

Data Fig. 3 A-C. Biofilm removal.

Colony forming units (single values, log₁₀) after one and 5 times biofilm formation (CON) and followed by instrumentation of the four different treatment methods (hand instrumentation (CUR), ultrasonication (US), erythritol air-polishing (EAP), and EAP with chlorhexidine digluconate (EAP-CHX)).

After one treatment

| Sample | Con | CUR | US | APE | APE-CHX |
|--------|------|------|------|------|---------|
| 1. | 5.98 | 4.43 | 2.60 | 4.20 | 0.00 |
| 2. | 5.92 | 5.97 | 3.23 | 2.30 | 4.16 |
| 3. | 5.54 | 5.61 | 3.00 | 3.00 | 2.00 |
| 4. | 4.42 | 2.48 | 0.00 | 2.30 | 2.00 |
| 5. | 6.17 | 3.91 | 2.00 | 2.95 | 2.30 |
| 6. | 5.87 | 0.00 | 2.00 | 2.95 | 0.00 |
| 7. | 6.25 | 4.96 | 3.04 | 4.55 | 0.00 |
| 8. | 5.34 | 4.63 | 3.68 | 4.13 | 0.00 |
| 9. | 6.96 | 5.00 | 4.00 | 3.59 | 0.00 |
| 10. | 6.96 | 3.63 | 2.00 | 2.30 | 4.10 |

After five treatments

| Sample | Con | CUR | US | APE | APE-CHX |
|--------|------|------|------|------|---------|
| 1. | 7.58 | 5.41 | 3.34 | 5.15 | 3.38 |
| 2. | 7.26 | 6.32 | 3.60 | 5.96 | 2.95 |
| 3. | 7.93 | 6.75 | 2.60 | 3.26 | 3.15 |
| 4. | 6.89 | 6.37 | 2.90 | 4.19 | 3.32 |
| 5. | 6.06 | 6.55 | 4.66 | 4.62 | 3.80 |
| 6. | 6.49 | 5.72 | 3.89 | 4.18 | 4.20 |
| 7. | 8.09 | 6.63 | 4.95 | 3.58 | 3.04 |
| 8. | 8.02 | 6.64 | 4.36 | 5.74 | 4.49 |
| 9. | 8.24 | 6.33 | 4.43 | 4.49 | 3.20 |
| 10. | 8.05 | 6.58 | 4.79 | 4.19 | 2.70 |
| 11. | 7.46 | 6.60 | 2.78 | 4.78 | 2.60 |
| 12. | 8.08 | 6.49 | 2.48 | 4.15 | 3.08 |

Data Fig. 4 A-C. Reformation of biofilm

Colony forming units (single values, log₁₀) after one and 5 times biofilm formation (CON) followed by instrumentation of the four different treatment methods (hand instrumentation (CUR), ultrasonication (US), erythritol air-polishing (EAP), and EAP with chlorhexidine digluconate (EAP-CHX). All treatment modalities were followed by an additional biofilm formation cycle).

After one treatment

| Sample | Con | CUR | US | APE | APE-CHX |
|--------|------|------|------|------|---------|
| 1. | 4.90 | 6.84 | 5.32 | 6.65 | 5.93 |
| 2. | 6.95 | 6.03 | 5.51 | 5.88 | 6.80 |
| 3. | 6.52 | 6.92 | 6.01 | 5.45 | 5.82 |
| 4. | 6.84 | 4.60 | 4.00 | 6.40 | 5.30 |
| 5. | 6.78 | 6.77 | 6.50 | 6.41 | 6.03 |
| 6. | 6.89 | 6.83 | 4.30 | 5.88 | 4.48 |
| 7. | 5.80 | 4.03 | 5.61 | 2.30 | 2.00 |
| 8. | | 5.45 | 4.21 | 4.85 | 3.00 |
| 9. | 6.08 | 5.72 | 6.20 | 5.08 | 4.09 |
| 10. | 6.34 | 5.34 | 6.16 | 6.24 | 5.93 |

After five treatments

| Sample | Con | CUR | US | APE | APE-CHX |
|--------|------|------|------|------|---------|
| 1. | 7.88 | 6.20 | 6.13 | 6.08 | 5.75 |
| 2. | 7.28 | 6.10 | 5.41 | 6.05 | 6.42 |
| 3. | 6.51 | 7.00 | 5.53 | 7.00 | 0.00 |
| 4. | 7.58 | 5.79 | 5.36 | 5.51 | 5.94 |
| 5. | 8.06 | 7.30 | 6.83 | 6.41 | 6.37 |
| 6. | 7.26 | 7.18 | 7.08 | 4.44 | 7.15 |
| 7. | 7.71 | 7.08 | 7.11 | 7.26 | 6.65 |
| 8. | 8.19 | 6.36 | 5.41 | 5.90 | 5.90 |
| 9. | 7.15 | 7.30 | 6.20 | 5.99 | 5.82 |
| 10. | 7.28 | 5.72 | 5.26 | 5.51 | 5.36 |

Data Fig. 5 A-D. Biofilm removal and recolonization of selected bacterial species.

