

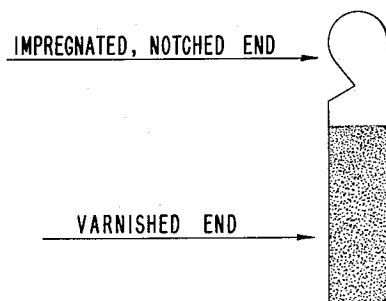
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STERILE MEDICATED STRIPS

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STERILE MEDICATED STRIPS
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This invention relates to the treatment of the eyes and particularly to a new carrier of medicament, to a method of making it, and to a novel method of introducing a medicament to the eye. The invention is particularly useful when it is desired to introduce to the eye a very small quantity of medicament, for instance less than one drop.

One object of this invention is to prepare medicaments in a sterile, solid form adapted to immediate use.

Another object is to provide medicated applicators which require no instruments for application.

Another object is to avoid the use of liquid in the treatment of the eye.

Another object is to prepare a novel applicator for ophthalmic medicaments soluble in tears.

Another object is to apply dry medicaments to the eye in the treatment of ophthalmic diseases.

The standard method of applying medicament to the eye is to use a dropper. This requires a bottle for the medicament, a stopper which is handled, a dropper, a container for the dropper and sometimes a sterilizer or a sterilizing solution for the sterilization of the dropper. The use of the dropper is not altogether satisfactory when very small quantities of medicament are to be applied, for instance less medicament than would be included in one or two drops. In some cases the carrier liquid is irritating and it is desirable to apply the medicament in a dry state. After a bottle is opened, the contents are sometimes regarded as not sterile, resulting in the loss of expensive medicament.

The objects of the invention are accomplished, generally speaking, by an ophthalmic applicator which in its preferred form is an elongated, flat strip of soft fabric, a part of which is impregnated with a dry medicament miscible with tears. A preferred method of making the applicator is to apply a suitable quantity of a medicament solution of selected concentration to a soft textured, bibulous filter paper, dry it in warm air, seal it in an envelope, and sterilize it. In preferred cases the absorbent strip is varnished at one end and the medicament is applied only to the other. The varnish is dried before the medicament is applied. The medicament is applied as a solution of selected strength to the unvarnished part of the strip and the solution is dried leaving the paper impregnated with dry medicament. The medicament used is preferably of such nature that it is soluble in tears and in such common solvents as water or alcohol. After the strip has been dried it is cut by sterile means into small strips, each of which includes a quantity certain of medicament, for instance the dried content of one, two or more drops. These small strips, for instance 2" long x 3/8" wide may have rounded and notched ends and may be packaged in small polyethylene envelopes and sterilized. Sterilization is preferably done by the ethylene oxide method, as described in my copending application Serial No. 679,196 now Patent No. 3,032,182.

Example I.—The paper to be used in preparing these medications is a highly absorbent, soft textured, bibulous filter paper which is varnished on both sides almost to the tip to prevent the distribution of the introduced solution throughout its length by capillary action. The varnish may be of any type but especially of neutral, quick drying resinous type, such as Bakelite. This paper then is die-cut to a narrow strip which is notched on one end.

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The absorbent end is exposed to one drop of medication for instance containing .125 mg. of tetracaine hydrochloride, introduced by either a mechanized syringe capable of dispensing one drop at a time, pipetting manually, or dipping in a solution. The strips are dried in warm air-current and packaged individually in a transparent bag such as described in my copending case which would admit and maintain sterility. The ready strip is sterilized in ethylene oxide. Materials other than paper, that have absorbing qualities, may be used instead of paper strips i.e. gauze, and fabrics but they should be lintless and soft.

In use a sterile package containing a medicated strip is opened, the medicated strip is taken by its varnished end, and the soft, medicament-impregnated end of the strip is tucked inside the eyelid, for instance inside the lower lid where the medicament, being soluble in tears, is absorbed and distributed by the tears of the eye to the places which require treatment.

Typical of the medicaments which can be applied in this way are homatropine HBr, atropine sulfate, pilocarpine HCl, eserine salicylate, carbamylcholine chloride, and tetracaine HCl.

In place of the filter paper there can be used any soft absorbent material, that is to say, any material which is acceptable to the eye without too much irritation, which will absorb an adequate quantity of medicament solution such as soft cotton or linen fabrics, and synthetics such as woven strands of inert plastic threads. The shape of the applicator can be as desired being rounded, notched, or any other convenient shape at the end which is to be inserted in the eye. It is unnecessary to varnish the strip although varnish, or a high size, or lacquering has the advantage of limiting the penetration of the medicament solution into the paper and of preventing moisture on the hands of the physician from travelling through the fabric to the medicated end. Impregnation by means of water solution of the drug is satisfactory, but alcoholic solutions may also be used for impregnation and have the advantage of drying faster.

In some instances it is desirable to include in the solution a small amount of visible indicator, examples of which are rose bengal and fluorescein sodium, so that the physicians may be able to estimate how much of the medicine will be absorbed by tears. By observing the color of the tears as they dissolve the medicine a reasonable estimation can be made of the quantity of medicine which has been taken. In what may be considered standard practice, it is satisfactory to include up to 3 mg. of such dyes in the impregnated end of the strip.

