Risk Assessment – Human urine

Background

Urine is a liquid byproduct of metabolism in humans and in many animals. Urine flows from the kidneys through the ureters to the urinary bladder. Urination results in urine being excreted from the body through the urethra. Urine can contain various biomarkers excreted from body, so it is a useful sample for diagnostics.

It is commonly believed that urine is sterile until it reaches the urethra, where epithelial cells lining the urethra are colonized by facultatively anaerobic Gram negative rods and cocci. Current research suggests though that urine is not sterile, especially in case of Zika virus, urine can contain infectious virus and other agents.

Risk Considerations

When we use human urine sample, it can be classified by two cases.

Screened Samples – are those obtained through the hospitals or sample bank that undertakes screening of their samples for harmful pathogens. Where these samples are proved to be negative for harmful pathogens, the material can be handled at Biosafety Level 1. When samples are screened and are shown to contain a pathogen, they should be handled at the appropriate Containment Level for that pathogen.

Unscreened Samples – human materials that do not come from a screened source must be regarded as potentially infectious (e.g. Zika virus). They must therefore be handled at Biosafety Level 2. If a sample is shown or discovered to be infected at a later date, then the risk assessment should be revisited and the Biosafety Level altered accordingly.

Exposure risk

Healthy urine is generally not toxic. However, it contains compounds eliminated by the body as undesirable, and can be irritating to skin and eyes.

In case of unscreened sample handling, precaution is required. The main route of infection from human materials is usually via a sharps injury (needlestick, cut, etc), or a splash onto a mucous membrane. There is no conclusive epidemiological evidence for transmission via the airborne route. However, there have occasionally been laboratory acquired infections that have not been clearly attributed to a known accident, and exposure has been assumed, in these cases, to have occurred via an infectious aerosol. Therefore, care should always be taken to minimise aerosol generation in the first place, and to contain aerosols, e.g. by using a microbiological safety cabinet.

Decontamination/Disposal Procedures

General Level 2 good laboratory practices of decontamination of all work surfaces daily and appropriate chemical disinfection (eg. 1% hypochlorite) of all liquid cultures and laboratory glassware will successfully contain any recombinant virus produced in the lab. For the disposal of used area with urine sample, wear gloves and / or other ppe as required, use a mop or paper towels soaked in dilute bleach solution to wipe up or collect waste, dispose of the cleaning/paper towels in yellow bin and wash hands thoroughly.

Summary

Urine is a useful bio-samples and it can contain various biological agents. Urine from healthy one is not toxic and infectious, but precaution is required for handling of urine from patients, especially in case of unscreened sample which can contain infectious agents. Depending on the containing agents in urine, the risk can be classified by two cases and handling in suitable laboratory setting is required.

Tentative Assessment:
BIOSAFETY LEVEL 1~2 (depending on containing agents)

Precautions for laboratory workers handling human body fluids

All work with human materials needs to be risk assessed before it begins. Biosafety level 2 practices and procedures are required as a minimum for any work with human body fluids and tissues, even screened material. There may be pathogens present that have not been detected by the screening process and therefore the material should always be handled with care. The risk assessment must be reviewed regularly, and particularly following an accident or any change to the work. The main controls required are as follows:

- The entrance to the laboratory should be marked with Biohazard signs.
- Authorised access only is allowed.
- Laboratory coats, or appropriate protective gowns should be worn in the laboratory and fastened properly. Lab coats and gowns should be removed when leaving the laboratory to go to offices, tearooms, cafeterias, toilets or seminar rooms.
- There should be no eating, drinking, application of cosmetics, mouth pipetting or storage of food within the laboratory. All hand-mouth/eye/nose contact must be minimized.
- The use of sharps should be avoided. If it is necessary to use sharps an appropriate assessment of the risks should be carried out, and control measures

put in place to reduce the likelihood of cuts/needlestick injuries. For example, using snub nosed scissors instead of pointed scissors, using chain mail gloves for high risk cutting procedures, and safe sharps disposal for needles. There is further information on sharps safety below.

- Work with human material, if carried out within a large facility, should be confined to a quiet, marked area of the lab, where there will be little interference from other lab users.
- Any open wounds, lesions etc should be covered with a waterproof dressing. Disposable gloves should be worn.
- The work area should be uncluttered and should be decontaminated before and after work takes place.
- Hands should be washed immediately in the event of contamination, and should always be washed after removing gloves, and before leaving the laboratory.
- Care should be taken to prevent contaminated gloves coming into contact with door handles, telephones and other surfaces that may be touched by people not wearing gloves.
- The use of glassware should be reduced to a minimum, and disposable plastic equivalents used instead. This includes the use of Pasteur pipettes. Plastic Pasteurs should be used, unless there is a good scientific reason for using glass, which should be justified by the risk assessment.
- All samples must be labelled, and stored in secondary containment to prevent leaks, within their designated refrigerator or freezer.
- In the event of a spill all contamination must be cleaned up immediately and the incident reported.
- If there is a risk of splashing eye and mouth protection may be needed.
- All procedures likely to generate aerosols, such as sonication, homogenisation etc, should be carried out within a microbiological safety cabinet. Where equipment is placed within a safety cabinet to contain aerosols an operator protection test should be carried out to ensure that the containment of the cabinet is not compromised.
- Sealed tubes should be used for centrifuging, and where at all possible sealed buckets should also be used to contain any aerosols in the event of tube breakage. The sealed bucket can then be removed and taken to a safety cabinet for decontamination. Disinfection with 1% Virkon is recommended for contaminated rotors and bowls, unless it is known or suspected that Mycobacterium tuberculosis is present, in which case an appropriate disinfectant, known to be effective against the MTb, must be used. Because Virkon is corrosive to metals, it should not be left in contact with the metal surface for a prolonged period, but should be washed off with water. Alternatively, a disinfectant such as Trigene, with no known corrosive properties may be used, if it is appropriate to do so.
- All waste should be carefully disposed of, particularly any sharps which should be placed directly into yellow sharps bins for ultimate disposal by incineration.
- Individuals should NEVER work on their own cells – if cells are transformed in culture the body's immune response may not provide protection in the event of re-exposure through a needlestick or other accident.