Observed "underpressure" in the urine drainage bag tube,

when using ecinput

(i.e. no bacterial gas in the urinary bag).



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Addition to "Air in the bag" .

Abstract:

The objective of this study was to examine the reported observations from nurses and patients using uridomes. It has been discovered that after start using the ecinput applicator, the remaining volume of urine in the uridome is significant reduced. It is registered a certain negative pressure in the tubings, resulting in a constriction in the uridome between the penis and the urine drainage bag. (Fig.1). This constriction empties the tubing so that the amount of urine staying in contact with the penis is minimal. This avoids bacterial growth and urinary tract infections (UTI).

Hospital treatments and antibiotics are hereby significantly reduced.

Fig.1 a & b: Photo of "constricted" uridom .



Significant constriction

White nippel of urine drainage bag



Photo of a constricted uridome on a "patient" model. No urine is left in the uridome above the connection point to the urine drainage bag (white nippel).

Materials an Methods:

"The Laboratory patient" consist of urine drainage bag (common commodity). The



"leg", a plastic tube, to which the drainage bag are fixed, is of the same size as a normal patient leg. The plastic tube is filled with water of approximately 30°C. The room temperature is recorded to 20°C.

The uridome is replaced with the tubings from the drainage bag, bent in a downward arc, for measuring the water pressure. The water in this tubing is coloured red.

The equipment is fixed to a horisontal plate. For measuring the waterpressure, common graph paper is used.

Fresh urine, from a healthy voluntary person, 500ml of the body temperature of 37°C, was filled through the supply tubings connected with a Y-coupling.

Fig.2. Test setup

With all the urine placed in the drainage bag, the supply tubings was properly sealed, and the first photo and pressure measurement were recorded. This procedure was repeated at 5, 10, 20 and 30 minutes. The results are presented in a graph (Fig.8) at the last page.

The vapour pressure above the urine, decreases with temperature decrease. The result is a significant lower pressure in the drainage bag, and suction in tubings and uridome. The remaining urine volume will thereby be removed from the penis and urethra.

The vapour pressure is the pressure of a gas when a substance in liquid form is in equilibrium with it's own gas.

When a liquide is sealed in a chamber, some of the liquid will evaporate when the molecules change to gas. An exchange of molecules between liquid and gas will continue until equilibrium. The pressure over the liquid is called the vapour pressure for the substance at that particular temperature.

If the liquid is heated, more substance will evaporate and the pressure will rise. By cooling, the vapour pressure will decrease .

If the gas is a of mixture of different substances, we talk about the partial pressure for the various gasses.

Test I: Urine drainage bag containing "bacterial" gas.

(Simulating "Manual coupling of drainage bag to the uridome").

It has been reported for patients not using ecinput that the drainage bag is blown up like a balloon and a significant back pressure is registrated when the patient urinates. (Pressure from the gas formed by gas producing bacteria). It will always be a rest of urine remaining in the tubings, and that volume will be in contact with the penis and the urinary tract opening, urethra. The bacteria introduced to the urine by the manual coupling method, will most probably cause an UTI.

Fig. 3. Pressure, recorded at time 0, with 500ml urin in the



bag ,before the bacterial gas formation has started.

____ Pressure in equilibrium.

Starts with 500 ml "bacterial infected" urine in the urine drainage bag.

The succesive cooling of the urine ends at room temperature until next urinating.

Daltons Law: The total pressure of a gas mixture is the sum of the partial pressures. The total pressure is independent of the composition of the mixture.

Ammonia and carbon dioxide are formed, and these gases increase the pressure in the sealed urine drainage bag.

The pressure increases until no more urine can enter the bag. The urine will remain in the tubings and in the uridome. A result may be that the glue inside the uridome is dissolved by the urine pressed back. Consequently, the uridome is released and a leakage is a fact.



Fig.4. Urine drainage bagblown to a "balloon" by gas, .

High pressure recorded on the graph paper.

High pressure in the bag (blown up like a balloon).

Test II: Without gas in the urine drainage bag.

(by using the ecinput applicator)



Fig.5. Start with fresh, non- bacterial infected urine.



Non-bacterial contaminated urine, 500ml, was filled into the new urine drainage bag. Subsequently cooling down to room temperature

Vapour pressure over the urine decreases by decreased temperature.

It will be negative pressure in the bag and suction in the tubings and uridome. (Fig1).

No rest volume of urine in contact with the penis and urinary tracd opening.

Data. from Wikipedia.

Vapour pressure over water as function of temperature.

38°C: 6633 Pa

26°C: 3364 Pa

Both the urine drainage bag/uridome and drainage bag/catheter works under Boyles Law.



Fig.7. Recorded 16 mm pressure after 10 minutes.

The graph below is from the test II, with no bacterial contamination (using ecinput application), fresh urine (500ml) at 37°C used. The patient leg, where the bag is fixed, is expected to hold approximately 30°C. Room temperature was 20°C.

The vapour pressure over the urine was measured at 0, 5, 10,20,30 minutes.

The graph shows that by the cooling of the urine the pressure (and the constiction of the uridome) is increased until a steady state of negative vapour pressure occurs after 10 min (blue line).

The red line, the pressure of water, is included to demonstrate the pressure dependece of temperature.

Conclusion:

As mentioned in the reports from patients and nurses, the constriction of the uridome will start almost immediately after urination. This means that there will be no urine in contact with the urinary tract opening, and consequently no bacterial contamination if an ecinput applicator is used.

Fig.8. Graph of the recorded negative pressure in the "uridome" (blue line) and

the pressure over water as a demonstration of pressure dependence of temperature(red line)



Time in minutes , temperature in oC.