



MVZ DORTMUND - Dr.Eberhard u. Partner - MICROBIOLOGY
Report of the Visit to Ulaanbaatar 2012
Microbiological Laboratories

MIKROBIOLOGIE www.labmed.de / mikro@labmed.de



Mongolia March 2013

accreditation since april 2003 (DIN EN ISO 15189; DACH)

MVZ Dortmund - Dr.Eberhard u. Partner





Dortmund, "Ruhr-valley" - Germany



founded in 890 as "imperial free city" (part of an important trading route)

**1900 - 1970 well known for beer (7 Breweries), coal-mines, steel-production (Thyssen, Hoesch)
and now: 600.000 citizens, technical university, research, administration, soccer-champion 2012**

"Labor Dr.Eberhard" was founded in the seventies with 25 employees

and now "MVZ Dortmund / Dr.Eberhard" provides medical diagnostics with 350 employees!



... main goal of my (first!) visit in 2012 ...

In 2012 I was very pleased to be asked:

- **Dipl.Biol. Michael Rossburg**
Head of Diagnostic Management / Department of Microbiology
Medical Care Center Dr.Eberhard u. Partner Dortmund

to support the MeshHp-Project by

- **having a look at microbiological laboratories**
with a focus on structure - equipment - methods / techniques

... the existing situation of microbiological diagnostics like detection of bacteria, susceptibility-testing - incl. MDR / XDR (Multi-Drug-Resistance), the management of Nosocomial Infections ...

and

- **giving a report of the visit in UB / Mongolia ...**





... my (first!) impressions of UB / Mongolia ...



I had to learn very soon, that it is essential not only to ask for details in the laboratory itself, but also trying to understand the basics of the existing health care system in Mongolia and - very important - the country itself!

- great changes / fast development within the last years
... even right now!**
- some unique conditions
... like weather, great distances, infrastructure etc.**

may have an influence on the availability and management of microbiological diagnostics (e.g. methods)



... in german laboratories usually:

- **management / marketing-department decides the strategy: cost-effective or highest quality?**
- **medical director choses the diagnostic method**
- **medical director negotiates the terms of costs and delivery: buying or leasing?**
- **every equipment and all test-kits are usually available always and everywhere, and are ordered / delivered within a few days**

... and very useful: test-periods / training on the job !

...manufacturers give the opportunity to test new systems for weeks/months! (costs: only installation/testkits)

... otherwise new equipment may be a risky capital investment!

Not every good equipment is suitable for every laboratory!





... the found situation of laboratories in UB ...

laboratories in general:

- **buildings / laboratory-rooms**

- not always modern room-arrangements: suboptimal workflow!
(but: often new laboratory-rooms planned or they are ready to move)

- **companies / reliable and guaranteed delivery**

- not always sufficient technical support available: no short reaction time!
(modern technical equipment is mostly very sensitive!)

- **health care system / prescription of antibiotics**

- free availability of antibiotics and treatment without medical indication
(one cause for the increase of Multi-Drug-Resistance!)

- **costs**

- sometimes not effective use of equipment and testkits could be found
(donated equipment is available - substances and reagents are not)

- **skill-level of staff / motivation of employees**

- ... very gratifying: cooperative, engaged, motivated staff!
(finding suitable solutions for changing and even suboptimal conditions)



specimen

- **amount of specimen in microbiological laboratories**

- **evaluating about 50 to 120 specimen a day**
(from own hospital / institution - but even brought in by outpatients)
- **sometimes from other hospitals / medical centers**
- **NCCD: in the case of an outbreak it is possible to perform up to several hundreds of specimen a day**
(larger amounts of some ready-to-use media may be available)





a common trend in Germany:

not every hospital provides microbiological diagnostics
less specimen / throughput = more expensive diagnostics

- **fast + appropriate transport of specimen is important**
 - suitable containers**
(... against danger of contamination!)
 - suitable temperature**
(... living bacteria are needed!)
 - suitable time**
(shuttle-transport 1-3 times a day; cooling bags!)