In impregnating as in Example I one may assume that 20 drops equal 1 cc. and make up solutions that contain in one drop the following quantities of medicament.

	Percent	Amt. Present, mg.
One Drop-----	1/4	0.125
	1/8	0.25
	3/8	0.375
	1	0.5
	2	1
	4	2

Increasing the absorbable solution to 2 drops would, of course, double the amounts in the above tabulation but would approximate the conditions that prevail if medication is used in a liquid form. Not all the salt is expected to dissolve in the lacrimal fluid.

The method of coating or sizing paper and other fabrics is well known, and the method of cutting long paper strips into small strips is also well known. In applying the medicament to the strips it is satisfactory to

include in a solution that quantity of the desired medicament which will deposit the quantity of medicament desired in the applicator.

Example II.—A paper strip 1½" wide, 1' long and made of soft filter paper was varnished on both sides except for a strip ⅜" wide along one long edge. A solution of atropine sulfate was made up to contain 0.125 mg. of medicament per drop. Drops of the solution were placed ¼" apart on the exposed edge of the filter paper and allowed to dry in warm air. The strip was cut apart between the drops producing 48 small strips each of which contained about 0.125 mg. of the medicament. Each of these small strips was placed in a small envelope of polyethylene which was sealed thereafter. The sealed strips were placed in the autoclave which was closed and filled with ethylene oxide in a non-explosive concentration. The ethylene oxide penetrated the polyethylene envelope and sterilized the contents. In using the strip the doctor opened the envelope at the varnished end of the strip, removed the strip from the envelope, and immersed it in the tears of the eye gathered in the lower lid. The medicament, being soluble in tears was dissolved out of the strip and carried throughout the eye.

Air drying was used in drying the impregnated paper in this example, but in general drying will be carried out at elevated temperatures under reasonably sterile conditions. Absolute sterilization of impregnation and drying is not necessary where the strips are to be sterilized after packaging. In some cases, where it is desirable to have greater concentrations of medicament than can readily be applied in a single drop, repeated impregnations and dryings may be resorted to. Where a greater concentration of medicament is desired in the tears than can be obtained from a single strip, the physician can apply more than one strip.

In each instance the envelope containing the applicator strip will be labeled with the name and quantity of medicament carried.

The advantages of the invention are in the accomplishing of the objectives of the invention. There are other advantages, for instance over the application of medicaments by the dropper. The quantity of liquid which the eye can retain is small and the addition of more than that limited quantity achieves no purpose, but material variations in the quantity of medicines usefully employable in the eye can be achieved by dissolving the medicine from more than one strip into the tears of the eye, thus increasing the concentration.

The necessity of keeping bottles of solutions at various strengths is avoided. Also, the danger of breakage and spillage is lessened. Furthermore, the use of a medicament in liquid form increases the volume of fluid in the eye causing the excess liquid to flow out of the eye and the medicament, already diluted in liquid form; is further diluted in its concentration when it is inserted into the eye fluids. This invention avoids all these problems be-

cause the medicament in the concentrated dry form utilizes the eye fluids to form the medicament in concentrated liquid form. There is thus no increase in the amount of fluid in the eye to cause the eye fluids to overflow and there is no dilution of the medicament concentration by the eye fluids themselves.

The accompanying drawing is a diagrammatic representation of a notched strip of filter paper one end of which has been varnished and the other impregnated with a quantity of medicament.

As many apparently widely different embodiments of the present invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments.

What is claimed is:

1. A medicated ophthalmic applicator comprising an elongated, flat, thin, absorbent, soft, bibulous filter paper strip having a portion shaped for admission to the eye and impregnated with a dry ophthalmic medicament miscible with tears.

2. The applicator of claim 1 in which the impregnated portion of the strip also contains an indicator.

3. The applicator of claim 1 in which the ophthalmic medicament is selected from the group consisting of homatropine HBr, atropine sulfate, pilocarpine HCl, Eserine salicylate, carbamylcholine chloride, and tetracaine.

4. The applicator of claim 1 in which the impregnated portion of the strip carries the ophthalmic medicament in an amount equivalent to about 0.125 to 2 mg. of the medicament.

5. A medicated ophthalmic applicator comprising an elongated, flat, thin, absorbent, soft, bibulous filter paper strip having a stiffened, non-absorbent portion convenient for handling, and an absorbent portion shaped for admission to the eye impregnated with a dry ophthalmic medicament miscible with tears.

6. A medicated ophthalmic applicator comprising an elongated, flat, thin, absorbent, soft, bibulous filter paper strip having a rounded and notched portion for admission to the eye impregnated with a dry ophthalmic medicament miscible with tears.

7. A medicated ophthalmic applicator comprising an elongated, flat, thin, absorbent, soft, bibulous filter paper strip varnished throughout a substantial part of its length, and a rounded and notched unvarnished part for admission to the eye impregnated with a dry medicament miscible with tears.

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