

Report of the visit of microbiology labs of the visit to Mongolia

14.-22.6.2019

With this report, I will complement the MeshHp report about trip to Dornogobi Aimag of Walter Popp of June 2019. My report focuses on the microbiological diagnostics performed in the laboratories we visited between 14.-22.6.2019.

During our trip to Mongolia in June 2019 we visited the microbiology laboratories of three hospitals:

1. Hospital No2 in Ulaanbaatar on 14.6.2019
2. Dornogobi Aimag Hospital in Sainshand on 18.6.2019
3. New University Hospital in Ulaanbaatar on 20.6.2019

Microbiology laboratory in Hospital No2:

Since my first visit in the microbiology lab of the Hospital No2 in June 2017, the laboratory has been sanitized and newly equipped.

The laboratory performs microbiologic analyses for the hospital with 255 beds. The hospital departments focus on surgery and internal medicine including renal dialysis. About 50-60 samples are sent to the lab for microbiologic analyses, 60% of these are urine samples. Blood culture diagnostics, which is the most important specimen in Germany, is rarely performed.

There is a spatial separation for sample acquisition, sample streaking and culture processing including identification and resistance testing as well as for the agar kitchen.

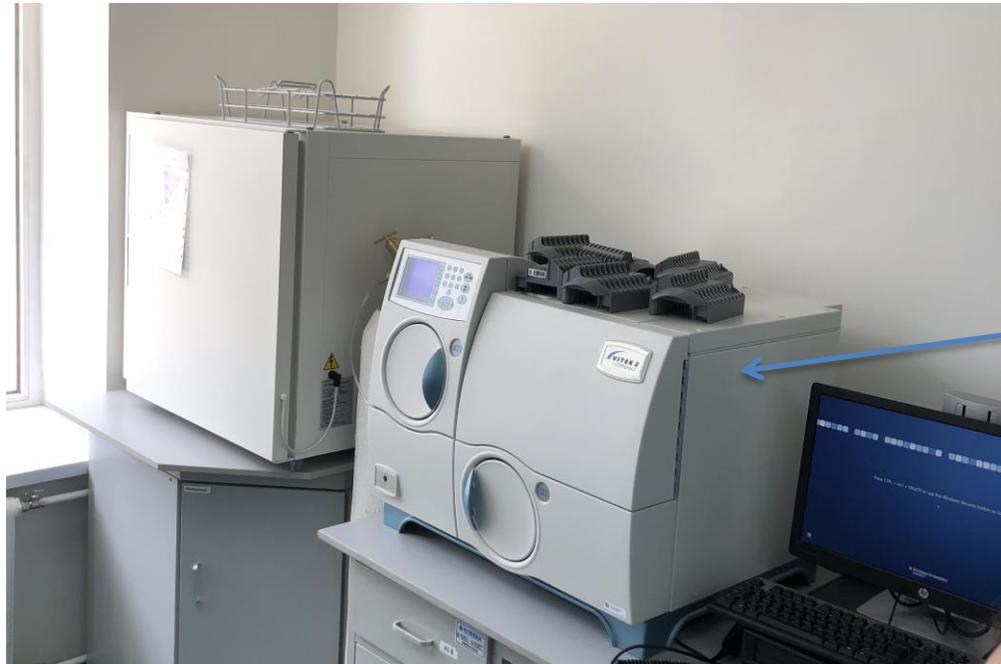
In the room where samples are received, gram staining with commercially available kits and microscopy is performed. The laboratory for streaking the agar plates and performing microbiologic analyses is spacious.

A BSL2 safety cabinet installed with UV-light used within the biosafety cabinet for UV-disinfection. We advised to primarily focus on disinfection of the surfaces and to use UV-light disinfection only as add-on.



For identification of bacteria grown from culture, the Vitek2 compact device is available in the lab. This automated machine is able to identify bacteria and fungi by assessing metabolic properties of bacteria. They told us that they perform identification of about 40 pathogens each month, which appears low compared to the number of samples received. Antimicrobial susceptibility testing (AST) is not performed using the VITEK2 system, although the fridge was full of kits for performing AST by using VITEK2. This method would be less laborious and easier to perform compared with the disk diffusion that they perform currently for AST-testing routinely. Date of expiry for the VITEK kits was November 2019, which means that they have more kits than they could use until the date of expiry if they do all antimicrobial susceptibility testing now only with the VITEK-AST cards. They have no knowledge how to use the VITEK-AST cards.