• letters of transmittal

important for effective microbiological diagnostic is profound information about:

- **patient:** (clinical symptoms, suspected diagnosis etc.)
- **specimen:** (kind of specimen, localisation etc.)

helpful for a fast and result-oriented bacteriological diagnostics
and is essential for deciding between examination in the routine-laboratory
or in a room with higher security-class (e.g. MDR, Tuberculosis)

Anforderungsschein für Mikrobiologische Untersuchungen

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Dr. Eberhard & Partner

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44137 Dortmund

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Bitte freilassen

Materialannahme:
Mo.-Fr. 7.30 – 16.30 Uhr
Sa. 7.30 – 12.30 Uhr

Patientenangaben / ggf. Patientenetikett:

Name _____

Vorname _____ Geb.-Datum _____

Straße _____

PLZ _____ Ort _____

Einsenderangaben:

Krankenhaus _____

Station _____ Fachbereich/
Kostenstelle _____

stationär / Regelleistung (Rechnung an Krankenkasse)
 stationär / Wahlleistung (Rechnung an Patient)
 Abrechnung mit Ü.-Schein (bitte beifügen)
 privat (Rechnung an Patient) ambulant

Kostenträger: PostB. BG Knappsch. All
(nur bei Priv.-Pat.) KVB-Kl. Stud. KV Sonstige

Stempel und Unterschrift / ggf. Einsender-Etikett
 EILT! telefonische Nachricht erwünscht:

Tel.: _____ Fax: _____

patient

(name, date of birth,
home-address)

laboratory

(name, Tel.-number,
mail, opening hours etc.)

sender

(institution, clinic, ward,
perhaps name of doctor)



- kind of specimen - e.g. swab, urine / stool / liquor / blood ...

incl.:

localisation (which pathogenic bacteria do we expect at this location?)

date of collection (suited specimen?)

suspected diagnosis (urgent specimen?)

clinical symptoms and antibiotic treatment
(if yes: given substance)

Art des Untersuchungsmaterials				
<input type="checkbox"/> Abstrich	(Lokalisation)		Abnahmedatum	Uhrzeit
<input type="checkbox"/> Punktat	(Lokalisation)		<input type="checkbox"/> Erstuntersuchung	<input type="checkbox"/> Kontrolle zu Befund
<input type="checkbox"/> Sekret	(Lokalisation)		Verdachtsdiagnose/ Bemerkung	
<input type="checkbox"/> Wundabstrich	<input type="checkbox"/> Magensaft	<input type="checkbox"/> Stuhl		
<input type="checkbox"/> Sputum	<input type="checkbox"/> Tracheal-Sekret	<input type="checkbox"/> Bronchial-Sekret		
<input type="checkbox"/> Blutkulturen	<input type="checkbox"/> i. v. Katheter	<input type="checkbox"/> Liquor		
<input type="checkbox"/> Urin-Mittelstrahl	<input type="checkbox"/> Urin-Tauchmed.	<input type="checkbox"/> Katheter-Urin		
<input type="checkbox"/> Sonstiges:			Antibiotika-Therapie	<input type="checkbox"/> nein <input type="checkbox"/> ja, welche?
			<input type="checkbox"/> Hygiene-Untersuchung	<input type="checkbox"/> Personal-Untersuchung



- desired diagnostics: NO stool:

**common pathogenic bacteria, Tuberculosis, yeasts ...
or focussed ONLY on MRSA, VRE, ESBL, Meningococcus etc.**

Gewünschte Untersuchung(en)	
Allgemeine Diagnostik (außer Stuhl)	Stuhl Diagnostik
<input type="checkbox"/> Allgemeine pathogene Keime Kultur aerob; ggf. anaerob, Mikroskopie, Resistenzbestimmung	<input type="checkbox"/> Allgemeine pathogene Keime Campylobacter, Salmonellen / Shigellen, Yersinien incl. EHEC (3) bei Kinder < 3 Jahre: incl. Rota- / Adeno-Viren [EIA]
<input type="checkbox"/> Tuberkulose-Erreger Kultur, Mikroskopie; ggf. Resistenzbestimmung	<input type="checkbox"/> Darmparasiten (Würmer / Wurmeier, incl. Amöben / Lamblien)
<input type="checkbox"/> Pilze / Hefepilze	Einzelanforderungen:
Einzelanforderungen: (nicht immer in „Allg. path. Keime“ enthalten!)	<input type="checkbox"/> Salmonellen / Shigellen <input type="checkbox"/> Clostr. difficile-Toxin [EIA]
<input type="checkbox"/> β-hämolysierende Streptokokken (u.a. Scharlach-Erreger)	<input type="checkbox"/> Campylobacter <input type="checkbox"/> Würmer / Wurmeier
<input type="checkbox"/> Clostridium perfringens (Gasbrand)	<input type="checkbox"/> Yersinien <input type="checkbox"/> Amöben [EIA]
<input type="checkbox"/> MRSA (Methicillin-/ Oxacillin-resistente Staphylococcus aureus)	<input type="checkbox"/> toxinbild. E.coli / EHEC (3) <input type="checkbox"/> Lamblien [EIA]
<input type="checkbox"/> VRE (Vancomycin-resistente Enterokokken)	<input type="checkbox"/> Rota-Viren [EIA] <input type="checkbox"/> Oxyuren (Mikrosk.; Analfilm)
<input type="checkbox"/> Listerien	<input type="checkbox"/> Adeno-Viren [EIA] <input type="checkbox"/> Cryptosporidien [EIA]
<input type="checkbox"/> Cryptococcus	<input type="checkbox"/> Astro-Viren [EIA] <input type="checkbox"/> Norwalk-Viren [PCR]
<input type="checkbox"/> Meningokokken [Liquor: PCR]	Sonstiges:
<input type="checkbox"/> Dermatophyten (Nägel, Haut etc.)	
<input type="checkbox"/> Plasmodium sp. (Malaria)	
weitere Erreger: Urogenital-Infektionen	
<input type="checkbox"/> Ureaplasma urealyticum / Mycoplasma hominis (1)	
<input type="checkbox"/> Gardnerella (2) <input type="checkbox"/> Trichomonas (2) <input type="checkbox"/> Candida (2)	
	(1) ggf. spezielle Transportmedien! (2) Direktnachweis mittels DNA-Hybridisierungstest (3) toxinbildungsfähige E.coli / EHEC, hämolyt.-urämisches Syndrom; siehe auch Epidemiol. Bulletin 31 / 99

- desired diagnostics: stool

**common pathogenic bacteria, parasites ...
or focussed ONLY on Clostridium difficile (toxine),
Campylobacter, Salmonella/Shigella, EHEC, Noro-Virus etc.**



- **example: workflow incoming specimen**

plausibility-check

(letter of transmittal fits to specimen?)



1. recording-step: specimen-data

(kind of specimen, desired diagnostics)



labelling specimen and letter of transmittal with a unique Lab-number (barcode)

(barcode)

distributing the specimen to the concerning working-area

(reading barcode and labelling culture-media with Lab-number)



start of examination immediately!

scanning the letter of transmittal and

2. recording-step: patient-/sender-data

(2. recording-step: Name, date of birth etc.)





laboratory rooms

often to find in elder buildings:

- **suboptimal arrangements / environments:**

- **delivery-ways for good are complicated**
(stairs, long ways, no good closing doors, too little storing place for incoming goods and waste etc.)
- **electric- and water-installation is sometimes not sufficient**
(a lot of plug connectors for very sensitive (!) equipment etc.)
- **ventilation facilities are not existing or not sufficient working**





- working-places that should be close together (one room) are often disconnected no optimal workflow!

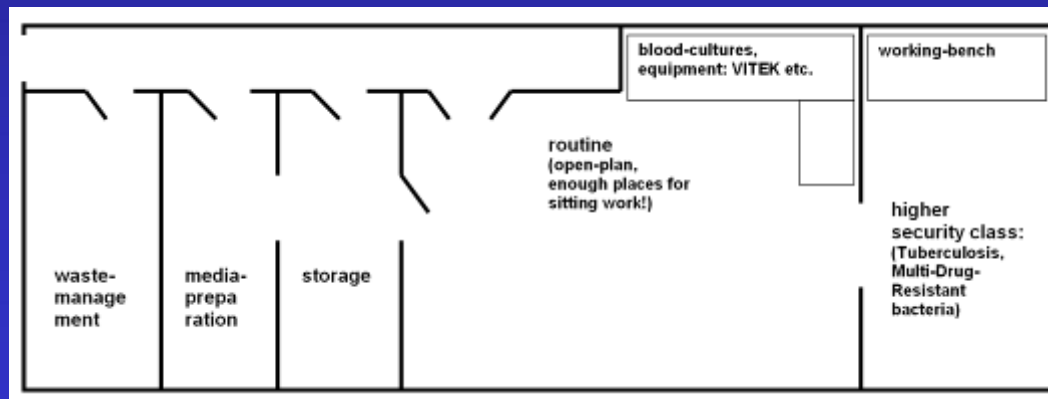
in Germany nowadays often open-plan microbiological laboratories:



routine-laboratory



higher-security-class

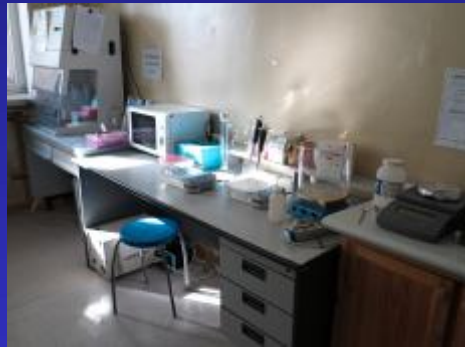


... for example without PCR ...

... diagnostics of tuberculosis (or other high-risk-bacteria), media-preparation and waste-management is separated.



- **high-risk-bacteria are sometimes examined at the same working place as less pathogenic bacteria (separation recommended!)**
- **even writing places and aereas for preparing specimen should be strictly separated**
- **all surfaces should be suitable for a sufficient disinfection e.g. furniture, seats (covering with well tendend cloth: only a good in-between-solution)**





- not enough desk-areas for work in sitting position

- streaking of urines and wound-swabs onto culture-media must not necessarily be done under a working bench.

... but sometimes there is no alternative: one of the few areas for sitting position in the laboratory is the working bench...!



... better alternative:





- it seems not to be possible to implement a sufficient microbiological diagnostic in every hospital / institution in UB within a short time

... and perhaps it is not necessary!

For smaller medical centers the sending of specimen (shuttle-transports) to other hospitals with a well equipped microbiological laboratory will be the better alternative - at this time...

Annotation: ... plants in a microbiological laboratory?

... lovely, but especially in a microbiological laboratory this is "suboptimal" (mould fungus!) ... in Germany not allowed!





culture media

- **manual media preparation - always low costs?**

requirements:

- **clean glassware (strictly divided: preparation vs. waste)**
- **exact weighing of substances (scale must be sensitive enough)**
- **using sterile / bacteria-free water and suited blood-products**



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- **sterilisation of all recommended material**
- **testing the proper functionality / performance !**
(control: streaking with several ATCC-strains; very expensive!
haemolysis, reproducible susceptibility-testing by agar-diffusion etc.)
- **incubation for some days without inoculation**
(contamination?)
- **clean / dark storage under constant temperature-conditions**



In some cases not all points are managed sufficient. If the amount of specimen is increasing in the future, it is recommended to think about

- **applying ready-to-use media from certified companies ?**
...fulfill all standards, no additional testing, always same performance assured!



diagnostic equipment

A broad spectre: from low level to very well equipped laboratories

- **inoculation – reusable inoculation loop**

- decontamination is mostly done by flame-scarfing

In Germany:

- single-use-inoculation loops are more comfortable and shure!
- no additional equipment for decontamination
- no flame (open fire close to alcohol in the laboratory...)






• **incubators**

- **condition are very different:**
old (chinese/russian) and newer (asian/european standard);
sometimes labelled as a donation or gift.



- **the temperature inside should be checked every morning**

Thermometer: protocol-sheet to guarantee a proper technical condition (quality management).

