# The antimicrobial and antifungal activity of a root canal core material

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The main goal of endodontic treatment is the elimination of microorganisms from the root canal system and prevention of reinfection. The success of obturation is related directly to the thorough elimination of microorganisms during mechanical cleaning and shaping, which is supplemented with antibacterial irrigants. This process is followed by antimicrobial dressings between appointments, if necessary.[1] Nevertheless, these procedures do not result in a completely sterile root canal space.[1]

For this reason, antimicrobial activity plays an important role in the efficacy of the root canal core material and sealer used during root canal filling. Hence, root canal filling is one of the critical determinants of the success or failure of endodontic treatment. As a result, many studies have examined the antibacterial activity of the endodontic materials.[2-4]

Clinicians have used gutta-percha to fill root canals for more than one century; its antibacterial properties have attracted researchers' attention.[5,6] Researchers recently developed a root canal filling material (Resilon, Resilon Research,

## ABSTRACT

**Background.** The authors conducted an in vitro study to determine the antimicrobial and antifungal activity of a recently introduced thermoplastic, synthetic, polymer-based polyester root canal core material (Resilon, Resilon Research, Madison, Conn.) against five different microorganisms by means of the agar diffusion test over different periods.

**Methods.** The microorganisms tested were *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus, Porphyromonas endodontalis* and *Candida albicans*. A microbiologist transferred Resilon cones and gutta-percha cones to the inoculated agar and incubated them at 37 C, either aerobically or anaerobically, as required for optimal growth.

**Results.** The Resilon cones exhibited no antimicrobial effect against any of the bacteria tested, except for *S. aureus.* It showed antimicrobial efficacy against *S. aureus* during the first 24-hour period ($P < .05$). However, after 48 and 72 hours, Resilon cones no longer inhibited the growth of *S. aureus*. In addition, the material demonstrated no antifungal activity during any of the three testing periods.

**Conclusion.** The results of this study indicate that the antibacterial and antifungal efficacy of the Resilon cone is not superior to that of conventional gutta-percha.

**Clinical Implications.** Clinicians should not use the new root canal core material for its antimicrobial or antifungal efficacy.

**Key Words.** Agar diffusion; antimicrobial activity; root canal core material.

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Madison, Conn.) as an alternative to gutta-percha for root canal obturation.

Resilon core material is a thermoplastic, synthetic, polymer-based, polyester root canal core material that contains bioactive glass, bismuth oxychloride and barium sulfate. The size of the Resilon core material is similar to that of gutta-percha cones.

Using different microorganisms, Melker and colleagues[4] detected no antibacterial properties of Resilon. To date, little is known about the antibacterial properties of this material. Moreover, to our knowledge, there are no published reports regarding its antifungal activity.

**TABLE**

**Inhibition zones for Resilon* and gutta-percha at different incubation periods.**

| MICROBIAL STRAIN | MEAN DIAMETER OF INHIBITION ZONE, MILLIMETERS | | | | | |
|---|---|---|---|---|---|---|
| | RESILON | | | GUTTA-PERCHA | | |
| | 24 Hours | 48 Hours | 72 Hours | 24 Hours | 48 Hours | 72 Hours |
| *Enterococcus faecalis* (ATCC† 29212) | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pseudomonas aeruginosa* (ATCC 27853) | 0 | 0 | 0 | 0 | 0 | 0 |
| *Staphylococcus aureus* (ATCC 95106) | 3.3 | 0 | 0 | 0 | 0 | 0 |
| *Porphyromonas endodontalis* (ATCC 35406) | 0 | 0 | 0 | 0 | 0 | 0 |
| *Candida albicans* (ATCC 10231) | 0 | 0 | 0 | 0 | 0 | 0 |

* Resilon is a registered trademark of Resilon Research, Madison, Conn.
† ATCC: American Type Culture Collection (Manassas, Va.).

The objective of this in vitro study was to analyze Resilon's antimicrobial and antifungal properties. Using agar plates, we measured zones of growth inhibition produced by the material against five different microorganisms associated with endodontic diseases.

## MATERIALS AND METHODS

Using the agar diffusion method, we investigated the antimicrobial and antifungal effects of the root canal core material for different periods.

The table lists the five microbial strains from the American Type Culture Collection (ATCC, Manassas, Va.) tested in the Microbiology Laboratory of the Refik Saydam National Hygiene Center, Ankara, Turkey.

A microbiologist propagated *Enterococcus faecalis, Pseudomonas aeruginosa, Staphylococcus aureus* and *Candida albicans* in 5 milliliters of brain heart infusion broth (Difco Laboratories, Detroit). He cultured *Porphyromonas endodontalis* on plates of brain heart infusion broth (Difco), supplemented with hemin (5 milligrams per liter) and menadione (5 mg/L). He incubated the aerobic bacteria and *C. albicans* aerobically for 24 hours at 37 C and incubated *P. endodontalis* anaerobically for 48 hours at 37 C.

Afterward, the microbiologist adjusted each broth culture suspension of bacteria and *C. albicans* to No. 1 MacFarland standard (approximately $3 \times 10^8$ cells/mL). He dispersed 100-microliter aliquots of each microbial suspension (except *P. endodontalis*) on the surface of Mueller-Hinton agar medium (Merck, Darmstadt, Germany) until the surface was covered. The inoculated plates were dried for 15 minutes at 37 C. The microbiologist dispersed aliquots of the suspension containing *P. endodontalis* (100 µL) on 100-millimeter petri dishes containing anaerobe basal agar medium (Oxoid, Unipath, Hampshire, England).

The microbiologist aseptically transferred three Resilon cones (0.02 taper points) and three conventional gutta-percha cones (number 35 size) (ML.029, DiaDent Group, Chongju, South Korea) into separate halves of each previously inoculated plate.

Subsequently, the microbiologist placed the agar plates with the aerobic bacteria in an incubator and incubated them aerobically for 24, 48 and 72 hours at 37 C.

The microbiologist placed the agar plates with the anaerobic bacterium (*P. endodontalis*) into an anaerobic culture jar (Oxoid AnaeroJar AG025A, Unipath) with a GasPak (Oxoid Anaerogen System AN025A, Unipath) anaerobic atmosphere and incubated them for 24, 48 and 72 hours at 37 C.

We maintained the positive and negative controls—namely, the inoculated plates and the