References

1. ALEXANDER, E., JR., SMALL, W., and CAMPBELL, J. B. *Ann. Surg.*, **127**, 1212 (1948).
2. WOOD, E. H., MONTGOMERY, G. E., JR., and GERACI, J. E. *Fed. Proc.*, **7**, 137 (1948).
3. WOOD, E. H., *et al.* *Proc. Staff Meet. Mayo Clinic*, **23**, 494 (1948).
4. DONOVAN, T. J., THOMAS, J. W., and MILLER, J. C. *Ann. Surg.*, **130**, 1024 (1949).
5. PETERSON, L. H. *Fed. Proc.*, **6**, 179 (1947).
6. PETERSON, L. H., DRIPPS, R. D., and RISMAN, G. C. *Am. Heart J.*, **37**, 1 (1949).
7. ABRAMSON, D. I. Personal communication.

Prevention of the Phytotoxic Action of Sodium Orthophenylphenate on Citrus Fruits by Hexamine[1]

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A serious limitation to the use of sodium orthophenylphenate (Dowicide A)[2] solutions as dip treatments for the control of decay in citrus fruits is their tendency to cause chemical peel burn. When concentrations of the fungicide high enough to prevent stem-end rot and mold infections are used, severe burning of the fruit peel may be caused. Although this does not affect the internal quality of the fruits, their unsightly appearance renders them unmarketable. For this reason concentrations of the chemical greater than 1.2% have seldom been used in such treatments, and even this concentration is not always safe. In fact, even when the fruit was rinsed following treatment, peel burn on lemons has been reported (*1*) with concentrations as low as 0.5%.

In searching for a means of overcoming this difficulty, the authors have tried additions of a wide variety of materials to Dowicide A solutions. Some of these substances, such as vegetable oils, soap, waxes, and certain synthetic detergents, were found to have an effect in reducing the severity of injury to the fruit peel but were not reliable counteractants under all conditions, especially in the early part of the fruit season, when the fruit peel is more sensitive to chemical action. The experimental work reported here shows that hexamine (hexamethylenetetramine) is effective in preventing peel injury in citrus fruits by Dowicide A.

The incorporation of hexamine in fruit wraps, along with orthophenylphenol, to prevent scalding of the fruit peel, has been reported previously (*3*), but, so far as the present authors are aware, its use in fruit dips with Dowicide A has not been suggested. The addition of formaldehyde to Dowicide A solutions has been said to prevent peel burn in citrus fruits (*2*). However, in simultaneous tests made on the same lot of oranges, 100% of the fruit was badly burned when formaldehyde was tried as a counteractant, whereas no trace of injury occurred when hexamine was used.

It was found that the addition of a certain amount of hexamine to the Dowicide A solution entirely eliminated injury to fruits very sensitive to chemical peel burn. Following this discovery, some 45 experiments were carried out with Hamlin, Parson Brown, and Pineapple

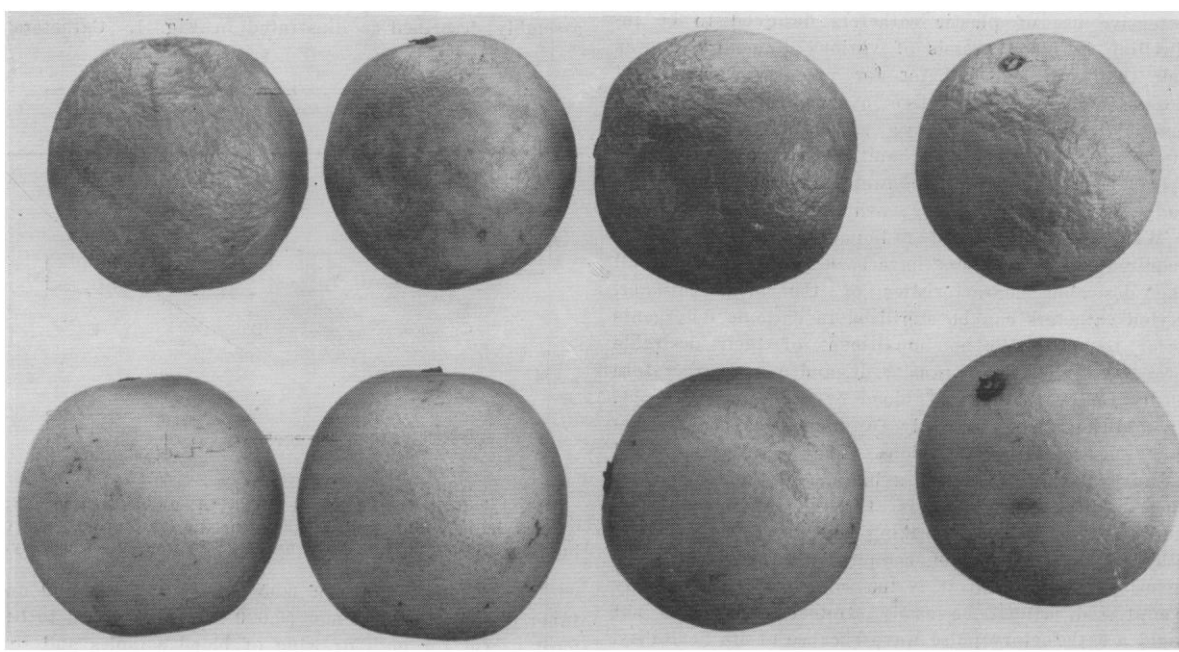

FIG. 1. Counteracting effect of hexamine on peel burn of oranges by sodium orthophenylphenate (Dowicide A): Above, 2% Dowicide A, 2 min at 100° F; below, 2% Dowicide A plus 1% hexamine, 2 min at 100° F.

