Review Article

Three Types of Useful Water and Liquid Based on US-Patents and Applications: A Mini-Review

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ABSTRACT

In this review, three types of highly consumed and widely used medical water will be examined. These investigations will be done by many Iranian and foreign groups and will be as follows. DEPS water is based on diethyl pyrocarbonate and is prepared from various US patents that have been reviewed. Eye lens maintenance liquid has 6 different substances that make it up and is prepared based on the calculations of the research group of this article. The amount and moles of these medical and chemical substances have been accurately calculated as so cell culture water (hem's f10) based on the series of substances its creator will be further explained. The literature review of these works will be inspected in the text of the article.

Introduction

Diethylpyrocarbonate (in English: Diethylpyrocarbonate) with the chemical formula $C_6H_{10}O_5$ is a chemical compound with Pubcom ID 3051. whose molar mass is 162.141 g/mol, and it is used to deactivate RNase enzymes. Accordingly, pour its one thousandth volumes (one milliliter for one liter) in distilled water and stir the above mixture for at least two hours at 37 °C, and then to complete the process, the water treated with diethyl pyrocarbonate is autoclaved for at least 15 minutes so that the remains of this molecule are destroyed, and the water treated with it is ready to use. The purpose of this work is to destroy this molecule, which, if present, can be

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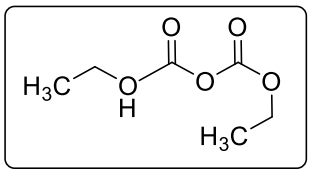
effective in subsequent experiments. For example, with Tris, it can cause problems in reactions where Tris is used [1,2].



Scheme 1: Structure of diethylpyrocarbonate

However, the care and hygiene of the lenses is very important because the slightest contamination can cause various eye diseases, some of which are irreversible. Therefore, you should be very careful in their use and maintenance.

One question that need answer for many of us is; how many types of lens protection solution existed. The four types are as follows: (i) Daily cleansing solution, (ii) Multipurpose cleaning solution, (iii) Enzymatic cleaning solution, (iv) Hydrogen peroxide solution, and (v) Eye protein cleaning solution. In this review and article the multipurpose cleaning solution were investigated [2-6].

A composition of liquid detergent that contains: (a) hydrogen peroxide or a compound that forms hydrogen peroxide in water; (b) a compound chosen from boric acid, borax, or a boric acid salt in an amount of 0.05 to 1% by mass as a boron atom; (c) a compound that has one or more sites, the site having one hydroxyl group at each of both sides of adjacent carbon atoms, in an amount of 3 to 35% by mass; (d) a surfactant in a quantity of between 4 and 45% by mass; and (e) water, where the molar ratio of component (c) the component (b) is between 1.5 and 2.7; and where the detergent composition has a pH of between 4.6 and 7.0 at 20 °C [3-6].

The liquid composition produced by the current work has a pleasing pH jump effect up to a degree of bleaching impact. The drawback of hydrogen peroxide is its stability. Furtehrmore, the presence of other components, like organic peracid, forms from a bleaching activator to a suitable level when used in conjunction with another bleaching activator, a bleaching activator [4-10]. Alternatively, a few elements found in water that are naturally occurring and may impact cell culture are:

Bacteria and endotoxins

Pure cultures can become contaminated by bacteria, and contamination can result in abrupt changes in media pH. Furthermore, the majority of Gram-negative bacteria emit a complex lipopolysaccharide called endotoxin (LPS). When endotoxins are stimulated, macrophages and mononuclear phagocytes release a range of pro-inflammatory cytokines. Endotoxins also impact different cell types, even those without CD14 endotoxin receptors. Modifications in cloning efficiency, recombinant protein production, and cell growth and function are among the effects [5-12].

Inorganic ions

Manganese causes DNA polymerase to incorporate ribose instead of deoxyribose into nascent DNA chains. Magnesium inhibits glucose-6-phosphate dehydrogenase and DNA nuclease II. Heavy metals like lead, nickel, mercury, zinc, chromium, and cadmium have been shown to be toxic to various cells, including glial and neural cells [5,6].

Organic compounds

Humic acids, tannins, pesticides, endocrine disruptors, and other small organic compounds are frequently found in raw water supplies and can persist in tap water. Since these materials are known to have an impact on cell development, they should be eliminated throughout the appropriate procedures in order to produce laboratory-grade water [6-13]. Water is also utilized in a variety of equipment used in cell culture, including incubators and autoclaves.

Experimental

CO_2 incubators (termofischer incubator), offer optimal circumstances for controlling temperature, cell growth, humidity, and CO_2 levels (O_2 control optional). Parameters' uniformity and recovery as well as contamination control are significant considerations. Biological Safety Cabinets (Nuaire Biological Safety Cabinets) indeed control the airflow of the work area and are vital in protecting samples and safety of lab personnel. When buying a BSC, Safety and ergonomics are factors to consider. Iranian centrifuges are used in the harvesting workflow step to concentrate or separate cells or cell components. This procedure requires precise temperature control and correct centrifugal speeds.