Counts of selected bacterial species after biofilm removal and recolonization. Mean log₁₀ counts (\pm SD, n=10) after one and 5 times biofilm formation and followed by instrumentation of the four different treatment methods (hand instrumentation (CUR), ultrasonication (US), erythritol air-polishing (EAP), EAP with chlorhexidine digluconate (EAP-CHX), and an untreated control (con) as well as after an additional biofilm formation

Counts after one treatment

| | <i>P. gingivalis</i> | | <i>T. forsythia</i> | | <i>T. denticola</i> | | <i>A. actinom.</i> | |
|----------------|----------------------|------|---------------------|------|---------------------|------|--------------------|------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Con | 4.80 | 0.70 | 3.45 | 1.57 | 1.89 | 0.30 | 3.91 | 0.42 |
| CUR | 4.17 | 0.61 | 1.52 | 2.25 | 0.20 | 0.63 | 3.63 | 0.77 |
| US | 1.12 | 0.89 | 0.00 | 0.00 | 0.00 | 0.00 | 1.66 | 0.95 |
| APE | 2.25 | 1.27 | 0.00 | 0.00 | 0.00 | 0.00 | 2.15 | 0.99 |
| APE-CHX | 1.71 | 1.13 | 0.75 | 1.08 | 0.42 | 0.81 | 1.07 | 0.73 |

Recolonization after one treatment

| | <i>P. gingivalis</i> | | <i>T. forsythia</i> | | <i>T. denticola</i> | | <i>A. actinom.</i> | |
|----------------|----------------------|------|---------------------|------|---------------------|------|--------------------|------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Con | 4.87 | 1.26 | 3.84 | 1.62 | 2.65 | 1.04 | 4.16 | 1.00 |
| CUR | 5.15 | 0.57 | 3.74 | 2.20 | 2.07 | 1.22 | 4.25 | 0.53 |
| US | 4.99 | 0.80 | 3.41 | 1.85 | 2.51 | 0.84 | 3.92 | 0.39 |
| APE | 4.61 | 1.45 | 3.15 | 1.77 | 1.94 | 1.32 | 3.96 | 0.94 |
| APE-CHX | 3.95 | 1.33 | 3.00 | 1.84 | 2.06 | 1.28 | 2.97 | 1.23 |

Counts after removal after five treatments

| | <i>P. gingivalis</i> | | <i>T. forsythia</i> | | <i>T. denticola</i> | | <i>A. actinom.</i> | |
|----------------|----------------------|------|---------------------|------|---------------------|------|--------------------|------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Con | 5.11 | 0.49 | 5.18 | 0.43 | 3.64 | 1.17 | 4.58 | 0.53 |
| CUR | 4.48 | 0.49 | 1.91 | 1.82 | 1.28 | 1.31 | 4.22 | 0.29 |
| US | 1.94 | 1.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.94 | 1.07 |
| APE | 2.28 | 1.41 | 0.00 | 0.00 | 0.00 | 0.00 | 2.03 | 0.96 |
| APE-CHX | 1.32 | 1.23 | 0.00 | 0.00 | 0.00 | 0.00 | 1.24 | 0.99 |

Recolonization after five treatments

| | <i>P. gingivalis</i> | | <i>T. forsythia</i> | | <i>T. denticola</i> | | <i>A. actinom.</i> | |
|----------------|----------------------|------|---------------------|------|---------------------|------|--------------------|------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Con | 5.03 | 0.91 | 5.33 | 0.37 | 4.49 | 0.43 | 4.77 | 0.30 |
| CUR | 4.78 | 1.04 | 3.25 | 1.63 | 3.24 | 1.35 | 4.47 | 0.40 |
| US | 4.42 | 0.94 | 2.34 | 1.43 | 2.85 | 1.23 | 4.11 | 0.55 |
| APE | 4.54 | 0.83 | 1.71 | 2.17 | 2.73 | 1.92 | 4.30 | 0.42 |
| APE-CHX | 2.92 | 1.81 | 1.16 | 1.96 | 0.94 | 1.52 | 3.78 | 0.69 |

Data Fig. 6 A+B. Tooth hard-substance-loss by different treatment methods.

