Potensi Nitrat Asal Beetroot terhadap Pertumbuhan Bakteri Rothia pada Biofilm In Vitro Asal Anak Stunting Usia 8-12 Tahun = The Potential of Beetroot-Derived Nitrate on the Growth of Rothia Bacteria on In Vitro Biofilm from Stunted Children Aged 8-12 Years

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Abstrak

Latar Belakang : Menurut data Survei Status Gizi Indonesia (SSGI) pada tahun 2022, angka balita yang mengalami stunting di Indonesia masih berada di angka 21,6%. Stunting dapat berpengaruh terhadap kesehatan umum serta status kebersihan rongga mulut. Status kebersihan rongga mulut suatu individu dapat diukur menggunakan Oral Hygiene Index Simplified (OHI-S). Salah satu hal yang mempengaruhi kesehatan rongga mulut adalah pola diet dan kapasitas mikroflora oral dalam mereduksi nitrat di dalam mulut. Dengan mengonsumsi makanan yang kaya akan nitrat seperti buah beetroot, dapat meningkatkan proses reduksi nitrat menjadi nitrit dan nitric oxide oleh bakteri seperti Veilonella dan Rothia. Proses ini meningkatkan kadar NO secara sistemik yang berperan dalam penurunan risiko penyakit kardiovaskular dan pencegahan penyakit mulut. Tujuan : Mengamati pengaruh status stunting, status OHI-S, dan kadar nitrat pada beetroot terhadap kadar keasaman (pH), kadar nitrit, dan viabilitas bakteri Rothia spp pada biofilm, serta mengetahui perbedaan potensi beetroot dalam pertumbuhan bakteri Rothia pada biofilm In vitro yang berasal dari kelompok stunting dan non-stunting dengan kebersihan rongga mulut yang berbeda sesuai dengan kriteria OHI-S. Metode : Penelitian ini menggunakan sampel usap lidah dari 20 subjek anak stunting dan non-stunting yang dikelompokkan menjadi 4 kelompok berdasarkan status stunting dan OHI-S, kemudian dilakukan uji biofilm dengan durasi inkubasi 5 dan 9 jam dalam keadaan aerofilik. Perhitungan kadar keasaman (pH) menggunakan kertas lakmus, uji griess digunakan untuk mengetahui kadar nitrit pada biofilm, dan uji Total Plate Count (TPC) untuk mengetahui viabilitas bakteri Rothia pada biofilm. Setiap kelompok sampel tersebut diberikan intervensi yang berbeda yaitu kadar nitrat pada beetroot sebesar 6,25 µM dan 3,25 µM. Uji statistik yang dilakukan adalah Uji Mann-Whitney U dan Uji Wilcoxon. Hasil : Tidak terdapat perbedaan bermakna pada kadar kesamaan (pH), kadar nitrit, dan viabilitas bakteri Rothia pada biofilm berdasarkan status stunting, status OHI-S, dan konsentrasi nitrat pada beetroot ($p>0.05$). Namun, terdapat tendensi peningkatan kadar nitrit dan viabilitas bakteri Rothia pada kelompok non-stunting, kelompok OHI-S baik, dan kelompok dengan intervensi nitrat pada beetroot sebesar 6,25 µM. Berdasarkan durasi inkubasi, tidak terdapat perbedaan bermakna pada kadar keasaman (pH), kadar nitrit, dan viabilitas bakteri Rothia pada biofilm. Hasil menunjukkan adanya tren peningkatan kadar nitrit pada durasi 5 jam namun menurun pada durasi 9 jam. Pada viabilitas bakteri Rothia, adanya tendensi peningkatan bakteri Rothia setelah inkubasi 9 jam dibanding 5 jam. Selain itu, terdapat perbedaan potensi nitrat pada Beetroot dalam pertumbuhan bakteri Rothia pada biofilm di setiap kelompok sampel. Berdasarkan hasil PCR konvensional, bakteri Rothia yang tumbuh pada medium adalah bakteri Rothia dentocariosa. Kesimpulan : Beetroot memiliki potensi dalam mengakselerasi pertumbuhan Rothia pada biofilm anak stunting dan non-stunting. Status stunting dan status OHI-S tidak memiliki pengaruh terhadap kadar pH, kadar nitrit, serta viabilitas bakteri Rothia pada biofilm. Peningkatan konsentrasi nitrat pada Beetroot sebagai variabel bahan uji tidak menyebabkan adanya perbedaan bermakna terhadap kadar pH, kadar nitrit, serta viabilitas bakteri

