

Bacterial contamination of cavity varnish

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Abstract

The present investigation was undertaken to determine whether cavity varnish can serve as a bacterial reservoir. Twenty-eight samples of cavity varnish were collected from bottles in use in a clinic and two from previously unopened bottles of the material. Samples were grown on a variety of media, both aerobically and anaerobically. Results indicated growth in 25 of 30 samples. The two freshly opened bottles of varnish contained organisms indigenous to soil. The 23 contaminated samples from the clinic contained organisms including several varieties of oral and pharyngeal flora. The results indicate that cavity varnish can serve as a bacterial reservoir.

Cavity varnish is a natural rosin or synthetic resin dissolved in a solvent such as ether or chloroform. One of its principal functions is to reduce microleakage.^{1,2} Because of the difficulty of attaining a continuous layer of varnish and the tendency for small voids to form as the varnish dries, it has been recommended that two or three coats of varnish be applied.^{2,3,4} A dental operator who follows this advice and places the same applicator into the varnish bottle repeatedly may be contaminating the varnish.

In a study by Fuller and Hormati,⁵ this problem was addressed by studying six samples of cavity varnish. They concluded that the material did not support the growth of microorganisms. In actuality, their study only showed that the six samples tested were free of bacterial contamination. The purpose of the current study was to evaluate a large number of samples (both opened and previously unopened bottles) for contamination and to see whether the material would support bacterial growth.

Methods and Materials

Samples of cavity varnish^a were collected aseptically with sterile pipettes from bottles used by 28 randomly

selected students in the pediatric dental clinic, as well as from two unopened bottles. No attempt was made to ascertain the age of each bottle or its duration of use prior to sampling. Each 20 μ l sample then was plated on brain heart infusion agar and grown at 37°C aerobically and anaerobically. (Preliminary studies with several types of media suggested that all samples which demonstrated growth on more selected media also grew on brain heart infusion agar. Therefore, in subsequent work, all samples initially were plated on this enriched media).

Positive samples were observed by examining these plates for growth after 24 and 48 hours. Isolated colonies were transferred to media including blood agar, chocolate agar, Mitis-Salivarius agar, eosin methylene blue agar, and malt agar. They were then grown aerobically, anaerobically, and microaerophilically at 37°C. Biochemical tests included oxidase and coagulase tests, carbohydrate fermentation, and the Enterotube identification system for suspected coliforms. Techniques utilized for special identification followed standard protocols.^{6,7}

Results

Growth was evident in 25 of 30 bottles of cavity varnish tested. Only five samples were found to be sterile. Many of the samples were found to contain more than one type of organism (Table 1). The most frequently identified microorganism was *Neisseria* (15 samples, or half of all bottles tested). The second most common organism identified (13 positive cultures) was *Micrococcus*. In addition, six samples were found to contain strains of *Staphylococcus* (one of these was further identified as *S. epidermidis*), three samples contained *Corynebacterium*, three samples contained *Enterobacter cloacae*, and one sample contained *Lactobacillus*. In addition, there were seven unidentifiable gram-negative rods (four with spindle ends resembling the *Fusiform* group) and four anaerobic gram-positive cocci resembling the *Peptococcus* species. The unopened bottles of cavity varnish were found to contain *Micrococcus* and *Enterobacter cloacae*.

^a Copalite, Harry J. Bosworth Co., Chicago, Ill.

Discussion

Cavity varnish is prepared from gum copal (fossil resin) and natural rosin. Ten per cent of the ingredients consist of neutral matter⁸ and unidentified compounds which may serve as nutrient sources for microorganisms. As gum copal is a resin which is derived from fossils, it is not unreasonable to assume that varnish can contain organisms which are natural inhabitants of soil. It was, therefore, not unusual to find two such organisms, *Micrococcus* and *Enterobacter cloacae* in unopened bottles of cavity varnish. These organisms are generally not pathogenic to man. The samples taken from the clinic contained *Neisseria*, predominantly, which is not indigenous to soil, but rather is a parasite of the mucous membranes of mammals.⁷ *N. sicca* and *N. mucosa* are found in the nasopharynx.

The contamination of cavity varnish bottles with *Neisseria* may not be a fault of the manufacturer, but rather the operator whose improper application technique of the material causes contamination. Certain strains of *Neisseria* can be pathogenic to man. *Staphylococcus epidermidis* is a common organism found on the skin and mucous membranes of warm-blooded animals.⁷ As is the case with *Neisseria*, contamination of cavity varnish with this organism may be a result of inoculation by the operator during dental procedures. *S. epidermidis*, under appropriate conditions, can cause subacute bacterial endocarditis in susceptible patients.⁹ *Corynebacterium*, found in three samples, can be isolated from the nasopharynx, skin or mucous membranes of man. It also can be a parasite on mucous surfaces of warm-blooded animals.⁷ *Peptococcus* is isolated from gingival tissues, tonsils, and skin. Its pathogenicity is uncertain because isolations are frequently from sites where other potential pathogens are present.⁷ Many of the gram-negative anaerobic strains are indigenous to the oral cavity and are opportunistic pathogens.⁷

No effort was made to quantify the number of organisms in each sample. In the majority of cases the 20 μ l sample was enough to establish the bacteria in the laboratory. Many viruses are hardier than bacteria, and one cannot neglect the possibility of viral contaminants in cavity varnish.

The five samples in this study found to be free of bacterial contamination were probably sterile as a result of proper use and dilution of the varnish, or had not yet been contaminated. Fuller and Hormati's failure to find contamination may have been due to similar reasons.⁵ They used a nonenriched media (thioglycollate medium) which does not support certain fastidious organisms in their testing; this also may account for their findings.

Cavity varnishes have no long-term bacteriostatic effects,³ despite the claim that they are germicidal. The solvent itself probably has some limited antibacterial effect, but the amount and frequency of solvent dilution is not elaborated in product instructions. Every attempt

Table 1. Numbers of Samples of Cavity Varnish (Copalite) Containing Indicated Microorganisms

Bacterial Types Isolated	Clinical Samples of Cavity Varnish (28 samples)	Samples From Unopened Bottles of Cavity Varnish (2 samples)
<i>Neisseria</i>	15	
<i>Micrococcus</i>	12	1
<i>Corynebacterium</i>	3	
<i>Staphylococcus</i>	6	
<i>Enterobacter cloacae</i>	1	2
<i>Lactobacillus</i>	1	
Unidentified gram-positive anaerobic cocci	4	
Unidentified gram-negative rods: anaerobic	3	
aerobic	4	

should be made to prevent the addition of potential pathogens to the dental environment. It is, therefore, imperative that contamination of cavity varnishes be prevented after opening. This can be accomplished best by the use of sterile cotton pellets (used only once and not redipped into the bottle) or sterile brushes, or by dispensing a small amount of material into a sterile dappen dish for each patient. The proper dilution with solvent (a germicidal agent) also would be beneficial in attempting to control bacterial contamination.

A subsequent study is in progress to evaluate the proper dilution techniques necessary to ensure sterility of the product without compromising its mechanical and sedative properties.

Conclusion

Cavity varnish can serve as a bacterial reservoir if not treated aseptically. Operators should never place nonsterile applicators in the bottle.

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