Thickness difference (μm) before and after one and 5 times instrumentation of the dentin specimens using four treatment methods (hand instrumentation (CUR), ultrasonication (US), (erythritol air-polishing (EAP), EAP with chlorhexidine digluconate (EAP-CHX)), and an untreated control (con).

After one treatment

| Sample | Con | CUR | US | APE | APE-CHX |
|--------|------|------|------|------|---------|
| 1. | -10. | -24. | -2. | -4. | 2. |
| 2. | -28. | -46. | -18. | -6. | -10. |
| 3. | -26. | -28. | 4. | -10. | -30. |
| 4. | 2. | -14. | -20. | -2. | -10. |
| 5. | -6. | -50. | -40. | 2. | -6. |
| 6. | 6. | -4. | -8. | -2. | 6. |
| 7. | 18. | 8. | 6. | -2. | -16. |
| 8. | 0. | -22. | 4. | 2. | -8. |
| 9. | -8. | -4. | -8. | 10. | 14. |
| 10. | -6. | 6. | 0. | 6. | 4. |
| 11. | 0. | 0. | -10. | -2. | 8. |
| 12. | -6. | -18. | 0. | -2. | -14. |
| 13. | -6. | -14. | -16. | -20. | -14. |
| 14. | -18. | -20. | -6. | -2. | 4. |
| 15. | -2. | -32. | -12. | -20. | 4. |
| 16. | 6. | -82. | 4. | 6. | -2. |
| 17. | -4. | 0. | -12. | -6. | -38. |
| 18. | -14. | 8. | -8. | -2. | 0. |
| 19. | 4. | -32. | -6. | -14. | -30. |
| 20. | -22. | -24. | 6. | -24. | -6. |
| 21. | | -34. | -14. | -8. | |
| 22. | | -24. | -12. | 0. | |

After five treatments

| Sample | Con | CUR | US | APE | APE-CHX |
|---------------|------------|------------|-----------|------------|----------------|
| 1. | -10. | -90. | -22. | -16. | -24. |
| 2. | -14. | -98. | -8. | 4. | -22. |
| 3. | -16. | -132. | -12. | -10. | -12. |
| 4. | 0. | -78. | 2. | -2. | 0. |
| 5. | 8. | -88. | -8. | 0. | 0. |
| 6. | -8. | -112. | -10. | -2. | -2. |
| 7. | -4. | -178. | -2. | 0. | -2. |
| 8. | -6. | -184. | -12. | -2. | -12. |
| 9. | -26. | -158. | -34. | -20. | -20. |
| 10. | -14. | -134. | -6. | -4. | -22. |
| 11. | 8. | -128. | -2. | -18. | -14. |
| 12. | -10. | -130. | -24. | -4. | -8. |
| 13. | -4. | -56. | -20. | -12. | -2. |
| 14. | -2. | -222. | -10. | -4. | 6. |
| 15. | -8. | -124. | -46. | 0. | -16. |
| 16. | 2. | -140. | -24. | -6. | -26. |
| 17. | -4. | -136. | -16. | -12. | -4. |
| 18. | | -110. | -6. | -4. | -18. |

Data Fig. 7 A-D. Tooth surface roughness.

Average surface roughness Ra and the arithmetic mean height of the surface profile Rz (μm) after one and 5 times instrumentation of the dentin specimens using four treatment methods (hand instrumentation (CUR), ultrasonication (US), (erythritol air-polishing (EAP), EAP with chlorhexidine digluconate (EAP-CHX)), and an untreated control (con).