Rothia pada biofilm. Selain itu, peningkatan durasi inkubasi dari 5 ke 9 jam juga tidak menyebabkan adanya perbedaan pada kadar pH, kadar nitrit, serta viabilitas bakteri Rothia pada biofilm di setiap kelompok sampel.

.....Background: According to data from the Indonesian Nutritional Status Survey (SSGI) in 2022, the number of toddlers experiencing stunting in Indonesia is 21.6%. Stunting can affect general health and oral hygiene status. An individual's oral hygiene status can be measured using the Oral Hygiene Index Simplified (OHI-S). One of the things that affects oral health is diet and the capacity of oral microflora to reduce nitrate in the mouth. Consuming nitrate-rich fruit and vegetable such as beets can increase the process of reducing nitrate to nitrite and nitric oxide by bacteria such as Veilonella and Rothia. This process increases NO levels systemically which play a role in reducing the risk of cardiovascular disease and preventing oral diseases. Objective: To observe the effect of stunting status, OHI-S status, and nitrate levels in beetroot on acidity levels (pH), nitrite levels, and viability of Rothia bacteria in biofilms, and to observe the differences potential of beets in the growth of Rothia bacteria in biofilms from stunted and non-stunted groups with different oral hygiene according to the OHI-S criteria. Methods: This study used tongue swab samples from 20 stunted and non-stunted children collected into 4 groups based on stunting status and OHI-S, then biofilm tests were carried out with an incubation duration of 5 and 9 hours in aerobic conditions. The calculation of acidity levels (pH) using litmus paper, the griess test was used to determine the nitrite levels in the biofilm, and the Total Plate Count (TPC) test to determine the viability of Rothia bacteria in the biofilm. Each sample group was given a different intervention, namely the nitrate levels in beets of 6.25 µM and 3.25 µM. The statistical tests performed were the Mann-Whitney U Test and the Wilcoxon Test. Results: There was no significant difference in the similarity level (pH), nitrite level, and viability of Rothia bacteria in biofilms based on stunting status, OHI-S status, and nitrate concentration in beetroot ($p>0.05$). However, there was a tendency for an increase in nitrite levels and viability of Rothia bacteria in the non-stunting group, the good OHI-S group, and the group with nitrate intervention in beetroot of 6.25 µM. Based on the incubation duration, there was no significant difference in acidity levels (pH), nitrite levels, and viability of Rothia bacteria in biofilms. The results showed a trend of increasing nitrite levels at a duration of 5 hours but decreased at 9 hours. In the viability of Rothia bacteria, there was a tendency for an increase in Rothia bacteria after 9 hours of incubation compared to 5 hours. In addition, there was a difference in the potential of nitrate in beetroot in the growth of Rothia bacteria in biofilms in each sample group. Based on the results of conventional PCR, the Rothia bacteria that grew in the medium were Rothia dentocariosa. Conclusion: Beetroot has the potential to accelerate Rothia growth in biofilms of stunted and non-stunted children. Stunting status and OHI-S status have no effect on pH levels, nitrite levels, and viability of Rothia bacteria in biofilms. Increasing nitrate concentration in Beetroot as a variable did not cause any significant differences in pH levels, nitrite levels, and viability of Rothia bacteria in biofilms. In addition, increasing the incubation duration from 5 to 9 hours also did not cause any differences in pH levels, nitrite levels, and viability of Rothia bacteria in biofilms in each sample group.