Automated cell counters

To experience the ease of use and power of our automated cell counters, which are intended to fulfill the needs of any laboratory. Each tiny equipment includes innovative algorithms that allow you to count cells from the bench quickly and reliably..

Cold storage

Refrigerators for storing medium, controlled-rate freezers for freezing down cells, ULT freezers, and cryopreservation systems for storing cells were all available from Thermo Scientific Cold Storage.

Cell imaging microscopes

With only a few clicks, you can collect publication-quality photos and data with powerful EVOS digital microscopes. The EVOS product line is versatile, small, and suited for a wide range of imaging applications.

Water baths

Precision General Purpose Thermo Scientific Water baths improve temperature uniformity and stability while being simple to clean and maintain. To avoid contamination, water baths can be utilized with either water or thermal beads.

Water purification system

Water purification systems from Thermo Scientific provide a diverse range of purification methods, capacities, and options. Thermo Scientific lab water systems have been a valued resource for scientists for over 130 years.

Flow cytometers

The Attune Nxt Flow Cytometer is a tiny benchtop cell analyzer that can be set with up to four spatially separated lasers to build, operate, and analyze multicolor panels of up to 14 colors.

Result and discussion

These three types water need to be improved in quality and production process. In this part all the component amount and analysis will be study. Some of these analysis was reported as bellow. One of the most practical bovin serum is HAM's F10 [14]. HAM'S cell culture method is related to the most used of them, which will be discussed in the discussion and conclusion. In other words, this analytical method is based on the amounts of chemical and biological substances related to it. Likewise, eye lens maintenance fluid is among the investigated items, each of its chemical and biological substances will be reported with their respective percentages, which shows the importance of multi-purpose lens washing fluid. However, deps water is another case that is treated with deionized water diethyl pyrocarbonate to be biologically used.

Materials needed to make contact lens maintenance liquid:

1. H_2O_2
2. Borax / Boric acid
3. Cellobios3. Or Lactose
4. Surfactant (Lauryl glucoside) (Glycerol mono stearate)
5. Water

1. H_2O_2 has a molecular mass of 34 g/mol. It participates in the oxidation reaction of charged groups. Approximately 0.05 to 1% of it if used. According to the following equations and calculations, boric acid participates in the 2-electron reaction in the environment of weak acid.

Up to 1% by weight of borax is required. The molecular weight of borax is 381. According to the ratio below, 0.1905 grams of borax is needed.

The formula for lactose and Cellobios $C_{12}H_{22}O_{11}$ is the same, but they have different spatial structures. 19 percent of it if we use it. The required amount is obtained as follows:

Lauryl glucoside has the formula $C_{18}H_{36}O_6$ and its molecular mass is 348.5. The average amount of 25% of it is 87.125 grams of this substance, the total of the above items used and prepared is 1 liter, which is 1000 mL.

Required water: 300-1000 mL of water with zero TDS.

DEPC-treatment of water protocol

Many biological research procedures necessitate the use of RNase-free water to prevent RNA degradation. RNase-free water is obtained when distilled water is treated with diethylpryrocarbonate (DEPC), which efficiently inhibits RNases via covalent modification. Here, a general approach is explained to treat water with DEPC.

Materials

1. dH_2O
2. DEPC (Gold-Bio Catalog # D-340)
3. Glass container

Method

1. In a glass container, 100 l of DEPC was combined with 100 mL of dH_2O to get a final concentration of 0.1% DEPC.2, and then mixed thoroughly and left aside for 1 hour at room temperature.3. To decompose DEPC, autoclave the solution for 15-45 minutes at 15 psi.
4. The solution was allowed to cool to room temperature before its use.
5. DEPC-treated water was kept at room temperature until needed [14].

One of the cell culture media preparation component [15]

Components	Concentration (ppm)
Inorganic Salts	
Calcium chloride ($CaCl_2$)	33.30
Cupric sulfate ($CuSO_4$-5H2O)	0.0025
Ferrous sulfate ($FeSO_4$-7H2O)	0.834
Potassium chloride (KCl)	285.00
Potassium phosphate (KH_2PO_4)	83.00
Magnesium sulfate ($MgSO_4$)	74.62
Sodium chloride (NaCl)	7400.00
Sodium bicarbonate ($NaHCO_3$)	1200.00

One of the cell culture media preparation component [15]

Components	Concentration (ppm)
Sodium phosphate, dibas. (Na_2HPO_4)	153.70
Zinc sulfate ($ZnSO_4$-$7H_2O$)	0.0288
Other Components	
D-Glucose	1100.00
Hypoxanthine Na	4.70
Lipoic Acid	0.20
Phenol Red	1.20
Sodium Pyruvate	110.00
Thymidine	0.70
Amino Acids	
L-Alanine	9.00
L-Arginine HCl	211.00
L-Asparagine H2O	15.00
L-Aspartic acid	13.30
L-Cysteine	25.00
L-Glutamic acid	14.70
L-Glutamine	146.00
L-Histidine HCl H_2O	23.00
Glycine	7.51
L-Leucine	13.00
L-Isoleucine	2.60
L-Lysine hydrochloride	29.00

