

Influence of Vacuette® -Urine System on the Evaluation of Urine Sediment

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In the laboratory of the University Hospital Groningen approximately 50 urine samples are microscopic evaluated for sedimentation on a daily basis. Most of these samples are presented in a urine beaker with screw cap. This causes a nuisance due to leakage and the need to pour out the sample into a conical shaped tube before centrifugation.

Recently Greiner introduced vacuum urine tubes which allow processing of the samples in a closed system. The urine sample can be transferred directly from the bedpan into a 9, 5 ml tube by using a transfer device. A urine beaker with integrated transfer device is also available to allow the laboratory to work with a closed system.

However, there is no written data concerning the influence of evacuated urine collection on the elements in the urine sediment.

Before introducing Vacuette® - Urine Tubes in our laboratory to prevent the hygienic problems caused by the leaking urine beakers, investigation of the effects of these tubes on material for microscopic evaluation was needed. In addition, the influence of transportation of the vacuum tubes by pneumatic dispatch on the urine sedimentation was evaluated. Special attention was paid to what we believe to be the most vulnerable part of the urine sediment, i.e. the cylinders.

Urine sedimentation taken into closer consideration

In our laboratory 50 urine samples containing cylinders were evaluated using the Vacuette® system. These were compared to the "old method" used in our laboratory; i.e. pouring out the urine into a conical shaped tube by hand. In both methods a drop of eosin is added to the urine sample, to stain the cell elements, after which the tubes were centrifuged at 400g (1500 rpm) for 5 minutes. After centrifugation the tubes were decanted at an angle of 45°, the hanging drop was shaken off and the tube was placed vertically for 30 seconds to allow the liquid film on the tube wall to sink towards the bottom of the tube.

After resuspending the sediment by carefully inverting the tube, the tube was placed at an angle of approximately 20° allowing the sediment to move to the rim of the tube. Subsequently, using the corner of a cover slide, an amount of urine is transferred to a slide and covered with the cover slide. An analyst, who was not informed about the specifics of the sediment, performed the microscopic evaluation using a 400 x magnification.

After evaluation of the randomised and coded sediments a comparison was made between the sediments originating from the "old method" and the Vacuette® system.

In a parallel study differences were evaluated in the sedimentation of two tubes (n=5) drawn under vacuum of which one was sent to the laboratory by pneumatic dispatch and the other by courier. This was done because urine sent by pneumatic dispatch is considered to be immobilised, but is, due to the air bubble in the tube susceptible to quite a lot of shaking which could cause damage to the components in the urine which in turn might influence the sediment.

Table 1. Components of sediment and amounts found in the old conical tube and the new vacuum tube (n=48). All components found in the “old tube” were also found in the sediment of the same urine sample in the vacuum tube. In some cases (*) components were found in the vacuum tube that were not found in the sediment of the same urine sample from the “old tube”.

	old tube	vacuum tube
Leucocytes	25	25
Leucocytes group	1	1
Erythrocytes	21	21
Bacteria*	14	15
Squamous epithelium*	14	16
Cuboidal epithelium	5	5
Columnar epithelium	5	5
Hyaline cylinders*	19	22
Granular cylinders*	19	20
Epithelial cylinders	2	2
Wax cylinders	1	2
Leucocylinders	2	2
Mucus*	11	14
Oxalate crystals	4	4
Yeast	2	2
Amorphous salt	3	3
Fungal elements	1	1

Results

One of the most important findings of the study is that no differences were found in

the sedimentation using the “old” method and using the vacuum system.

This is not only the case for cylinders (hyaline-, epithelium-, wax-, leucocytes-) but also for all other components of the sediment such as crystals (oxalate), yeast, amorphous salt and mucus (table 1). Also, in the amounts of erythrocytes, leucocytes, epithelial cells and bacteria found, there were no differences between the two methods. Furthermore, no differences were found between the sediments of urine samples from the Vacuette® system sent by pneumatic dispatch and the same samples brought to the laboratory by courier.

Consideration

The Vacuette® system is also sterile and therefore also useful to the Laboratory of Medical Microbiology for urine cultures. After removing the cap of the tube in a laminar flow environment, a standardised amount is inoculated in culture medium.

The tube is equipped with a so called hemoguard closure which is reusable. After this the closed tube is centrifuged in order to make a Gram slide. The advantage of this tube is that during transport no urine can be lost and the sample is kept sterile. Another advantage is that urine no longer has to be poured out in order to make a slide, thus preventing aerosols.

Summary: “in comparison to urine beakers hygiene is considerably improved with the Vacuette® urine system, during transport as well as in the laboratory.

Gratitude

The evaluation and the introduction of the Vacuette® tubes were performed in collaboration with the following departments: laboratory, medical microbiology, labour and safety, nursing affairs and purchasing.