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Radiographic Marker Adhesives and Their Potential to Transmit Diseases

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Abstract

Research has suggested that image receptors are one of the biggest carriers of microbial agents in radiology departments. During each exam, radiographers use anatomical side markers in conjunction with some type of adhesive, and these items come in contact with patients, image receptors, and other surfaces. This study sought to research if the adhesives used on anatomical side markers carried microbial agents as well as determine if one type of adhesive was any better at staying microbial free than another. The three types of adhesives tested were adhesive tape, adhesive strips, and adhesive putty. A three-person team collected a total of fourteen samples from fourteen different technologists, with samples being collected at three different hospitals. The technologists participating in the study were instructed to not clean or replace their markers or adhesives for a week. After a week, a two-centimeter by two-centimeter area on the adhesive of the left markers was swabbed. The swabs were cultured and left in an incubator for 48 hours before the colonies were assessed and counted. The surgical tape performed the best and the adhesive putty performed the worst in regard to harboring the most bacterial agents. Surgical tape appears to be the most sanitary choice of adhesive, however cleaning or replacing adhesive should be a practice carried out more frequently than once a week.

RADIOGRAPHIC MARKER ADHESIVES AND THEIR POTENTIAL TO TRANSMIT DISEASES

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ABSTRACT

Research has suggested that image receptors are one of the biggest carriers of microbial agents. Anatomical side markers are used in conjunction with some type of adhesive and come in contact with all kinds of surfaces as well as image receptors. This study sought to research if the adhesives used carried microbial agents and determine if one type of adhesive was any better at staying microbial free than another. The three types of adhesives tested were adhesive tape, adhesive strips, and adhesive putty. A three-person team collected a total of fourteen samples from three separate hospitals. The technologists participating in the study were instructed to not clean or replace their adhesive for a week. After a week, a two-centimeter by two-centimeter area was swabbed on the adhesive of the left markers belonging to a total of fourteen technologists. The swabs were cultured and left in an incubator for 48 hours before the colonies were accessed. The surgical tape performed the best and the adhesive putty performed the worst in regard to harboring the most bacterial agents. Surgical tape appears to be the most sanitary choice of adhesive, however cleaning or replacing adhesive should be a practice carried out more frequently than once a week.

Examples of the types of adhesives tested can be seen below:



MATERIALS & METHODOLOGY

This study was conducted in the radiology departments of three separate small hospitals, named "hospital A," "hospital B," and "hospital C." Eleven radiologic technologists and three student technologists participated in the study. Each participant gave consent before any data was collected. The University biology department supplied the student technologists with a total of forty-five petri dishes and fifteen swabs for the sample collection portion of the study. Out of the forty-five petri dishes, fifteen contained tryptic soy agar (TSA), fifteen contained phenyl alcohol agar (PEA), and the last fifteen contained MacConkey agar. TSA is a growth medium that helps cultivate a variety of bacteria, PEA agar cultivates gram-positive organisms such as Staphylococcus aureus, and MacConkey agar cultivates gram-negative organisms like Salmonella or Escherichia coli.

In preparation for this study, each student at the three hospitals asked the participating technologists to sanitize their left radiographic marker exactly one week before the swabs were taken. This was done to ensure consistency between the radiographic markers in each location. Then one week later, the swabbing process was started. In total, five markers with adhesive strips, five markers with tape, and four markers with putty were swabbed. During the process, the student technologists put on clean gloves to avoid further contaminating the markers. The sterile swabs were opened and rolled over a two-by-two-centimeter portion in the center of the adhesive on the left radiographic marker. Then, the swab was rolled in a zig-zag motion over the agar in the TSA petri dish, followed by the PEA dish and lastly the MacConkey dish. The swab was then disposed of and the petri dishes were labeled clearly to identify the type of adhesive on the marker and the hospital in which the marker was used. This process was repeated with each remaining radiographic marker until five markers with adhesive strips, five markers with tape, and four markers with putty were tested. Due to a lack of access to markers with putty, only four could be tested.

RESULTS

Based on the data, the putty was the most contaminated adhesive, and the tape was the least contaminated. Each adhesive swab resulted in the growth of the most bacterial colonies in the TSA and PEA agars, meaning there was a high presence of gram-positive bacteria present on the radiographic markers. Only four total samples grew bacterial colonies on the MacConkey agar, meaning that there was only a small presence of gram-negative bacteria present on the radiographic markers as a whole.