[1] Cooperative investigation by the Citrus Commission and the Citrus Experiment Station.

[2] Acknowledgment is made to the Dow Chemical Company for kindness in furnishing samples of Dowicide A for this work.

varieties of oranges, and Dancy tangerines, to determine the reliability of the counteractant under various conditions and, at the same time, to evaluate the effect of the mixture on decay control. Approximately 30,000 individual fruits have been under observation. In no case has hexamine failed to prevent peel burn, even under severe conditions of treatment, namely, when the fruit was dipped in 2% Dowicide A for 2 min at 100°F and not rinsed after treating (Fig. 1). In one experiment a solution containing 3% Dowicide A and 1.5% hexamine was used as a dip, and the treatment made as just described. No trace of burn was produced on oranges so treated, whereas 1.5% Dowicide A without the counteractant caused severe burn on the same lot of fruit.

TABLE 1

Treatment	Total decay, %*
Controls, untreated	24.4
Dowicide A, 2%	4.9
Dowicide A, 2% + hexamine 1% .	3.7

* Stem-end rot and mold.

Data obtained from oranges held in storage for 3 weeks show that the addition of hexamine to the Dowicide A solution does not interfere with its fungicidal action on the organisms causing stem-end rot and mold decay. The mean values for 8 experiments are presented in Table 1. In all 8 experiments the oranges were subjected to an ethylene coloring treatment for 60–90 hr before receiving the fungicidal dip. This hastens the onset of stem-end rot decay and makes its control more difficult. As shown in Table 1, good protection against decay was also afforded by Dowicide A used alone, but in all cases the fruit was badly burned and of no value.

In addition to the results given in this paper, extensive data, to be published elsewhere, have been accumulated in respect to the factors involved in this Dowicide A–hexamine treatment. These data have shown that excellent control of both stem-end rot and mold decay are obtained when oranges are dipped in a solution containing 2.0% Dowicide A and 1.0% hexamine for 2 min at 100°F and not rinsed following treatment. A number of runs made in commercial packing houses have also shown a high degree of decay control without injury to the fruit peel.

An explanation of the remarkable effect of hexamine in preventing injury to plant tissues—in this case fruit peel—by Dowicide A, without interfering with fungicidal action, remains for future work. However that may be, the fact remains, and promises to give us a means of stopping the enormous economic loss from citrus fruit decay. We suggest also that it will find application in other instances where the use of Dowicide A is indicated.

References

1. GODFREY, G. H., and RYALL, A. L. *Texas Agr. Exp. Sta. Bull. 701,* 1948.
2. MILLER, E. V., WINSTON, J. R., and MECKSTROTH, G. A. *Citrus Ind.,* 1944, **25**, 3.
3. TOMKINS, R. G. *Rep. Food Invest. Board,* Dept. Sci. Ind. Res. (Brit.) 1939, **1938**, 186.

A Mouth-swabbing Technique for the Laboratory Mouse

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Although mouth-swabbing techniques are widely used, the literature contains no reports of the application of such methods to small laboratory animals. Inherent difficulties are directly related to the small size of the animal. Two of the most serious handicaps are possible injury to the animal and contamination of the swab by the animal's face and paws. A satisfactory technique should therefore consist of an adequate appliance and a method of handling that will insure reproducible samples without injury to the animal or contamination of the swab.

An appliance and a method that meet these requirements have been devised and are herewith described.

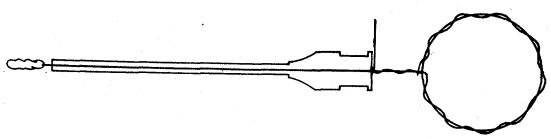

FIG. 1. Appliance diagrammed to show relations of parts when in mouth.

The device consists essentially of a cannula with a trochar and is analogous to the West nasopharyngeal swab (*1*). A 2-in., 18-gauge needle, which has had its end squared and dulled, is used as the cannula; the trochar is made of stainless steel wire of 0.013-in.

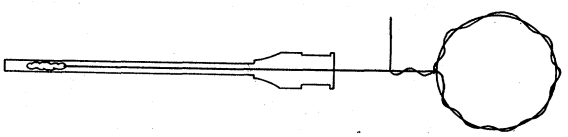

FIG. 2. Swab drawn back into needle for introduction to mouth.

diameter. The distal end of the wire, which can be projected beyond the end of the needle, is serrated and wound with a few strands of cotton to serve as the swab proper; the proximal end bears a stop and a loop (Fig. 1). The stop prevents the swab from being projected more than the predetermined ¼ in. beyond the end of the needle, and the loop allows the operator's index finger to manipulate the swab. To insure sterile dry swabs, it

[1] The opinions and assertions contained in this report are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.