



Monarch Lines Cleaner Study

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Objectives:

To investigate the ability of the **Monarch Lines Cleaner** to remove microorganisms from dental waterlines in outpatient practices.

Experimental Design:

Materials and Methods:

Water samples were aseptically taken from five self-contained bottle systems in two dental practices, in order to assess bacterial levels prior to treatment with **Monarch Lines Cleaner**. It must be noted here that both practices had previously used waterline maintenance tablets; they stopped adding them to water bottles at the start of the current study. Collected specimens were initially diluted 1/10 and 1/100 using sterile water, followed by filtration through a 0.45 micron membrane. Bacterial concentrations for resultant preparations were determined by plating the 1 mL loaded membrane onto R2A media and incubating for 7 days at 25°C. Microbial growth was visually analyzed and the colonies counted, with bacterial concentrations calculated as colony forming units (cfu). Following this baseline procedure, dental waterlines were treated with **Monarch Lines Cleaner (Air Techniques)** following manufacturer's instructions. First, water was purged from all lines and self-contained reservoir bottles. Afterwards, 60-100 mL of **Monarch Lines Cleaner** was added to the self-contained unit bottles and flushed through the lines to coat the walls of the tubing. The chlorhexidine/alcohol-containing solution was allowed to remain in the lines overnight. It was removed the next morning by flushing the system with water. These "shock" overnight treatments occurred after every workday for three weeks. Following this initial interval, the waterlines were exposed to the **Monarch Lines Cleaner** once a week for the remaining three months of the investigation. Samples of treated water were collected weekly and processed in the same manner as described above to determine concentrations of waterborne bacteria.

Results:

Culture data obtained from baseline water samples showed a wide range of initial microbial contamination in the self-contained waterline systems. Demonstrable bacterial concentrations ranged from 3–15,500 cfu/mL (Table 1). However, within one week after the first shock treatment with **Monarch Lines Cleaner**, the decrease in bacterial levels for those dental units with high initial levels were found to be dramatic. Collected samples met or were less than the <500 cfu/mL dental waterline microbial level recommended by the CDC. These acceptable microbial levels were maintained throughout the three-month investigation period.

Table 1. Microbial concentrations of self-contained waterline systems before and after treatment with **Monarch Lines Cleaner** (cfu/mL).

	Initial	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Unit 1	190	8	1	0	1	37	0	4	1	0	0	0	0
Unit 2	15,500	1	0	0	0	89	2	0	294	514	0	0	0
Unit 3	2630	2	2	278	59	28	0	0	0	0	0	0	0
Unit 4	3	0	0	148	80	18	190	445	2	0	0	0	0
Unit 5	192	188	93	223	67	114	1	11	386	442	14	0	0

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Discussion and Summary:

For this investigation, a chlorhexidine and ethanol-containing solution (**Monarch Lines Cleaner**) was used to reduce and maintain bacterial levels in dental units with self-contained water bottles for a period of three months. While initial microbial levels varied between dental units, in the end, bacterial concentrations met or were below the 500 cfu/mL level recommended by the CDC. This level was observed as early as the first week of treatment (Figures 1 and 2). Dental personnel in the offices also reported that they and their patients had positive comments regarding the mint-flavored water during the investigation. It is also important to note at the end of the study period, both practices converted from the use of tablets to the **Monarch Lines Cleaner** for their routine waterline infection control protocol.

Figure 1. Culture of 1/10 dilution of water from unit #2 prior to treatment with **Monarch Lines Cleaner**.

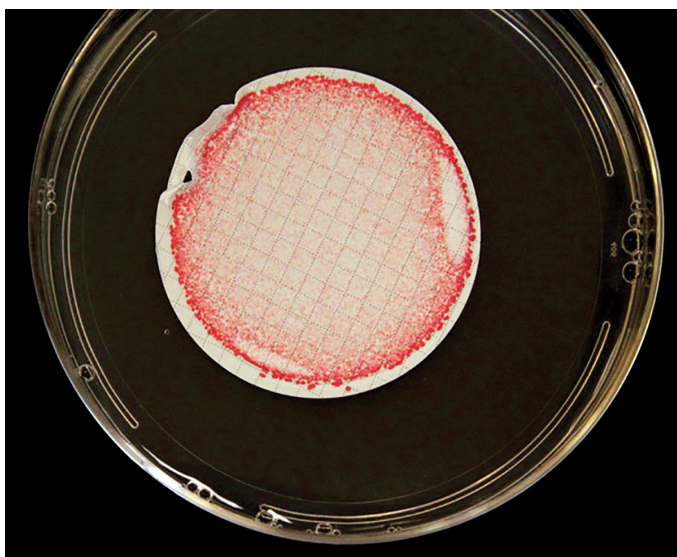
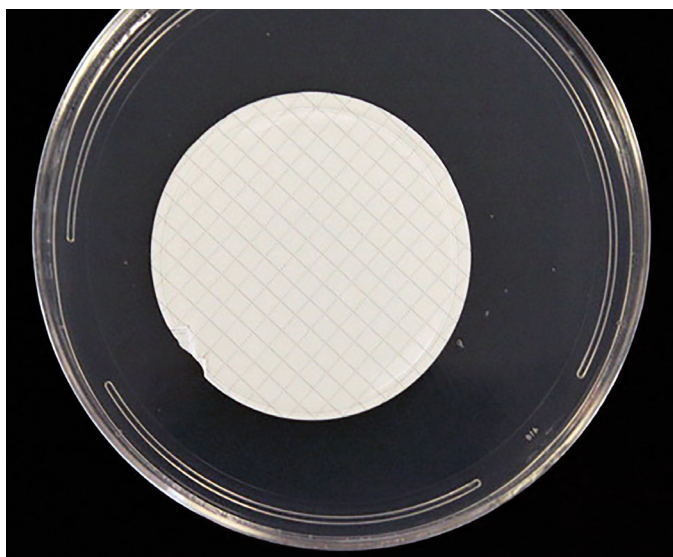


Figure 2. Culture of undiluted water sample from unit #2 after treatment with **Monarch Lines Cleaner**. Note: no microbial colonies are discernable.



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