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NUMBER 29 -JUNE 2010

Microbial Contamination of Patient Napkin Holders

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Purpose – The primary purpose of this study was to evaluate the presence and composition of bacterial contaminants on patient napkin holders (i.e. bib chains) before and after patient care appointments. Experiments were also performed to investigate the effectiveness of cleaning procedures on reusable bib chains.

Materials and Methods – Two types of bib chains were utilized: metal napkin holders with clips and coiled plastic holders with metal clips. Routine bacteriological culturing of experimental and control chains was performed by initially placing each specimen in 10 mL of sterile tryptic soy broth (TSB) for 30 seconds, followed by 15 second agitation using a vortex mixer (Fisher Scientific). This procedure was intended to remove and collect contaminant bacteria from the chains and suspend them in the TSB for subsequent culture. In this manner, a more accurate determination of the actual number of viable bacteria adherent onto the chains could be made. Following this, 1.0 mL of each exposed broth preparation was cultured in duplicate on tryptic soy agar plates containing 5% sheep blood, and incubated aerobically for 24-48 hours at 37C. Microbial growth was assessed visually and colony counts determined. All culture procedures were performed within 2 hours of sample collection.

Controls and Study Groups: New metal and plastic napkin holders taken from the manufacturer's packaging served as controls in order to provide baseline bacterial data (Group A). Metal and plastic bib chains assayed after use during patient care were divided into 2 other experimental groups. Chains in one group were wiped with an intermediate-level, environmental surface disinfectant towelette after each patient appointment (Group B). The number of patients treated using each chain was recorded and used to assess the effectiveness of periodically cleaning them during the practice day. The third group utilized bib chains that were re-used without being wiped after each treatment appointment (Group C). The number of uses for each of these napkin holders also was noted.

Results – As expected, control, unused metal and plastic napkin holders in Group A were found to harbor very few contaminant bacteria (Table 1). When representative colonies were Gram-stained and viewed under the microscope, the predominant forms were gram-positive cocci in irregular clusters. Both the white, smooth, circular appearance of the colonies and the microscopic observations suggested that these pre-dominant demonstrable bacteria were staphylococci. Staphylococcus spp. are among the most common, adaptable environmental bacterial forms and are routinely found on virtually all inanimate surfaces.

Metal and coiled plastic napkin holders in Group B that were quickly wiped between use on patients with an EPA-approved, intermediate level disinfectant showed more bacterial contamination compared to unused controls. While the mean bacterial levels for the "cleaned" bib chains were not high, a range of colony counts was noted for bib chains assayed after use on two - four patients. Some samples even failed to yield any growth. Of additional interest, culture of re-used and wiped plastic napkin holders yielded a mean colony count that was almost two times greater than that

found for the metal chains (41.3 vs. 21.9 cfu/mL). This increased microbial load may have occurred because of the more complex, coiled structure of the former type of napkin holder. Thorough cleaning of this type of chain could require a greater effort on the part of dental personnel in order to reach less accessible areas. For the present study, personnel were asked to only perform a quick wiping motion over the chain with the moist towelette.

The highest levels of bacterial contamination were found on metal and plastic napkin holders in Group C, sampled after use on multiple patients without cleaning between treatment appointments. Observation of bacterial colony morphologies, color, hemolytic reactions on typticase agar with 5%sheep blood, and microscopic viewing of representative gram stained colonies indicated that the overwhelming majority of organisms appeared to be gram-positive cocci in clusters or chains, and gram-positive rods. When these factors were considered together, it suggested that most of the isolated bacteria were environmental bacteria, and/or components of the skin or oral cavity. Contamination of chains could have occurred by a few different mechanisms: 1) prolonged contact of the bib chain with the patient's neck, thereby contacting normal epithelial bacterial flora; 2) exposure of the chain to microbe-containing aerosols and spatter generated during treatment, and 3) handling of the napkin holders with gloves contaminated during patient care.