One of the cell culture media preparation component [15]

Components	Concentration (ppm)
L-Phenylalanine	5.00
L-Methionine	4.48
L-Serine	10.50
L-Proline	11.50
L-Tryptophan	0.60
L-Threonine	3.57
L-Tyrosine	1.80
L-Valine	3.50
Vitamins	
D-Calcium pantothenate	0.715
Biotin	0.024
Folic acid	1.32
Choline chloride	0.698
Niacinamide	0.615
i-Inositol	0.541
Riboflavin	0.376
Pyridoxine HCl	0.206
Vitamin B_{12}	1.36
Thiamine hydrochloride	1.00

Application of DDW & DW

What is deionized water?

Deionized (DI) water is extremely purified water in which all total dissolved solids and ions (charged molecules) are removed. Before water is deionized, it is filtered (sometimes through a reverse osmosis machine) to remove organic matter and other contaminants. Next, the water is run through a process called ion exchange [16-20]. North Slope Chillers infographic showing the ion exchange process of creating deionized water

This water went through 2 charged porous electrodes, 1 positive, 1 negative. The positive electrode attracts and eliminates all negative ions from the water and substitutes them with hydroxide (OH). The negative electrode attracts and removes all positive ions from the water and substitutes them with hydrogen (H^+). The hydroxide and hydrogen then combine and form pure water molecules. The result of this process is completely purified water [16-20].

Deionized water vs. distilled water

Distilled water has been boiled, turned into water vapor, condensed, and collected. Solids and impurities are left behind and purified water remains. Distilled water has many positive uses but is not as pure as DI water.

The process of creating DI water is faster, more cost-effective and uses less energy than the distillation process. Due to this added convenience, it is easier to produce greater amounts of purified water than distilled.

What is deionized water used for?

North Slope Chillers infographic describing deionized water and its industrial uses: DI water has many industrial and manufacturing applications in process cooling since it doesn't leave behind mineral deposits and is free of corrosive salts. Its high purity levels mean it is used in ultra-sterile industries, such as pharmaceuticals, to mix medicines and cleanse lab equipment. It also has a very low electrical conductivity, which is ideal for use around electrical equipment. DI water is used to flush impurities and waste material away from sensitive equipment like circuit boards, micro electrics, and Electrical Discharge Machinery (EDM) [16].

Deionized water in process cooling

For industrial machinery that generates a lot of heat and requires the sensitivity of deionized water, specialized chillers are essential. Deionized water chillers pump DI water in and around equipment solving both problems at once [16].

In the following, we will describe cell culture water and lens protection liquid. Although the contents of these liquids are clear in the previous tables. That is, the bacterial tests of these liquids require these detailed microbial tests because these tests will be performed on the cells and human body and living organisms.

Is it necessary to use lens solution?

The care and hygiene of the lenses is very important because the slightest contamination can cause various diseases in the eyes, some of which are irreparable.

How many types of lens solutions are there?

Cleaning solutions are very useful and completely clean the dirt inside the eyes. Eye lens liquid has different categories that we have mentioned below.

Daily cleansing solution

To use the lens, you should intially clean it. A few drops of the solution are enough for cleaning. You can pour the daily cleaning solution on the lenses for 20 seconds to clean them completely.

Multipurpose cleaning solution

This lens liquid is very practical and is used to clean, wash and care for lenses, especially colored lenses. These solutions are not like the daily solution and you can keep them inside the lens container [16].

Enzymatic cleaning solution

This solution is not used continuously, but because of the enzymes it contains, it should be used once a week. You just need to fill your lens container with this solution and put an enzyme tablet in it. After it dissolves, you can put the lens in the solution and wash it with a regular cleaning solution 15 minutes later. This solution cleans the eye proteins stuck to the lenses [16-20].

Hydrogen peroxide solution

This cleaning solution is antiseptic and detergent and is considered one of the best solutions for long-term lens maintenance. It also comes with a neutralizing pill that eliminates eye allergies. The only thing about these lenses is that you have to wash the lenses with a normal solution before use and then put them in this solution [17-25].

Eye protein cleaning solution

These solutions are used to remove eye protein deposits. First, the lens container is filled with this solution and a drop of protein cleaner. This solution can be used daily. Just remember that using these solutions will increase the lifespan of your lenses and also prevent various eye diseases [25-29].

Conclusion

According to the studies carried out, it came to the conclusion that ion-free water and its synthetic lens fluids, cell culture water and deps water were efficiently applicable to pharmaceutical and bioanalysis, so that all its standards and standard methods are accepted by the national standards of Iran and the world was placed. In the future, more recent studies of this substance will be available to everyone.

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