Ra after one treatment

| Sample | Con | CUR | US | APE | APE-CHX |
|--------|------|------|------|------|---------|
| 1. | 0.24 | 0.20 | 0.15 | 0.22 | 0.18 |
| 2. | 0.26 | 0.49 | 0.19 | 0.21 | 0.20 |
| 3. | 0.18 | 0.30 | 0.18 | 0.31 | 0.20 |
| 4. | 0.31 | 0.40 | 0.21 | 0.34 | 0.31 |
| 5. | 0.29 | 0.34 | 0.32 | 0.40 | 0.33 |
| 6. | 0.43 | 0.29 | 0.38 | 0.42 | 0.35 |
| 7. | 0.13 | 0.21 | 0.15 | 0.31 | 0.18 |
| 8. | 0.20 | 0.29 | 0.16 | 0.30 | 0.19 |
| 9. | 0.15 | 0.22 | 0.19 | 0.21 | 0.19 |
| 10. | 0.18 | 0.20 | 0.12 | 0.35 | 0.18 |
| 11. | 0.24 | 0.25 | 0.29 | 0.39 | 0.22 |
| 12. | 0.20 | 0.43 | 0.31 | 0.40 | 0.23 |
| 13. | 0.20 | 0.27 | 0.14 | 0.16 | 0.17 |
| 14. | 0.20 | 0.29 | 0.18 | 0.18 | 0.29 |
| 15. | 0.49 | 0.64 | 0.14 | 0.17 | 0.34 |
| 16. | 0.41 | 0.28 | 0.25 | 0.30 | 0.43 |
| 17. | 0.41 | 0.45 | 0.26 | 0.30 | 0.19 |
| 18. | 0.29 | 0.38 | 0.20 | 0.30 | 0.15 |
| 19. | 0.17 | 0.21 | 0.15 | 0.21 | 0.20 |
| 20. | 0.14 | 0.33 | 0.19 | 0.18 | 0.15 |
| 21. | | 0.26 | 0.18 | 0.16 | |
| 22. | | 0.29 | 0.19 | 0.14 | |

Rz after one treatment

| Sample | Con | CUR | US | APE | APE-CHX |
|---------------|------------|------------|-----------|------------|----------------|
| 1. | 1.53 | 1.22 | 0.98 | 1.32 | 1.22 |
| 2. | 1.83 | 2.81 | 1.32 | 1.35 | 1.32 |
| 3. | 1.19 | 1.66 | 1.21 | 2.06 | 1.35 |
| 4. | 1.93 | 2.31 | 1.36 | 2.16 | 1.99 |
| 5. | 1.84 | 2.04 | 1.95 | 2.38 | 2.14 |
| 6. | 2.61 | 2.00 | 2.45 | 2.62 | 2.15 |
| 7. | 0.87 | 1.34 | 1.05 | 1.98 | 1.31 |
| 8. | 1.33 | 1.86 | 1.08 | 1.90 | 1.30 |
| 9. | 1.06 | 1.32 | 1.25 | 1.54 | 1.25 |
| 10. | 1.26 | 1.31 | 0.85 | 2.12 | 1.28 |
| 11. | 1.56 | 1.57 | 1.86 | 2.35 | 1.40 |
| 12. | 1.25 | 2.42 | 1.98 | 2.40 | 1.36 |
| 13. | 1.36 | 1.33 | 0.76 | 1.11 | 1.20 |
| 14. | 1.29 | 1.94 | 1.15 | 1.13 | 1.82 |
| 15. | 3.12 | 2.98 | 0.94 | 1.23 | 2.12 |
| 16. | 2.58 | 1.74 | 1.46 | 1.88 | 2.68 |
| 17. | 2.47 | 2.49 | 1.47 | 1.87 | 1.25 |
| 18. | 1.76 | 2.26 | 1.18 | 1.82 | 0.99 |
| 19. | 1.09 | 1.41 | 1.05 | 1.35 | 1.25 |
| 20. | 0.98 | 1.89 | 1.27 | 1.18 | 1.09 |
| 21. | | 1.73 | 1.19 | 1.14 | |
| 22. | | 1.78 | 1.23 | 1.05 | |

Ra after five treatment

| Sample | Con | CUR | US | APE | APE-CHX |
|---------------|------------|------------|-----------|------------|----------------|
| 19. | 0.26 | 0.58 | 0.18 | 0.32 | 0.32 |
| 20. | 0.29 | 1.38 | 0.28 | 0.36 | 0.41 |
| 21. | 0.35 | 0.50 | 0.65 | 0.30 | 0.27 |
| 22. | 0.29 | 0.21 | 0.17 | 0.32 | 0.32 |
| 23. | 0.35 | 0.28 | 0.21 | 0.33 | 0.30 |
| 24. | 0.28 | 0.23 | 0.83 | 0.23 | 0.44 |
| 25. | 0.33 | 0.29 | 0.39 | 0.31 | 0.31 |
| 26. | 0.30 | 0.27 | 0.20 | 0.27 | 0.30 |
| 27. | 0.35 | 0.22 | 0.69 | 0.29 | 0.31 |
| 28. | 0.32 | 0.35 | 0.34 | 0.27 | 0.27 |
| 29. | 0.18 | 0.21 | 0.23 | 0.22 | 0.21 |
| 30. | 0.15 | 0.23 | 0.38 | 0.15 | 0.23 |
| 31. | 0.32 | 0.27 | 0.21 | 0.35 | 0.32 |
| 32. | 0.29 | 0.89 | 0.65 | 0.29 | 0.38 |
| 33. | 0.30 | 0.24 | 0.89 | 0.45 | 0.31 |
| 34. | 0.33 | 0.33 | 0.39 | 0.22 | 0.24 |
| 35. | 0.24 | 0.17 | 0.36 | 0.27 | 0.34 |
| 36. | 0.17 | 0.43 | 0.29 | 0.40 | 0.27 |

