

INTRODUCTION

Secondary caries refers to caries underneath or at the margin of the tooth restorations, which is one of the main reasons for the failure of dental restorations.

The aim of this study was to evaluate the antibacterial effect of the different fluoride containing restorative materials – glass ionomers, composite and bioactive materials in addition to their effect on the expression of specific biofilm associated genes associated with glucose metabolism and therefore the caries process.

BIOFILM CULTURE

Bacterial colonies were harvested from agar plates. The collected biofilms were subjected to total viable colony counting by serial dilution and plating on brucella agar.

RNA was purified from the pellets. The concentration of RNA was determined by Nanodrop and the purity was assessed by A260/A280 ratio.

From the purified RNA stored at -20°C, cDNA was synthesized by using a High-Capacity cDNA Reverse Transcription Kit (ABI Systems) according to manufacturer's instructions

MATERIALS AND METHODS

Filtek™ Z250 Universal Restorative material (3M, ESPE, St Paul, MN, USA) was utilized as non fluoride containing control, Fuji II LC (GC Corporation, Tokyo, Japan), Beautifil II (Shofu, USA), Biodentine (Setodent, Lancaster, PA), and ACTIVA (Pulpdent, Watertown, MA, USA) were the tested materials. Disk shaped specimens were prepared.

Streptococcus mutans, Streptococcus salivarius and Lactobacillus acidophilus preserved at -80°C were revived on brucella blood agar containing 5% sheep blood. The agar plates were incubated at 37°C in 5% CO₂ in air for 2 days.

RESULTS

The expression of both gtfB and gbpB in *S. mutans* and *S. salivarius* was significantly reduced when biofilms were grown in the presence of all fluoridated discs except Filtek, the non-fluoridated control ($P<0.05$). A similar decreased expression of the genes gtf and epsB was also observed in *L. acidophilus* biofilms grown in the presence of fluoridated discs.

RESULTS

All four materials tested, showed significant ($P<0.05$) inhibitory effect on the biofilms of all three species compared to the untreated (without discs) biofilm cultures. In contrast to the biofilms grown in the presence of all 4 fluoridated discs, the biofilms grown in the presence of the non-fluoridated disc Filtek showed a much less reduction in CFUs compared to the control biofilm cultures grown in the absence of the disc. Biodentine and Activa completely inhibited the growth of *S. salivarius* at both time points.

CONCLUSION

Fluoride-containing restorative materials tested against major cariogenic bacteria demonstrated marked reduction of biofilm formation and a concomitant downregulation of genes involved in exopolysaccharide (EPS) synthesis. The ability of these materials to inhibit biofilm formation may be due to the downregulation of genes critically involved in EPS synthesis and in maintaining biofilm architecture.

