

THE RELATIVE ACTION OF PRESERVATIVES IN PHARMACEUTICAL PREPARATIONS.*

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The Federal Prohibition Act has affected the amount of alcohol used in pharmaceutical preparations, and manufacturing chemists have gradually reduced the alcoholic content of their products to as great an extent as possible.

This fact prompted the experiments noted in this paper, the object being to ascertain the efficacy of preservatives other than alcohol. The preservatives tested were:

Benzoic Acid	Sodium Bisulphite
Salicylic Acid	Chloroform
Cinnamic Acid	Chloretone
Boric Acid	Formaldehyde
Sulphurous Acids	Glycerin
Sodium Benzoate	Alcohol
Sodium Salicylate	

The preparations used for these tests were selected because of their excellent growing qualities for bacteria.

Three types of solutions were prepared, the acid, the alkaline and neutral type.

The *acid solution* consisted of:

Senna Leaves 1 oz.
Sugar 1 oz.
Water to make 1 pint

This media is somewhat similar to Infusion of Senna.

The *alkaline solution* consisted of:

Beef Extract 1 oz.
Sugar 1 oz.
Sodium Bicarbonate 140 grains
Water to make 1 pint

The *neutral solution* was prepared with:

Beef Extract 1 oz.
Sugar 1 oz.
Water to make 1 pint

Each type of solution was tested separately with varying amounts of preservatives. Each experiment was inoculated with a gas-producing bacterium and fermentation tubes were used as containers to note the collection of gas given off, providing fermentation took place.

The temperature under which these experiments were conducted ranged from 90° to 98° F., being within the proper temperature at which bacteria grow the best.

It will be noted that extreme measures were adopted in order to assure that the results obtained would hold good with practically all preparations.

The solutions of Beef Extract and Senna Leaves provided splendid media for the bacteria. Inoculation with gas-producing organisms of the *B. coli* group and incubation provided ideal conditions to test the various preservatives. The experiments were carried on through the course of a year, repeated testing being necessary to verify the results obtained.

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A one-pint sample of each medium was prepared and inoculated with the bacteria. Then samples were measured into the fermentation tubes and preservatives added. These tests were allowed to run from one to two months before the results were noted, and if a mold had formed, or gas had collected in the fermentation tube, the preservative or its strength was marked "not O. K."

1. The following preservatives were found to be inferior:

Boric Acid	Sodium Bisulphite
Cinnamic Acid	Sodium Benzoate
Sulphurous Acid	Chloroform
Sodium Salicylate	Chloretone

Boric Acid (0.4%) developed mold in acid solution, gas and mold in alkaline, and mold in neutral solution. Fermentation took place in 0.1% Cinnamic Acid. Due to its insolubility Cinnamic Acid is impractical. Sulphurous Acid (0.3%) proved ineffectual. Sodium Salicylate and Sodium Bisulphite failed to preserve in 0.3% solution. Sodium Benzoate (0.25%) preserved in acid solution but fermentation took place in the alkaline and neutral media; 0.4% Chloroform was not effective, mold forming in the acid and neutral, and gas produced in the alkaline solution; 45% Glycerin could not be relied on in acid or neutral media but was effective in alkaline solution.

Benzoic Acid, Salicylic Acid, Glycerin, Alcohol and Formaldehyde were found to be the best preservatives.

The following table will bring out more clearly the results obtained.

Preservatives.	MEDIUM.		
	Acid.	Alkaline.	Neutral.
Benzoic Acid	0.1% O. K.	Not O. K.	0.2% O. K.
Salicylic Acid	0.2% O. K.	Not O. K.	Not O. K. Mold
Glycerin	45% (Mold)	45% O. K.	45% (Mold)
Alcohol	15% O. K.	17.5% O. K.	17.5% O. K.
Formaldehyde	0.05% O. K.	0.05% O. K.	0.05% O. K.

In summarizing these conclusions Benzoic Acid was found to be a much better preservative than Salicylic Acid though in alkaline media neither one is effective.

Formaldehyde (0.05%) preserved in all the solutions and it would be the ideal preservative were it not for other objections; 3.84 minims of Formaldehyde to the pint would be sufficient:

It was found necessary to use at least 15% Alcohol in acid and neutral and 17.5% in alkaline solution.

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BY HENRY M. WHELPLEY, TREASURER.

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