

Source of Infection

Source of infection:

An object is designed as the source of infection, is one in which the agent of infection lives and propagates. Can be man or animal from which the infectious agent is secreted into the outer environment and from there to individuals. In certain circumstances, the outer milieu can be the source of infection where the agent lives as a saprophyte (lives on dead matter) e.g. mycoses and legionella.

Man as a source: A person can be the source of infection in the following cases:

- 1) During the incubation period of a disease- in some infections the agent is secreted during the incubation period this is important as the infection is usually not known (e.g. Hep A and B)
- 2) Sick man- in clinical, abortive (short and mild without usual pronounced clinical symptoms), atypical or apparent forms.
- 3) Convalescent – secretion of agents occurs during convalescence (gradual recovery of health and strength after illness) ie. as in pertussis
- 4) Carriers- short term (salmonella), long term (typhoid fever) or intermittent (secretions at certain periods)

Below are some common examples on how the source of infection transmits the pathogen to other organisms.

Patient as source : via airborne

Presence of infectious patient is hazardous to other patients and health care employees. The most common route of transmission is via air. Example of diseases transmitted via airborne are tuberculosis, chicken pox, measles, German measles (Rubella). *Diseases: TB* is transmitted as small mucosal particles carrying viable bacteria, known as droplet nuclei. These particles produced by coughing and sneezing by patients with active TB due to their small size particles can stay airborne for a long time. Bacteria can also be dispersed into air during many activities such as bed making. Exposure may also occur due to aerosols generated by surgical power tools, such as oscillating bone saw, bone drills and electrocautery. Most of the generated particles are within the respirable range (less than 4 micrometer) *Pseudomonas aeruginosa* can become airborne during certain procedures, e.g., removal of dressings from leg ulcers or puncturing of an abscess. Patients with Cystic Fibrosis usually become infected by respiratory pathogen *Burkholderia cepacia*. They commonly become a primary source of *B. cepacia* in their environment. A risk of transmission exists especially during physiotherapy. *Respiratory viruses* such as Rhinovirus, Influenza, and Parainfluenza viruses which mainly spread by large droplets. Respiratory Syncytial virus and Adenovirus have been shown to have airborne transmission in paediatric wards. Varicella-zoster, Measles and Rubella may also spread via airborne route (through respiratory droplets containing virus particles during coughing, sneezing and talking)

Patient as source: via bloodborne

Many health care workers have risk to exposure to blood borne pathogens. Direct contact of infected patient blood with skin cut in hands can be potential source of transmission. Accidental needle pricks with infected blood can also be a mode of transmission. In some cases hemodialysis can also be a source of transmission of diseases especially in patients with Hepatitis C. Example: Hepatitis B virus, Hepatitis C, HIV,

Patient as source: sexually transmitted

Many diseases can be sexually transmitted by an infected person to their partner. Example: Syphilis, Gonorrhea, Hepatitis C, Hepatitis B, HIV, HPV, HSV, Trichomoniasis (*Trichomonas vaginalis*)

Patient as source: direct contact Some diseases can be transmitted via direct contact with infected patients. Varicella zoster can be transmitted via direct contact with ruptured vesicles containing active virus. Erysipelas (intra-dermal *Streptococcus pyogenes* infection) can be transmitted by touching the infected skin of patient with bare hands. This can also cause self-inoculation to distant sites which causes spread of the infection to other places of the body (Autoinfection)

patient as source: fecal oral transmission

Food borne diseases are usually transmitted via contamination of drinking water or food with feces (by people not washing their hands before preparing food, or untreated sewage being released into a drinking water supply) and the people who eat and drink them become infected. In developing countries most sewage is discharged into the environment or on cropland as of 2006; even in developed countries there are periodic system failures resulting in a sanitary sewer overflow. This is the typical mode of transmission for the infectious agents of (at least): Cholera, Hepatitis A, Polio, Rotavirus, Salmonella, Shigella and *Campylobacter jejuni*.

Employees as a source of surgical site infections

A person releases about 10 million particles within a day. The release rate is roughly about 10 000 particles/min. About 5-10% of the particles carry bacteria. The most common bacteria where employees become carriers are *Staphylococcus aureus*, *Staphylococcus epidermidis* and gram negative rods. Men (9-13%) tend to be more common carriers of *S. aureus* compared to women (1-1.5%). These bacteria often become causes of postoperative wound infections.

Staphylococcus aureus most important source of surgical site infections in the USA. We now face the problems of resistant bacteria with antibiotics- MRSA and VISA. MRSA spread mainly by direct contact from hands of health care personnel. In the revised British guidelines for the control of MRSA infections in hospitals, isolation in a single room with a negative pressure as an important control measure because MRSA carriers contaminate their environment by releasing staphylococci-containing particles. Ventilation systems have also been found to be source of MRSA outbreaks.

S. epidermidis is also an important source of surgical site infections. This is due to the development of methicillin resistant strains (MRSE). A recent Swedish study indicated that as many as 43% of male and 25% of female operating room staff members were dispersers of MRSE. MRSE was also detected in the air of the operating room in spite of high ventilation rate (80 ACH).

Streptococcus pyogenes is rare but can cause serious surgical complications. Carriers often remain asymptomatic and transmission is via airborne. The most common source of this bacteria is the assisting staff members and not the surgeon.

According to an Italian study, bacteria detected in the ICU and surgical wards were mostly gram positives and most likely derived from human sources.

Environment as a source:

Legionella pneumophila can be found in warm water systems, such as faucets and showers, cooling towers and humidifiers. Stagnant water especially in dead end pipes provide amplification sites for organism. Legionellosis outbreaks have occurred in several hospitals. Most susceptible patients are elderly males with respiratory and renal diseases as well as immunocompromised patients.

Hospital with moisture damaged walls become mouldy and serve as risk for developing fungal infections among patients who are immunosuppressed. Long term exposure to fungi may cause adverse health effects among personnel and patients. Moisture damage may also lead to bacterial growth in building materials.

Animal as source of infection:

They cause infections similar way to man. Diseases that can be transmitted from animals to man are called zoonoses Example: Anthrax, Salmonella, Brucellosis, Tularemia, Toxoplasmosis, Toxocariasis, Cat scratch disease, Plague, Leptospirosis). Reservoir: Sheep, goat, ducks, hens, pigeons, cats, deer, rodents

Links

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Bibliography

References

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