Mechanisms utilized within the field of microscopy: studying microbes

Mechanisms Utilized within the Field of Microscopy: Studying Microbes

A microorganism, or microbe, is a form of life (organism) that is too small to be seen with the naked eye (microscopic) (New World Encyclopedia, 2017). Microscopy is a tool used to visualize microbes. There are many different types of microscopes and techniques that can be used to see the structure of a cell (Pommerville, 2018).

Microscopes

A microscope is an instrument used to see microbes. There are two main branches of microscopes, light microscopes and electron microscopes. Light microscopes are the most basic microscopes used in microbiology labs. Light microscopes use a simple system where visible light passes straight through the lenses and through the specimen. This optical design is known as bright-field microscopy. In order for image formation to occur with the light microscope, the light is projected through a lens called the condenser lens, which causes the light to focus into a sharp cone. Next the light moves through the stage opening, and hits the glass slide that contains the specimen. As the light passes through the glass slide and specimen, it will reflect or refract. The light must then pass through an objective lens, which will cause an intermediate magnified image to form. The magnified intermediate image presents as an object for the ocular lens, which then magnifies the image further and creates the final image the eye distinguishes. The light microscope can be equipped with several different optical systems that serve to improve the contrast of microbes, whether the cells are stained or not. Some examples of these commonly used optical

systems are phase-contrast microscopy, dark-field microscopy, fluorescence microscopy

Differences Between Light and Electron Microscopes

The respect for persons is one of the three basic principles outlined in the Belmont Report. Respect for persons is an ethical principal that states an individual's autonomy should be respected and those whose autonomy is diminished have a legal right to protection. In other words there is a requirement to recognize autonomy and protect individuals that have a diminished autonomy. An autonomous person is defined as a person that is capable of deliberating and acting on his or her own interests and values. Those with diminished autonomy are incapable of this. Diminished autonomy can be due to age, maturity, cultural barriers, illness, mental disability, and other circumstances that limit liberty. In order to respect autonomy, the individual must have the opportunity to consider their choices and options without any influence that could impact their decisions. Disregarding respect for an individuals autonomy is denying an individual their individual rights and freedoms (U. S. Department of Health & Human Services, 2018).

Staining Techniques

Justice is an ethical principle that says there should be fairness the participant distribution. In other words, the participants should be selected equitably. In medical research there are often benefits and burdens. Who receives the benefits and who receives the burdens can be justly distributed based on formulations. Theses formulations are that each person receives an equal share, each person receives according to their individual need, each

person receives according to their individual effort, each person receives according to their societal contribution, and each person receives according to their individual merit (U. S. Department of Health & Human Services, 2018).

Microbial Staining

An example of applying beneficence in healthcare is assessing the risk and benefits before conducting medical care or research. The scope and nature of the risk and benefits need to be accounted for. Medical research can pose a risk of physical, psychological, legal, social, and economic harm and associated benefits. These risks and benefits can impact the individual participants, their families, and society as a whole. The assessment of justifiably research requires certain considerations. These considerations are that it is never morally justified to treat patients in an inhumane or brutal manner; the risks should be only those necessary to achieve the medical research objective; the use of human subject should be necessary, and if not, eliminated from the research experiment; research involving a significant risk should be extraordinarily justified; the appropriateness of involving vulnerable populations in a research experiment must be validated; finally, all risks and benefits should be thoroughly presented to the individual before informed consent is granted (The University of Iowa, n. d.).

Using Microscopy to Identify Unknown Microbial Specimens

Applying non-maleficence to healthcare is tricky, because with most medicine, there are risks associated with the benefits of treatment. An effective way non-maleficence can be applied to healthcare is by balancing it

against beneficence. For example, when a medication is becoming harmful to the patient, ceasing the use of that medication would be applying non-maleficence. Another way to apply non-maleficence in healthcare practice is not providing a treatment to an individual if there is no proof the treatment is effective (University of California San Francisco, 2019).

Summary

Ethical principles are crucial in order to conduct medical research. The implementation of the Belmont report and the IRB became the foundation to the medical research industry; applying these principle ensures quality and reliable data.

References

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