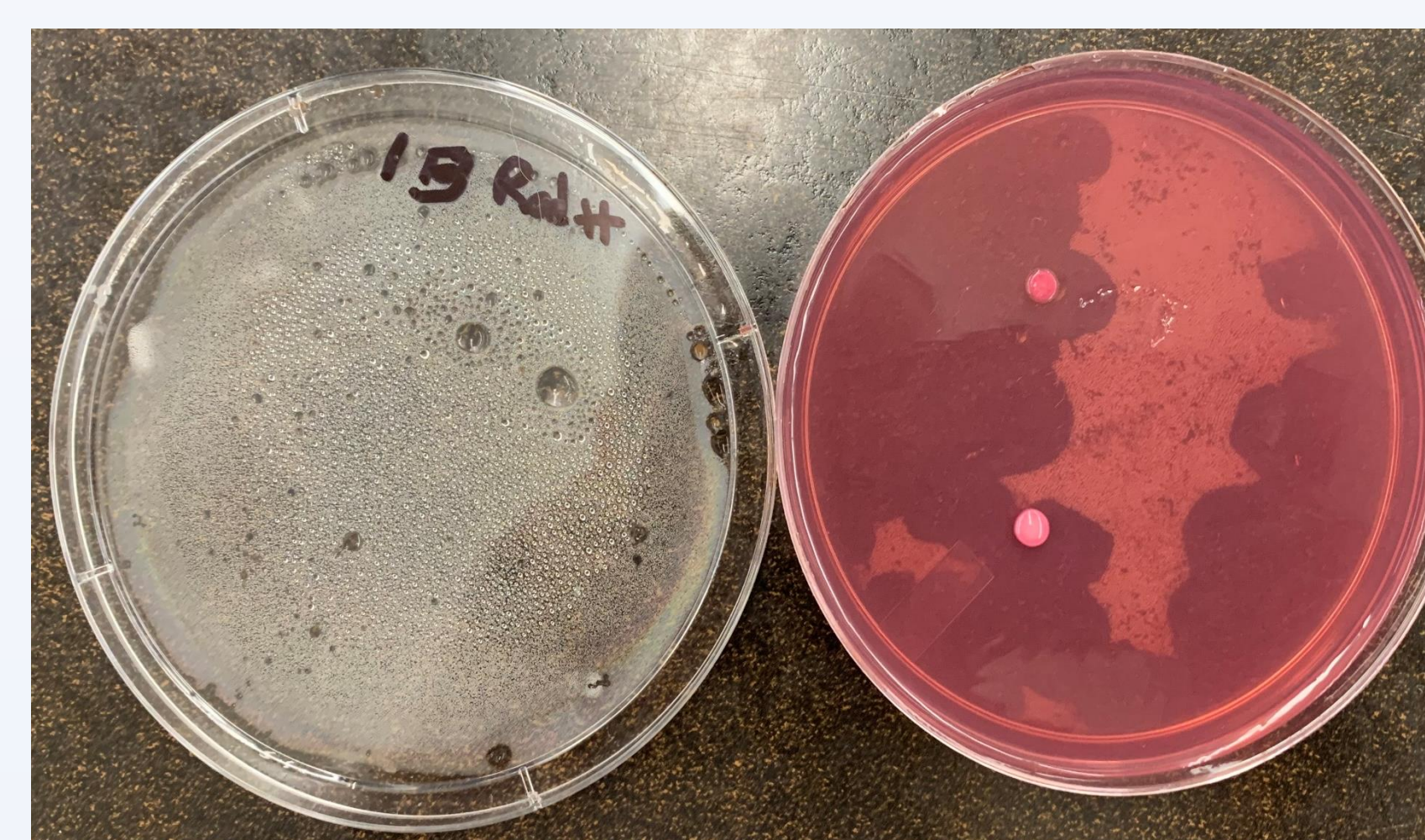
Number of Bacterial Colonies per Adhesive Type

Samples	TSA	MacConkey	PEA
A1 Putty	140	0	13
A2 Putty	95	0	21
A3 Radhesive	64	0	62
A4 Putty	TNT	0	TNTC
A5 Putty	141	0	98
B1 Radhesive	196	2	283
B2 Tape	15	1	1
B3 Tape	27	0	2
B4 Tape	140	0	21
B5 Tape	29	1	1
C1 Tape	3	1	4
C2 Radhesive	0	0	0
C3 Radhesive	66	0	20
C4 Radhesive	2	0	1

Sample A4, TSA agar, colonies too numerous to count



Sample B1, MacConkey agar, two colonies



Sample A4, PEA agar, colonies too numerous to count



DATA ANALYSIS

Overall, the data collected during the study did not support the null hypothesis. There was a noticeable difference in contamination resistance between the three different types of adhesives. The findings suggested that the putty was most contaminated. The second most contaminated type of adhesive was the adhesive strips. Samples collected from hospital C ranged from 0 to 66 colonies grown on the TSA petri dishes, and 0 to 20 colonies grown on the PEA dishes. The samples of adhesive strips taken from hospital B had 196 bacterial colonies grow on the TSA dishes and 283 colonies grow on the PEA dishes. On average, there were 45.6 colonies per TSA dish and 73.2 colonies per PEA dish.

Lastly, the least contaminated type of adhesive was the tape. The tape samples resulted in a range of 3 to 140 colonies cultured in the TSA petri dishes, with an average of 42.8 colonies per dish. The range of bacterial colonies grown on the PEA agar from the tape swabs was between 1 and 21, which is significantly less than the putty. Only a total of four samples collected produced a significant number of bacterial colonies on the MacConkey agar. Three tape samples grew one colony each, and one adhesive strip sample grew two bacterial colonies.

CONCLUSIONS & RECOMMENDATIONS

The data collected in this experiment suggests that the adhesives used to place anatomical side markers onto the image receptor do have the potential to harbor infectious microbes. The data also suggests that not all adhesives are not equal in their rate of collecting and harboring microbial agents. The petri dishes that contained the samples from surgical tape swabs had fewer bacterial colonies than the dishes containing swabs from the adhesive strips or the putty. This indicates that surgical tape might be the best adhesive for technologists to use to limit nosocomial infections and spreading other communicable diseases.

What this means for healthcare and particularly the medical imaging department is that there is more that can be done to protect both technologists and patients from harmful microorganisms that grow on radiographic markers. A week of not changing out the adhesive on an anatomical side marker or at least cleaning the adhesive with a disinfect wipe is putting patients, particularly those who are immunocompromised, at risk.

Due to the limitations in time and funding, the researchers were unable to thoroughly answer the next logical question: how long can an adhesive go without being changed or cleaned? However, it is safe to say that radiologic technologists should err on the side of caution and should either disinfect their radiographic markers or replace the adhesives after each use. Even though radiographic markers are small items, they are a link in the chain of infection, and radiographers need to adapt more thorough cleaning habits in order to prevent the spread of pathogens in the hospital setting.

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