

# Kapasitas penyangga material restoratif bioaktif dalam larutan pH kariogenik = Acid buffer capability of bioactive restorative materials in the cariogenic pH solution

Windy Almyra Hanyouri, author

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## Abstrak

Saliva di dalam rongga mulut merupakan agen perlindungan alami karena memiliki kapasitas penyangga yang mampu menetralkan asam yang dihasilkan oleh mikroorganisme asidogenik. Seiring dengan perkembangan material restoratif, beberapa material bioaktif baru dikembangkan yang memiliki kemampuan untuk bereaksi terhadap perubahan dalam lingkungan mulut, dengan melepaskan sejumlah ion kalsium, fosfat, hidroksil, dan fluor terutama dalam kondisi asam. Oleh karena itu, maka akan lebih menguntungkan jika material restoratif bioaktif memiliki karakteristik kapasitas penyangga seperti yang dimiliki oleh saliva. Hal ini dapat memicu remineralisasi gigi dan lingkungan sekitarnya, sehingga perkembangan karies akibat suasana asam dapat dikurangi. Tujuan penelitian ini dilakukan untuk mengetahui dan membandingkan kapasitas penyangga yang dimiliki oleh material restoratif bioaktif dalam larutan kariogenik (saliva buatan pH 4,7) selama 30 menit, 60 menit, 90 menit, 120 menit, dan 150 menit. Material restoratif bioaktif yang digunakan pada penelitian ini adalah Giomer, Activa (Activa Bioactive Restorative), Cention N (Alkasit Composite Resin), Fuji II LC (RMGIC), dan Zirconomer Improved. Penelitian eksperimental laboratorium menggunakan 30 spesimen yang terdiri dari 5 kelompok material restoratif bioaktif. Spesimen berbentuk lempeng dengan diameter 15 mm dan ketebalan 1 mm yang direndam dalam 10 ml saliva buatan (pH 4,7) kemudian disimpan dalam inkubator dengan suhu  $(37 \pm 1)^\circ\text{C}$ . Uji kapasitas penyangga menggunakan pH meter (Thermo Scientific Orion Star A211 Benchtop) untuk melihat perubahan nilai pH saliva buatan setiap 30 menit sampai 150 menit. Hasil penelitian menunjukkan adanya peningkatan nilai pH saliva buatan pada seluruh kelompok material seiring dengan waktu perendaman. Berdasarkan Uji One-Way ANOVA serta Post Hoc Bonferroni dan Tamhane, terdapat perbedaan bermakna antar kelima material restoratif bioaktif, seiring dengan waktu perendaman. Namun, hanya antara material Giomer dan Activa Bioactive tidak terdapat perbedaan bermakna. Berdasarkan hasil penelitian dapat disimpulkan bahwa material restoratif bioaktif, yaitu Giomer, Activa Bioactive, Cention N, Fuji II LC, dan Zirconomer Improved memiliki kapasitas penyangga yang dapat meningkatkan pH saliva buatan (pH 4,7) ke arah lebih netral dalam 150 menit perendaman.

.....Saliva in the oral cavity is a natural protective agent because it has a buffering capacity that is able to neutralize acids that produced by acidogenic microorganisms. Along with the development of restorative materials, several new bioactive materials were developed with the ability to react changes in the oral environment, by releasing a number of calcium, phosphate, hydroxyl and fluoride ions especially in acidic conditions. Therefore, it would be more advantageous if the bioactive restorative material had the buffer capacity characteristic as owned by saliva. This can induce remineralization of the teeth and the surrounding environment, so that the development of caries due to an acidic condition can be reduced. The aim of this research was to observe and compare the buffer capacity owned by bioactive restorative materials in cariogenic solutions (artificial saliva pH 4.7) during 30 minutes, 60 minutes, 90 minutes, 120 minutes, and 150 minutes. The bioactive restorative materials used in this study were Giomer, Activa (Activa Bioactive

Restorative), Cention N (Alcasite Composite Resin), Fuji II LC (RMGIC), and Improved Zirconomers. The experimental research laboratory used 30 specimens consisting of 5 groups of bioactive restorative materials. Disk-shaped specimens with a diameter of 15 mm and a thickness of 1 mm were immersed in 10 ml of artificial saliva (pH 4.7) and then stored in an incubator at a temperature of  $(37 \pm 1)^{\circ}\text{C}$ . Buffer capacity test was conducted using a pH meter (Thermo Scientific Orion Star A211 Benchtop) to see changes in the pH value of artificial saliva every 30 minutes until 150 minutes. The results showed an increase in the pH value of artificial saliva in all groups of materials along with the immersion time. Based on the One-Way ANOVA also Post Hoc Bonferroni and Tamhane tests, showed that there were significant differences between the five materials along with the immersion time. However, only between Giomer and Activa Bioactive material there were no significant differences. Based on the research results, it can be concluded that the bioactive restorative material, namely Giomer, Activa Bioactive, Cention N, Fuji II LC, and Improved Zirconomer have a buffering capacity that can increase the pH of artificial saliva (pH 4.7) towards a more neutral direction within 150 minutes of immersion