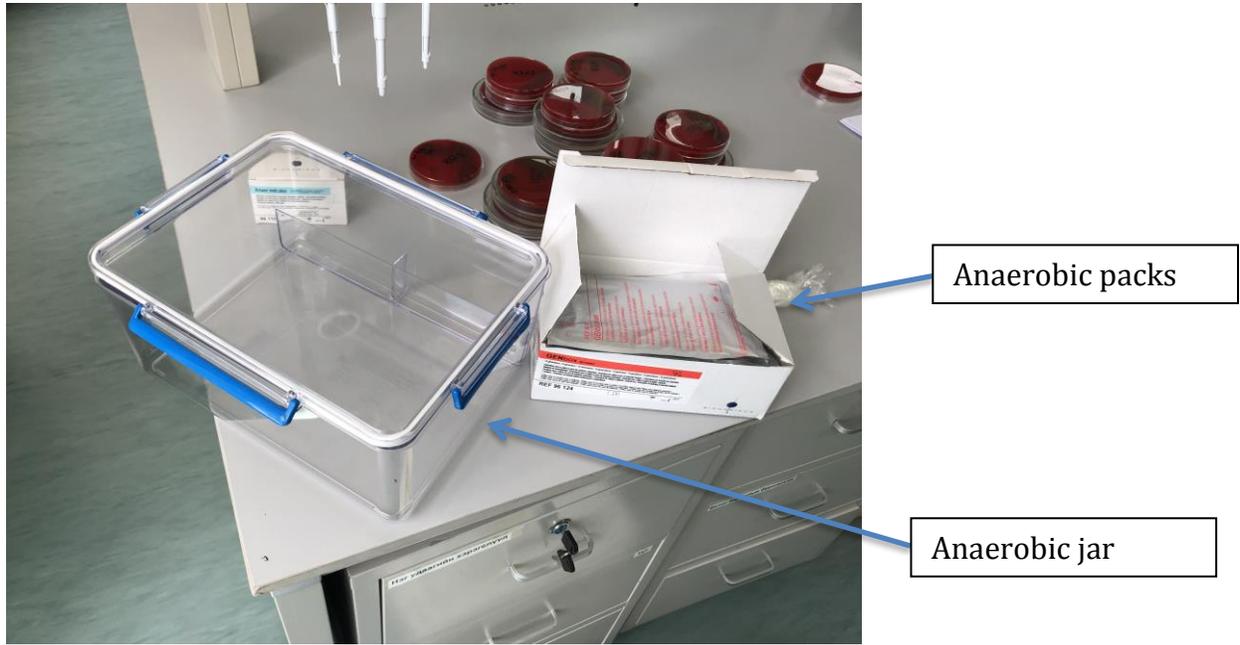
For performing antimicrobial susceptibility testing using disk diffusion, which they routinely perform so far, it is necessary to perform testing of control strains for quality control in parallel, but it remains unclear to us, if and how often this is performed.



Device for performing identification and antimicrobial resistance testing of bacteria

Screening for MRSA or multidrug-resistant gram negative bacteria is not performed for certain high-risk patients, but is performed when patients are admitted to the intensive care unit. TB diagnostics is not performed in the microbiology lab of Hospital No2. They send all samples to the NCCD to perform the diagnostics, which is adequate as the delays in sample processing are minor due to local proximity of the NCCD hospital.

Knowledge for certain aspects of bacterial culturing was lacking for the technical staff and physician that we met in the laboratory. Culturing of obligate anaerobe bacteria was performed basically incorrect. For culture of obligate anaerobe bacteria they thought that it is sufficient to incubate agar plates at 5% CO₂ at 37°C. Rectangular anaerobic jars for the culture of obligate anaerobic bacteria, anaerobic packs to create anaerobic atmosphere within the jars and anaerobic control sticks to check for anaerobic atmosphere within the jars were present in the laboratory but it was unknown that obligate anaerobic bacteria need to be cultured in these jars and that 5% CO₂ atmosphere of the incubator was not sufficient.



Blood cultures are the most important specimen for patients with fever of unknown origin and septic patients and are very frequently performed in Germany. Blood culture diagnostics can be done with the BactAlert in Hospital No2, which can be regarded as state-of-the art diagnostics. The same system is also available in many German hospitals. When blood culture bottles are cultured they perform that for 5 days usually, which is adequate for the routine culture in septic patients (except for suspected endocarditis patients, which is incubated usually for 21 days). When we opened the machine, no blood culture bottle was currently incubated. They told us that doctors send only very few samples. As the machine is relatively new and available since April 2019, improved communication with the doctors on the wards might improve awareness of the possibility to use this important diagnostics.



