Un-noticed infections that affects public health: A brief study

Vijayasarathy S, Suneetha V*
Department of Biotechnology, School of Biosciences and Technology, VIT University, Vellore -632014, Tamilnadu, India

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**ABSTRACT**
Human body is a perfectly designed and the most effectively functioning bio-machine. When there is no proper care microbes enter our body and lead to septicemia and makes us asthenic. Much of the pathogens gain entry into our body by contaminated food, water and physical contact with the affected person or material. Pathogens are biological fluids which disrupts homeostasis. The pathogens could be viral, bacterial, nematodal, prional or fungal. The impact of the infection depends on the pathogenicity of the infected pathogen. We are always concerned about the places that we see regularly and we hear frequently. We rarely think of certain sites that may cause us an infection. Not only drainage or an unclean surrounding is a place where pathogens grow; even nosocomial sites like catheters, ICU’s or operation theaters can be a site of infection. We never even think of these sites but we need to be cautious about such sites. Our own unclean habits lead us to various opportunistic infections from unnoticed sites like toothbrushes, currency notes etc. Our daily usage things like toiletries must be kept moisture free and clean. Moisture content in such things readily promote microbial growth. The reviewed article gives a brief outline of such unnoticed sites of infection.

**INTRODUCTION**
Microorganisms are present all over the world. They could be found in every part of this planet, even the human body is covered by microbes. They are found all varied diversities varying from the hospitable deltas to scorching deserts including the snowcaps and deep oceans. The number of microbes present in the world is more than the number of human beings on this planet. Of the millions of species roughly around only 1% of microbes are said to be pathogenic and all infections are associated with any of the pathogens in that. There is a special category of pathogens, the viruses which are just RNA material enclosed in a protein capsule. When they infect a host it uses the metabolism of the host and survives in the host organism. Almost all viral particles are infectious. Microbes include fungi also. The pathogen could gain entry into the host through any means like air, water, food, contact with infected person, sharing syringes etc....When we check for infection sites, hospitals and health care centers also play a major role. Hospitals are not always the sites of recovery; they can be a site of a new infection also. Since pathogens acquired from hospitals are much more resistant than the common pathogens it is difficult to treat them. In many of the cases proper diagnosis and prophylaxis can save the life of the infected person. But when left untreated the infection could be life threatening.
MATERIALS AND METHODS

Infections from catheters
The advancement in medicine has been impeccable. One important advancement is the use of catheters (both indwelling intravascular and urinary). Nosocomial infections are mostly associated with the infections spread from the device used for life support. In an already suffering and fragile patient these devices increase the risk of iatrogenic infections.

The pathogenesis of the infection from these devices is well understood from the formation of the biofilm layer which is slime and has multiple species of microorganisms (Raad, 1998). The conditioning film promotes the growth of the microbes and also supports them for getting them associated with the surface. Urinary catheters bathe in host’s urine and get encrusted with molecules like proteins, organic compounds and electrolytes while vascular catheters get a film of fibrin and fibronectin. Bare catheter is most unlikely for microbes to colonise while these layers act as conditioning films for the promotion of bacterial growth. The bacterial fluids start forming micro colonies. Under congenital conditions certain sessile organisms detach and enter the blood stream of the host causing infection. Since, these organisms are frequently exposed to antibodies and antimicrobial fluids they become resistant (Donlan, 2001). So it rarely suppresses the infection.

Intravascular catheters
The mode of entry of the pathogen is multifaceted where it disseminates into the blood stream. The biofilm formation could be observed within 24 hours of insertion. The skin site and the catheter hub becomes the most favorable way to enter. The intravascular catheter related bloodstream infection is considered as one of the most life-threatening hospital acquired infection (Zhang et al., 2011). The organisms in the endogenous and exogenous flora of the worker’s hands inoculate into the hum and migrate to the lumen of the catheter. The pathogens are commonly coagulase-negative staphylococci and Staphylococcus aureus, along with other nosocomial pathogens like Stenotrophomonas, Pseudomonas, enterococci, and Candida. Staphylococci, can gain entry even from the hands of the health care personnel.

Since biofilm formation is unavoidable, we therefore must be extra careful while using catheters. Maximal sterile barriers for insertion, antibiotic flushes, antimicrobial catheter hub, good hand hygiene, removal when not needed are some ways to prevent the infection from spreading.

Urinary catheters
Pathogenesis of catheter associated urinary infection is much more complex. Urine deposits Tamm-Horsfall glycoproteins which is slime and of renal origin. The hair-like projection on Escherichia coli and gram-negative bacteria helps them bind to the surface of the catheter. As stasis is a common condition in the urinary tract, it is not that worthy implementing a sterile catheter to prevent infection especially in case of long term catheters. The site of insertion is also a natural orifice. Contamination of periurethral area with high numbers of bowel microbes is very common. Hence the patient is likely to get infected from his own colonic flora (Nickel et al., 1994). Organisms like E. coli, Pseudomonas, Klebsiella, Enterobacter and Candida are very common in causing CAUTI. The enteric gram negative species is associated with multi drug resistance and is found in catheterized urinary infection. Since duration of urinary catheter placement may go for years, it is impossible to completely prevent the infection.