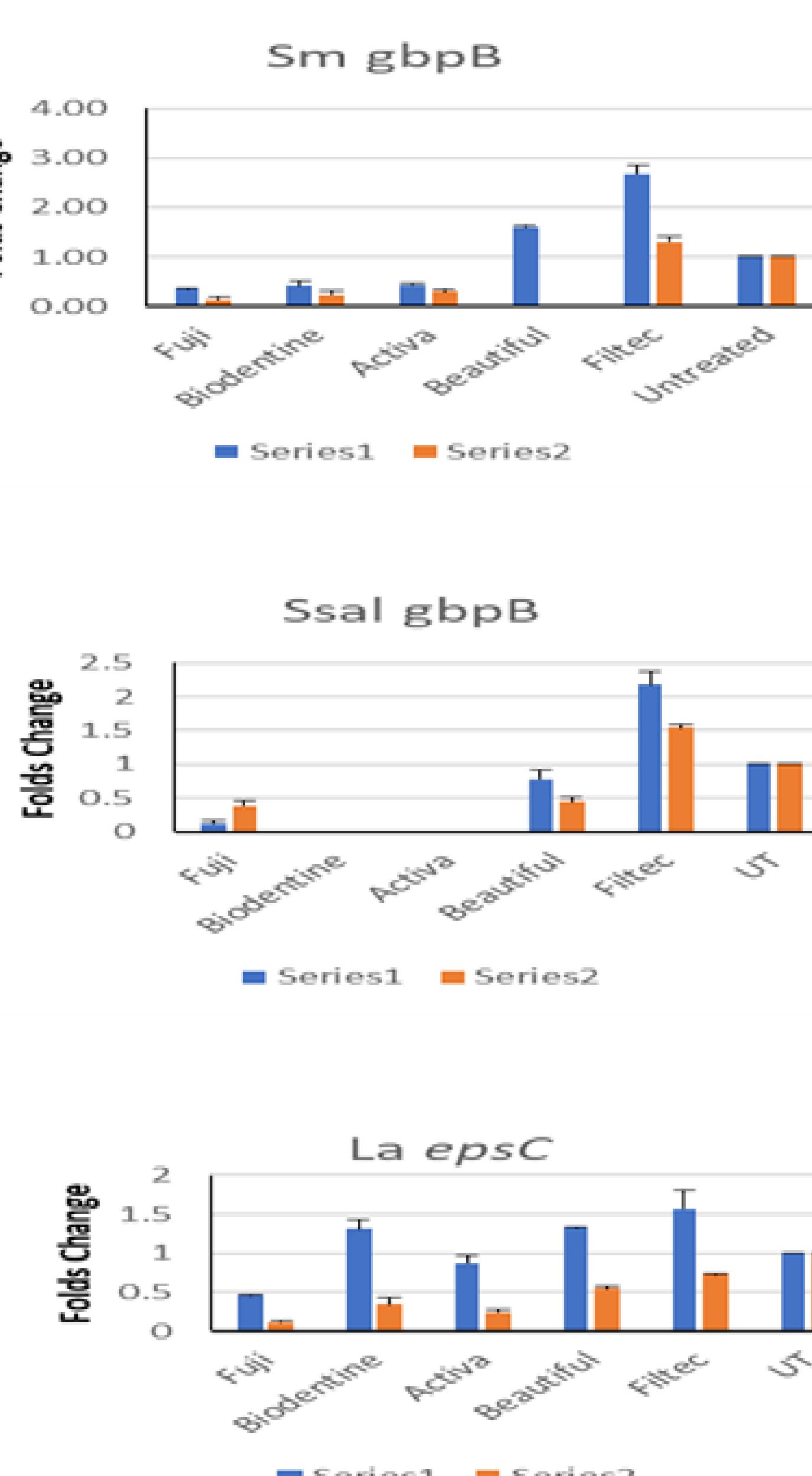
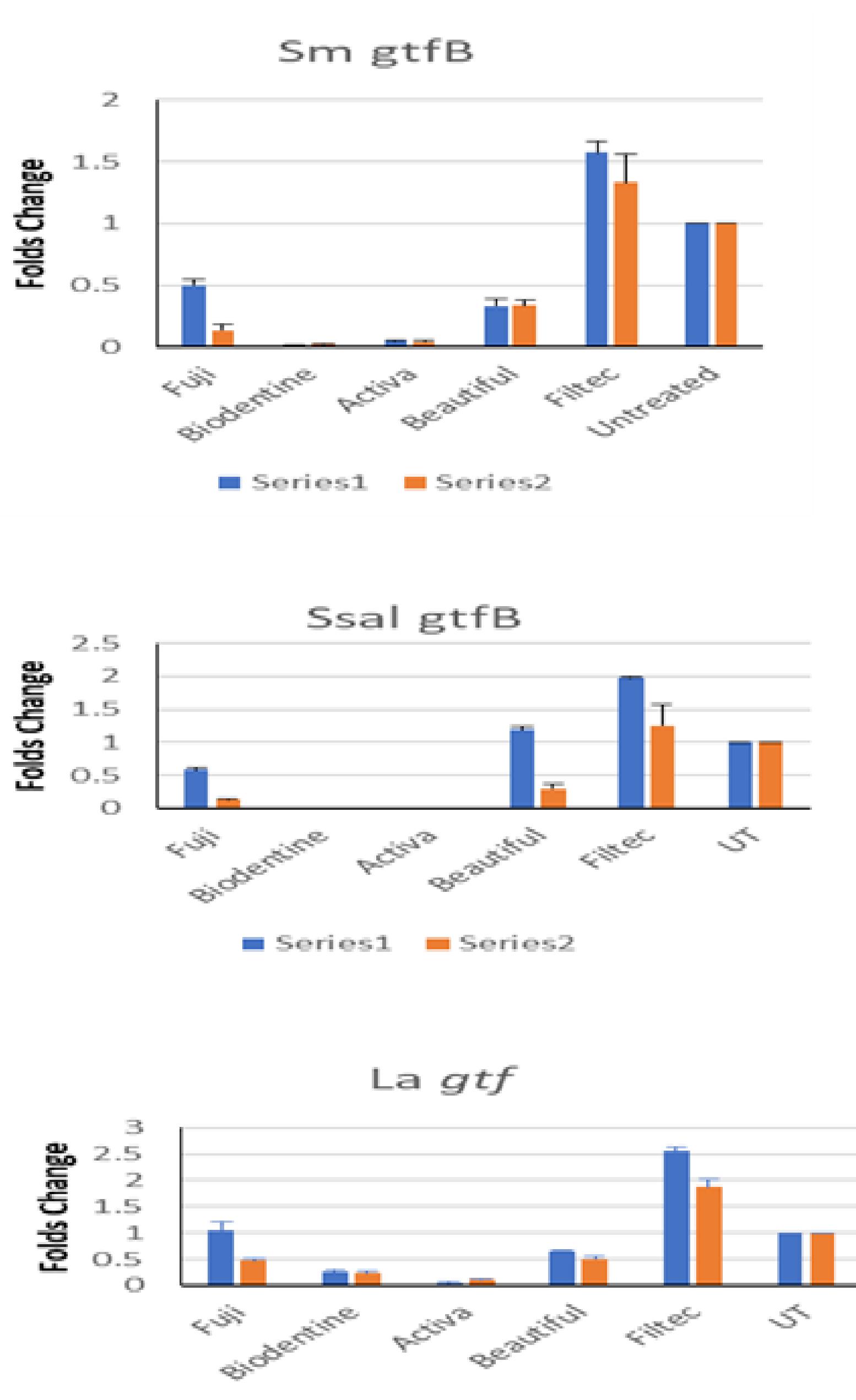


Figure mRNA expression of the biofilm-associated genes from oral bacterial biofilms grown in the presence of restorative materials.