during the PCR amplification process. It is characterized by high sensitivity and specificity and is the method of choice to quantitate gene expression.

**PCR Error Prevention Control Measures**

- Know and follow the specific protocols
- Use proper pipetting and calibration techniques
- Verify instruments
- Monitor changes in the specific reagents
- Aliquot enzymes and buffers and limit to 3 freeze-thaw cycles
- Ensure the purity of the input DNA
- Determine a 260/280 ratio
- Always include positive and negative controls in the experiment

**PCR Quality Control Measures**

- Physically separate pre- and post-PCR processing areas
- Prepare all materials to be used in pre-PCR areas and carry out with water and reagents that are contamination-free
- Use sterile or nuclease-free tubes
- If aliquoting in larger volumes (greater than a single use), return all reagents to the freezer/refrigerator before opening the tube of template DNA

**References**