Of the total estimate of hospital acquired infections 26% of it are related to CAUTI. The tests conducted to confirm UTI’s are given below (Figure 1). In case of preventing CAUTI the use of antimicrobial agents or antibiotics does not work. Use of urinary acidifying agents, antimicrobial bag solutions, tropical disinfections lead to temporary suppression but eventually resistant bacteria will emerge. If chlorhexidine is used for perennial cleaning after the use for certain number of times, the patients could be screened with chlorhexidine-resistant bacteria. The suppression of bacteriuria is very difficult because the bladder’s flora is diverse and numerous where even exchanging the DNA encoding for drug resistance is also abound. The use of frequent antibiotics can also lead to supra-infections like Clostridium difficile colitis. Of all ways closed drainage system developed in 1928 could be an effective strategy to control CAUTI.

Infections from toothbrushes
Toothbrush the thing that sits innocuously in our bathrooms is the one that must be cared or dental health but it does harm than good. Since it removes the biofilm from our teeth many bacteria, virus and fungi which we remove while brushing often adheres to the bristles. These organisms which are infectious can re infect our buccal cavity and teeth. Some can even spread to other body parts along with food.

Dental caries causing mutant streptococcus, pharyngotonsillitis causing beta-hemolytic streptococcus, thrush causing fungi Canadida albicans and Coliform bacteria which are commonly found in bathrooms are the common organisms that remain
on toothbrush and infect the oral cavity (Caudry et al., 1995). E.coli infection is very common on toothbrushes if we have the sink and the faucet in the same room as the bacteria aerosolizes and sticks to the brushes. Dr. Maria Geisinger, DDS, an assistant professor and periodontist at the University of Alabama at Birmingham said that this is the bacteria that causes gastro intestinal diseases like gastro-enteritis.

When there is sharing of toothbrushes between persons there could be more risk of infection. The way of prevention lies in our limb. The American Dental Association recommends people to change their tooth brushes once in three months. As moisture content promotes the growth of microbes the toothbrushes must be placed in a ventilated area and not sealed or capped as it leads to growth of opportunistic organisms like Pseudomonas aeruginosa (Mehta et al., 2007). Sharing of toothbrushes must be avoided. Sick people with oral infection must change their toothbrushes to prevent reinfec tion. Toothbrushes must be disinfected daily. As per an article published in Pediatric Dentistry toothbrush contamination can be prevented by disinf ecting it by soaking in 1 % sodium hypochlorite solution (1 part bleach, 4 parts water) for 20 hours (Filho et al., 2000). The images of a properly cleaned and improperly cleaned brushes are given below (Figure 2 (A) and Figure 2 (B)).

**Infections from surgical site**

In case of a patient admitted in hospital and requiring a surgery it is likely that the patient must come out of the OR safe and cured but it is not the case always. There could be a new shift of infection that his body may encounter. Instruments like arthroscopic shavers, which surgeons usually use to shave bone and tissue during surgery and cannulas, long narrow metal tubes used to irrigate and employ suction in the surgical site are likely to infect the patient with new set of infections like Pseudomonas aeruginosa (Tosh et al., 2009)
The sterilization and decontamination of surgical instruments is very important after every surgical procedure. Microorganisms in the skin flora like coagulase-negative staphylococci (CoNS) and Bacillus species infect the surgical instruments (Dancer et al., 2012). Bacteria, viruses or any other pathogen which are only a few micrometers size could enter a sterile packing even if there is a small hole in it. The common nosocomial bacteria Staphylococcus aureus is one of the most commonly identified pathogen in surgical site infections. Staphylococcus epidermidis is commonly associated with infections in surgeries that involves prosthesis, espicially vascular prostheses. Other pathogens like Staphylococcal, entero-coccal, pseudomonal, and streptococcal species are also some pathogens that may cause surgical site infection. Post-sterilization contamination is also a cause of surgical site infections in orthopaedic and ophthalmic patients (Kirkland et al., 1999). Hospital is a place where microbes are constantly exposed to antibiotics and other drugs they develop resistance due to long time exposure. Methicillin which once was used to effectively destroy Staphylococcus aureus does it no more. MRSA (Methicillin resistant Staphylococcus aureus) has now been developing in the hospital atmosphere (Dancer et al., 2012). Patients whose skin flora or nose is colonized by MRSA have high chances of getting infected with this microbe by getting transferred surgical site post-operatively. Pseudomonas aeruginosa is another nosocomial pathogen where there could be contamination of apparatus, surgical instruments and the hands of healthcare provider. Multi-drug resistance Pseudomonas may lead to serious illness in patients in critical care after surgery.

38% of the total nosocomial infections are associated with surgical site infection. The exact cause of an infection after surgery is very difficult to identify. Since there are many causes like infection from the instrument used for the surgery, the healthcare provider’s hands or the patients skin flora, it is very difficult to come to a conclusion. Sterile Processing personnel break the infection chain by sterilization and autoclaving. But when the process is not performed properly the infections may turn pathogenic to the next patient. There are facilities that screen patients prior to surgery and reduce the risk of infection by decolonizing microbes prior to high risk surgeries.

CONCLUSIONS

The responsibility of living healthy is on us. There are many infectious sites that we see like the drains, sewers etc. We also show concern in bringing up a healthy home with a lot of precautions. Quite often we miss to notice sites that are potentially infectious. Hence, the care of preventing infections and pathogens must reside in every sphere of our life.

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