

COMMON PRESERVATIVES USE IN MEDICAL LABORATORY

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A SEMINAR PRESENTED

BY

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SUMMARY

A preservative is a substance in which samples can be stored and maintained without further degradation. The main purpose of preservative is to provide an environment in which bacterial and the infestations are unlikely, thus maintaining the specimen over long period of time. Refrigerator is used to preserve sample at 2-6°C and when time of refrigeration is exceeded, it should then be preserved using chemicals. Common preservative are boric acid, toluene, thymol, acetic acid and hydrochloric acid used for preservation of urine sample, 10% formalin used to

preserve stool samples, polyvinylalcohol used to preserve stool samples, ethanol is used to preserve tissues EDTA, CPD and ACD are used to preserve blood samples.

WHAT IS PRESERVATIVE?

Preservative is a substance or chemical that is added to products such as biological samples, pharmaceutical drugs, foods and many other products to prevent decomposition by microbial growth or by undesirable chemical changes.

Samples are preserved when they cannot be examined within the prescribed time interval.

The primary role of preservatives is to provide an environment in which bacterial and other infestations are unlikely, maintaining the specimen over a long period of time.

COMMON WAYS OF PRESERVING SAMPLES

By refrigeration

Refrigeration is a process of freezing samples to prevent bacterial growth. This process preserves samples at 26°C . Storage in a frozen state helps to achieve long storage, by storing at temperature below the freezing point (-3°C).

Additives used for low temperature storage are

Glycerol

Dimethyl sulphoxide (DMSO)

Polyvinyl pyrrolidone (povidone or PVP)

Liquid nitrogen

Advantages

It does not interfere with chemical tests.

Disadvantages

It raises specific gravity by hydrometer

It precipitates amorphous phosphate and urates

Boric acid

- Boric acid which is in powdered form is used to preserve urine mainly for culture and sensitivity testing .
- It preserves protein and formed elements well and does not interfere with routine analysis.

Disadvantage

It precipitates crystals when used in large amount

Toluene

This is used to preserve urine samples and when added to urine sample forms a thin film on the surface preventing air from

reaching the urine. Samples preserved with toluene should be pipetted from beneath the surface.

Advantage

It does not interfere with routine testing

Disadvantage

It floats on surface of specimen and clings to pipette and testing materials.

Thymol

This is a urine preservative that preserves glucose and sediments well.

Disadvantage

It interferes with acid precipitation tests for protein.

10 % formalin

Formalin is an all purpose fixative used in parasitology laboratory to preserve helminth eggs, larvae and protozoan cysts.

Advantage

- It is easy to prepare
- It has long shelf life
- It is suitable for concentration procedures and UV fluorescence microscopy.

Disadvantage

- It is not suitable for some permanent smears stained with trichrome.
- Inadequate preservation of morphology of protozoan trophozoites.

PVA (polyvinylalcohol)

PVA is a plastic resin that contains schaudinn's fixative, which is used to preserve protozoan cysts and trophozoites for the preparation of permanent stained smears.

Advantages

- It preserves morphology of protozoan trophozoites and cysts
- Preserved sample remain stable for several months
- It preserves organisms and makes them adhere to slides.

Disadvantages

- Contains mercuric chloride that is difficult and expensive to dispose.
- Not suitable for concentration techniques
- Difficult to prepare in the laboratory.

Ethanol

This protects specimen from bacterial or fungal degradation and at the same time protect colour pattern and external morphology. It dehydrates tissues and preserves DNA. **Disadvantage**
It causes shrinkage on tissues

(EDTA) Ethylenediamine tetra-acetic acid This is a colourless and water soluble substance used in haematology to preserve cellular components of blood. It prevents coagulation by chelating calcium. This anticoagulant is very good for ESR determination, PCV, Platelets counts, platelet function tests, haemoglobin estimation.

Advantages

It gives better preservation to cellular morphology of blood cells

It inhibits clumping of platelets

Disadvantages

Excess EDTA in blood may lead to shrinkage of RBCs and WBCs.
It may cause degenerative changes in blood cells.
Not suitable for calcium and iron estimation.

(ACD) Acid citrate dextrose

This is a solution containing citric acid, sodium citrate and dextrose in water. ACD is used in blood bank to preserve blood specimens required for tissue typing and also during procedures such as plasmapheresis.

(CPD) Citrate phosphate dextrose

This is used in blood bank to preserve blood samples.

Citrate is an anticoagulant

Dextrose produces energy in form of ATP

Phosphate is the preservative

CPD stores blood for 28 days

Incorporation of purines to CPD extends blood preservation to 35 days.

REFERENCE

Crump, J., A., Sjolund-Karlsson, M., Gordon, M., A. and Parry, C., M. (2015): "Epidemiology, clinical presentation, laboratory diagnosis, antimicrobial resistance, and antimicrobial management of invasive salmonella infections" *Clinical Microbiology Review*; 28(4):901-937. Available at: <https://pubmed.ncbi.nlm.nih.gov/26180063/> [accessed on October 21, 2020]

GBD 2015 Mortality and causes of death, collaborators. (2015): "Global, regional, and national life expectancy, all- cause mortality, and cause-specific mortality for 249 causes of death, 1980-2015: a systematic analysis for the global burden of disease study 2015" *lancet*; 388 (10053):1459-1544. Available at: <https://www.google.com/search?q=GBD+2015+Mortality+and+causes+of+death%2C+collaborators>. [accessed on October 20,2020

Wain, J., Hendriksen, R., S., Mikoleit, M., L., Keddy, K., H. and Ochiai, R., L. (2015): "Typhoid fever" *Lancet*; 385(9973):11361145.

Pruss, U. and Corralan, C. (2006): "Preventing diseases through healthy environment towards an estimate of the environmental burden of diseases" *World Health Organization, France publish*; 12:30-56.

Ray, C. (2002): "Epidemic deadly disease through History Typhoid Fever" *The Rosen Publishing Group Inc, New York*; 20:35-45.

Switaj, T., L., Winter, k. and Christenesen, S., R. (2015): "diagnosis and management of foodborne illness" *American family Physician*; 192(5):358-365.

