



General Overview of Types of Fixation and Processes

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Description

Fixation, in the disciplines of histology, pathology, and cell biology, is the protection of biological tissues from deterioration brought on by autolysis or putrefaction. It stops any current metabolic processes and might also improve the mechanical stability or strength of the treated tissues. The preservation of cells and tissue components is the main goal of tissue fixation, which is also a crucial step in the creation of histological sections. This preservation is done in a way that enables the creation of thin, stained sections. The shapes and sizes of macromolecules like proteins and nucleic acids (in and around cells) form the structure of tissues, which may then be studied.

Types of fixation and processes

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Heat fixation: Single cell organisms are fixed by heat fixation, most frequently bacteria and archaea. Physiological saline or water is frequently added to the organisms, helping to spread out the sample equally. The sample is applied to a microscope slide after being diluted. After being placed on a slide, this diluted bacteria sample is typically referred to as a smear. The slide is held in place with tongs or a clothespin as it is repeatedly passed over the flame of a Bunsen burner to heat-kill

and adhere the organism to the slide after a smear has dried at room temperature. Another option is to utilize a micro incinerating device. Samples are often dyed after heating before being observed under a microscope. Internal structures are typically not preserved by heat fixation, only the overall shape. The proteolytic enzyme is destroyed by heat, which stops autolysis. The capsule (glycocalyx), which cannot be seen in stains due to heat fixation, will shrink or be destroyed if it is employed in the capsular stain procedure.

Immersion: Histological samples, ranging from a single cell to an entire organism, can be fixed *via* immersion. The tissue sample is submerged in the fixative solution for a predetermined amount of time. The volume of the fixative solution must be at least ten times that of the tissue. The fixative must spread throughout the entire tissue for fixation to be successful; hence tissue size, density, and fixative type must all be taken into account. Although it can also be applied to bigger tissues, this method is frequently employed for cellular applications. To allow the fixative to reach the deeper tissue, a larger sample must be immersed for a longer period of time.

Perfusion: Perfusion is the movement of fluid *via* the natural channels or blood arteries of an organ or organism. The fixative is pumped into the circulatory system during tissue fixation by perfusion, typically through a needle placed into the left ventricle. The subject's chest cavity may be opened or ultrasound guidance may be used to do this. The volume of the fixative injection into the heart is adjusted to reflect the average cardiac output. The fixative is disseminated throughout the entire body by the inherent circulatory system, and the tissue doesn't die until it is fixed. When using this technique, a drainage port must also be introduced to the circulatory system, usually in the right atrium, to account for the volume of the fixative and buffer that has been injected. The fixative is delivered into the bloodstream until all of the blood has been restored. The benefit of per-

fusion is the preservation of morphology, but the drawbacks include the death of the subject and the enormous amount of fixative required for larger organisms, which could increase expenditures. By cutting off the arteries that supply tissues unrelated to the research at hand, it

is possible to reduce the volume of fluid required to carry out a perfusion fixation. When doing autopsies on humans, perfusion fixation is frequently utilized to examine the brain, lung, and renal tissues in rodents.