



Dirty Urinals/Toilets And Urinary Tract Inflammation/Infection: Worth Investigating If It Can Be True Due To Urinary Aerosols In Urinals/Toilets

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Origin of Hypothesis

Since the current pandemic dawned, we have been wearing masks and avoiding infectious aerosols even in the urinals/toilets, especially when using the shared urinals/toilets. Although masks can curtail the inhalation of aerosols generated in urinals/toilets, the aerosols contaminating the perineum cannot be avoided, especially when the urinals/toilets are unclean, dirty or clogged. Although the chemically cleansed urinals/toilets may generate chemicalized aerosols which may create non-infectious contaminations and complications, especially when the urinals/toilets are flushed powerfully with water [1-3] as similar to when the fomites/surfaces are transferring the infectious and non-infectious agents by contact [4], the question we often overlook is whether we are exposing our perineal areas to the infectious and non-infectious agents while urinating sitting on or standing over standard or compost urinals/toilet bowls. Therefore, as inspired from global researchers' investigation into imaging aerosols generated by simulated raindrops falling on soil [5-10], the research question that is worth investigating is whether aerosols generated while urinating can be imaged with ultra-high speed cameras [11-12] to quantify the aerosols generated depending on the position while urinating and depending on urinal/toilet bowl where urinating. This envisaged investigating may prove or disprove whether aerosol generation while urinating differs (a) between the sexes, (b) as urinary stream falls on smooth bowl surface or textured bowl surface, or (c) between the sawdust filled compost urinal/toilet and the water-filled standard urinal/toilet.

Envisaged Materials And Methods

After institutional review board approval, five male and five female adult volunteers with no pre-existing urinary problems can be consented by same-gender

investigators (to accommodate privacy and modesty concerns) for imaging their urinary streams with ultra-high-speed cameras while urinating through male condom catheter (made of opaque-material for privacy) or female pee funnel device (made of opaque-material for privacy). Rhodamine B dye can be coated onto the urinal/toilet bowl surfaces to visualize under ultraviolet the pattern of aerosols landing onto the outer surfaces of (a) condom catheters worn by male volunteers while urinating and (b) pee funnel devices worn by female volunteers while urinating, and this can be complemented by culture and sensitivity for microbiology of urinary aerosols deposited onto those outer surfaces. In case of difficulty to enroll volunteers for this envisaged study, it can be considered to use urinary bladder simulator [13] to simulate urinary streams among different sexes at their differing ages with differing urinary pathophysiology over the time. In the interim, the categories among human volunteers to investigate can be:

1. Male volunteers with full-bladder urinating while sitting to urinate into
 1. Smooth surfaced water-filled toilet bowl
 2. Texture surfaced water-filled toilet bowl
 3. Rough surfaced sawdust-filled compost toilet
2. Female volunteers with full-bladder urinating while sitting to urinate into
 1. Smooth surfaced water-filled toilet bowl
 2. Texture surfaced water-filled toilet bowl
 3. Rough surfaced sawdust-filled compost toilet
3. Male volunteers with full-bladder urinating while standing to urinate into
 1. Smooth surfaced urinal
 2. Texture surfaced urinal
 3. Rough surfaced sawdust-filled urinal
 4. Smooth surfaced water-filled toilet bowl
 5. Texture surfaced water-filled toilet bowl
 6. Rough surfaced sawdust-filled compost toilet
4. Female volunteers with full-bladder urinating while standing to urinate into
 1. Smooth surfaced urinal
 2. Texture surfaced urinal
 3. Rough surfaced sawdust-filled urinal
 4. Smooth surfaced water-filled toilet bowl
 5. Texture surfaced water-filled toilet bowl
 6. Rough surfaced sawdust-filled compost toilet

Expected Line Of Results

The envisaged study may demonstrate if ultra-high-speed cameras can capture urinary aerosols being generated when urinary streams fall on to urinal/toilet bowl surfaces. It may be interesting to see whether urinating while standing over the toilet bowls may protect the perineum from contamination by infectious/non-infectious urinary aerosols due to the larger distances needed to be traveled by those aerosols from the toilet bowl surfaces back to the perineum even though the overall contamination of washroom environments may be higher with the larger amounts of aerosols being generated by urinary streams traveling longer distances to reach the toilet bowl surfaces when urinating while standing. It may be interesting to see if rough surfaced sawdust-filled urinals/compost toilets [14] may be the answer to contain the amounts of not only urinary aerosols which are generated but also urinary aerosols which finally contaminate perineum as representatively surrogated by Rhodamine B dye-carrying urinary aerosols landing onto the outer surfaces of condom catheters and pee funnel devices in the envisaged study. It may be interesting to see if culture and sensitivity can be performed to further decipher the microbiology of urinary aerosols deposited onto the outer surfaces of condom catheters and pee funnel devices in the envisaged study.

Conclusion

It is high time to demystify the myth about dirty urinals/toilets and urinary tract inflammation/infection [15-19] once and for all by investigating whether there are variable amounts of urinary aerosols being generated by variably speeding urinary streams traveling variable distances to variably surfaced urinals/toilet bowls before they are variably returning back to the perineum of males as well as females urinating while sitting on or standing over composting or standard urinals/toilets.

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