Rz after five treatments

| Sample | Con | CUR | US | APE | APE-CHX |
|---------------|------------|------------|-----------|------------|----------------|
| 1. | 1.63 | 3.48 | 1.32 | 2.02 | 2.08 |
| 2. | 1.85 | 6.81 | 1.73 | 2.46 | 2.55 |
| 3. | 1.97 | 3.25 | 3.27 | 1.89 | 1.72 |
| 4. | 1.76 | 1.28 | 1.18 | 1.97 | 1.98 |
| 5. | 2.07 | 1.65 | 1.49 | 2.05 | 2.01 |
| 6. | 1.86 | 1.50 | 4.12 | 1.47 | 2.86 |
| 7. | 1.97 | 1.72 | 2.21 | 2.02 | 2.02 |
| 8. | 1.88 | 1.35 | 1.34 | 1.79 | 1.66 |
| 9. | 2.22 | 1.27 | 3.72 | 1.95 | 1.84 |
| 10. | 1.91 | 1.98 | 1.86 | 1.69 | 1.73 |
| 11. | 1.20 | 1.32 | 1.38 | 1.48 | 1.18 |
| 12. | 1.02 | 1.43 | 1.96 | 0.95 | 1.36 |
| 13. | 2.05 | 1.68 | 1.38 | 2.24 | 1.95 |
| 14. | 1.78 | 4.99 | 3.35 | 1.81 | 2.88 |
| 15. | 1.92 | 1.52 | 4.22 | 2.59 | 2.00 |
| 16. | 2.11 | 1.74 | 2.30 | 1.44 | 1.57 |
| 17. | 1.50 | 1.06 | 2.07 | 1.81 | 2.07 |
| 18. | 1.14 | 3.21 | 1.71 | 3.39 | 1.55 |

Data Fig. 8 A-C. Attachment of periodontal ligament (PDL) fibroblasts after one treatment. Mean attached PDL fibroblasts, release of IL-8 and SEM photographs after one biofilm formation and one instrumentation of the dentin specimens using four treatment methods (hand instrumentation (CUR), ultrasonication (US), (erythritol air-polishing (EAP), EAP with chlorhexidine digluconate (EAP-CHX)), and an untreated control (con). IL-8 was measured in media after 40 h incubation.

| | Counts/mm ² | | IL-8 | |
|----------------|------------------------|--------|--------|--------|
| | Mean | SD | Mean | SD |
| Con | 342.67 | 453.07 | 582.48 | 375.19 |
| CUR | 1024.00 | 416.26 | 549.03 | 372.13 |
| US | 1869.17 | 538.85 | 229.68 | 239.29 |
| APE | 1346.67 | 455.5 | 165.37 | 150.91 |
| APE-CHX | 1369.17 | 905.1 | 208.03 | 188.09 |

Data Fig. 9 A-C. Attachment of periodontal ligament (PDL) fibroblasts after five treatments.

Mean attached PDL fibroblasts, release of IL-8 after five biofilm formations, five instrumentations of the dentin specimens using four treatment methods (hand instrumentation (CUR), ultrasonication (US), (erythritol air-polishing (EAP), EAP with chlorhexidine digluconate (EAP-CHX)), and an untreated control (con) and a complete biofilm removal. IL-8 was measured in media after 40 h incubation.

| | Counts/mm ² | | IL-8 | |
|----------------|------------------------|--------|-------|-------|
| | Mean | SD | Mean | SD |
| Con | 784.17 | 195.2 | 21.59 | 17.44 |
| CUR | 553.67 | 139.99 | 41.08 | 51.57 |
| US | 889.00 | 223.66 | 43.65 | 12.88 |
| APE | 874.33 | 143.74 | 45.32 | 15.01 |
| APE-CHX | 727.67 | 357.74 | 9.82 | 2.21 |