Table 1: Bacterial growth represented as mean colony forming units (CFU) mL

	Number Tested	Mean CFU/mL (range)
Group A		
Metal Bib Chains	5	0.6 (0 - 2)
Plastic Bib Chains	5	2.5 (0 - 5)
Group B		
Metal Chains	10	21.9 (3 - 38)
Plastic Chains	10	41.3 (0 - 95)
Group C		
Metal Chains	10	283.2 (7 - >1500))
Plastic Chains	10	523.1 (37 - >1500)

Conclusions – Microbial contamination was found on both metal and coiled plastic napkin holders after use during patient care. The highest concentrations of isolated bacteria were observed on bib chains where a cleaning procedure was not performed between patient uses. Although cleaning chains with a disinfectant wipe between patient appointments lessened the microbial load, resultant bacterial levels were still higher than those noted for new unused patient napkin holders.

Figure 1:
Bacterial growth from unused metal patient napkin holder

Figure 2:
Bacterial growth from unused plastic patient napkin holder

Figure 3:
Bacterial contamination found on a metal napkin holder that was used on 3 patients and wiped with a disinfectant towelette between each use.

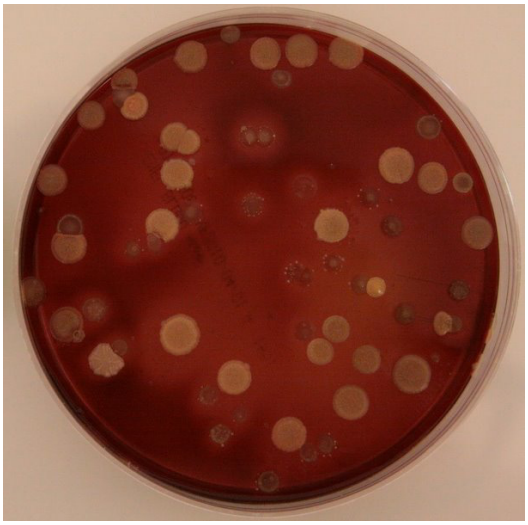

Figure 4:
Bacterial contamination found on a plastic napkin holder that was used on 4 patients and wiped with a disinfectant towelette between each use.

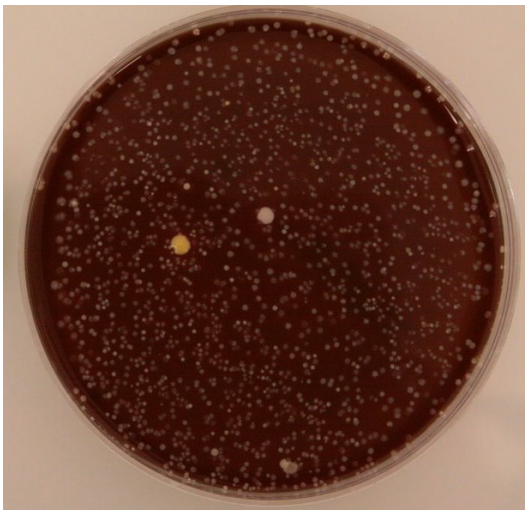

Figure 5:
Bacterial contamination isolated from a metal napkin holder, which was reused on 8 patients without any cleaning procedure between uses.

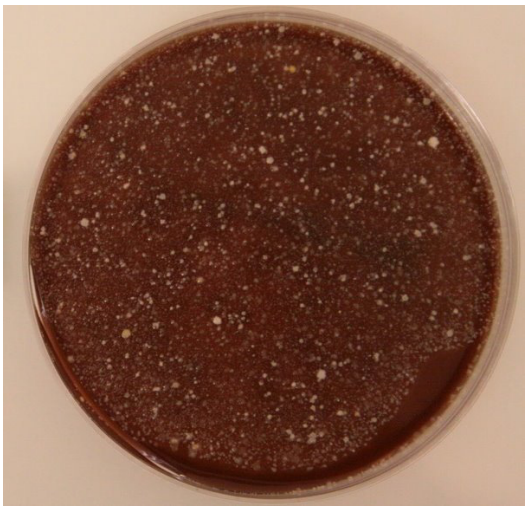

Figure 6:
Confluent microbial growth from a plastic bib chain used on 8 patients without any cleaning procedures performed