Device for performing blood culture - without any sample currently cultured

All agar media are produced by the Hospital No2 themselves in their own agar kitchen. Quality control is performed by incubating the new agar plates at 37°C and checking for growth of bacteria. The agar plates are used when no growth is detected. ATCC reference strains are available in the laboratory but it remained unclear if they are used to check when new agar plates are tested as a positive growth control, which needs to be performed as proper quality control.

Eye showers for showering both eyes simultaneously are available in the laboratory. The showers have never been used so far and also are not rinsed by the staff. We told them that they need to be rinsed regularly to reduce the risk of contamination of the eyes due to growth of bacteria in the tubes when the eye showers are never rinsed.



Compared with the equipment two years ago, there is a significant improvement now. The new devices allow for performing microbiologic diagnostics comparable to up-to-date standards used by laboratories also in Germany. But the education and understanding of some microbiological basics is lacking at least for staff we met. Extensive trainings are needed to operate the new devices so that correct microbiological diagnostics can be performed. In addition, communication for physicians for correct sampling and pre-analytics should be done.

Microbiology lab Dornogobi Aimag Hospital in Sainshand:

Tuberculosis and sexually transmitted diseases are a major problem in Sainshand. A new mobile X-ray and GeneXpert are used for suspected TB cases. Culture of tuberculous mycobacteria is performed in NCCD in Ulaanbaatar. The laboratory was equipped very similarly as the Microbiology lab in Hospital No2 in Ulaanbaatar. Microscopy and gram-staining, BSL2 safety cabinet with UV-light, Vitek2 for identification and resistance testing are available. But the staff also does not know how resistance testing is performed with the VITEK2 device. Many AST cards were available in the fringe but testing was also done using disk diffusion. Blood culture analyses can also be performed with Bact-Alert but it was switched off and no blood culture diagnostics was performed. They told us that instability of the electricity was so high, that a proper incubation for the period of five days was not possible. Bacterial growth detection is deleted when electricity is disturbed and automatic detection is not performed by the device in this case.

Also in Sainshand Aimag Hospital most specimens send to the microbiology lab were urine samples. The staff needs additional training to perform adequate microbiologic diagnostics with the new equipment. One person was trained in Ulaanbaatar for three days. The input for this single person during the training was too high, so that many things of the training in Ulaanbaatar could not be reproduced in the microbiologic laboratory in Dornogobi Aimag Hospital. The staff was unable to perform antibiotic susceptibility testing using the automated VITEK2 device and anaerobic culture. Additional training should be done in the microbiology lab in Sainshand.

Microbiology lab in University Hospital

The first patients are planned to be treated in the University Hospital in October this year. So the lab is not running so far. The microbiology lab is accessed by walking through the clinical chemistry laboratory, which is big in size and appeared well equipped.



Clinical chemistry lab

Compared with the clinical chemistry laboratory, but also compared with the laboratories that we visited previously during our trip, there is few space to perform microbiologic diagnostics adequately. There is one room with two BSL2 biosafety cabinets and one table in the middle of the laboratory where most of the work has to be done. Working with a chair at the table is not possible as the table is closed at its sides.

The University Hospital was the only microbiology lab where we saw an anaerobic chamber to perform culture of obligate anaerobes, which is an improvement to perform diagnostics of obligate anaerobes. But it is important to train staff so that diagnostics can be performed using the anaerobic chamber correctly.



Anaerobic chamber

There is few space left to build up the missing devices. The device used for identification of bacteria and antimicrobial resistance testing will be the BD Phoenix system, which has not been delivered so far. Blood culture testing will be performed with Bactec FX system device.



Conclusions:

All three microbiology laboratories were equipped with modern devices to perform up-to-date microbiological diagnostics. But the knowledge of the staff about the correct microbiological techniques and operation of the new devices at least in the two laboratories that are currently running is lacking. So it appears, that the investment to improve microbiological diagnostics has so far not turned into account for the patients in the same dimensions. Therefore, training of the staff should have absolute priority. Furthermore, communication between microbiologists and clinicians about existence of the new devices could improve sending of blood cultures of seriously ill patients with suspected bacteraemia instead of the high amount of urine samples that made up the majority of samples sent to the two currently operating microbiology laboratories that we visited.