 Laboratoriumsmedizin Dortmund Dr. Eberhard & Partner	Temperature-documentation Incubators tolerance: ± 1°C*	Number: F107 Date: 19.02.08 Version: 3.1 Page 1 of 1
	desired value: internal equipment-number:	Document-Name: F107 Temperature-documentation Incubators

month / year:				
	Temperature	CO ₂ -value	Aqua dest	sign
1				
2				
3				
4				
5				

month / year:				
	Temperature	CO ₂ -value	Aqua dest	sign
1				
2				
3				
4				
5				



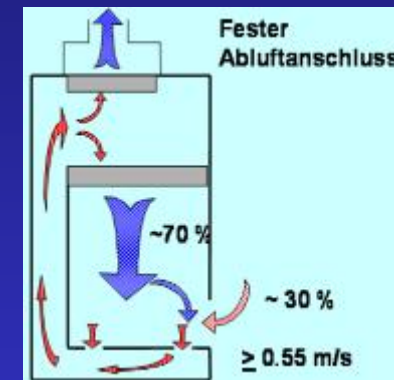
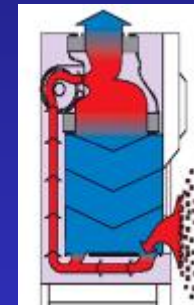
• laminar air flow / working bench

- quite new, but never used ...
effective capital investment?
 - missing connection to a ventilation facility
 - no necessity – currently no relevant specimen



- **suboptimal situations in the cabinets?**
due to the technical principle
of working benches:

**free airflow through
the desk is necessary!**



- **important: signs of failure
and technical support!**

**...display showed:
„Air Flow Failure“**



...reason should be investigated soon!



- **too much specimen, equipment, sheets of paper etc.**
 - > **no proper function of filtering system**
 - > **no proper protection of staff! *BIOHAZARD!***



- **methods**

- **identification and susceptibility-testing: e.g. VITEK**
 - some new equipment available - usage highly recommended:
 - faster and more sensitive than API
 - includes „Expert-software-system“ for testing the plausibility of results (hundreds of rules checked)





- incubating anaerobic bacteria

some very old fashioned methods in contrast to new equipment:
High-tech-equipment really recommended?



less expensive alternatives available - esp. for lower amount of specimen:

- normal incubator (multi-purpose)

+ anoxomate with corresponding containers

or + e.g. BBL-GasPak-system / BectonDickinson

(palladium catalyst, that can be rejuvenated by heating at 160-170 °C for two hours; waterless; convenience for use in producing anaerobic, microaerophilic or CO₂-enriched environments)





**- blood-cultures – incubation for how long?
should be done by automatisated methods
like BactAlert (BioMerieux) or BACTEC (BectonDickinson)**

- > measuring growth of bacteria by non-invasive technique!
- > because of slow growing bacteria / yeasts: min. 7-days-incubation!

In our laboratory 7 days-incubation in the routine!
In-between-results communicated to doctors after 2 days with a comment:
"No growth until 2 days of incubation - in case of growth an additional result will be sent. Total Incubation-time: 7 days"

In the case of endocarditis: 14/21-days-incubation
(slow growing: Kingella, Cardiobacter, Eikenella, Aggregatibacter etc.)





identification of bacteria

The mainly used method for identification is the API-system - a reliable method:

- **API-method: ... easy, well experianced, mostly valid**

- interpretation by the staff (subjective)
- some problems with detection of bacteria
(gram (+) bacilli, Streptococci etc.: not to find in database;
discrimination between Streptococcus mitis and Streptococcus oralis
often not significant etc.)





- **automatisation: ... faster, more sensitive and specific**

e.g. VITEK (BioMerieux), Phoenix (BectonDickinson) or MicroScan (Siemens):

- interpretation by an photometer (objective)

- revision of the results by an "Expert-Program"

(software which suggests plausibility-checked identifications of bacteria - even for susceptibility-testing!

... advantage concerning quality management)

The configuration of the used panels / cards must be well chosen; good experience we had with the panels:

gram (negative) bacteria:

routine:	AST-N118
MDR:	AST-N110

gram (positive) bacteria:

Staphylococci:	AST-P580
Enterococci	AST-P586



Staphylococci, Enterococci and Enterobacteriaceae are usually provided well.

... but also here you can find some problems with the discrimination of Streptococci (special cards available).

... Non-fermenters show some gaps

... anaerobic bacteria are sometimes better identified by API ...



susceptibility-testing of bacteria

• agar diffusion

mainly used method for susceptibility-testing in UB/Mongolia is agar-diffusion:

- a valid and good evaluated technique

... but well known:

- measuring (diameter) and
- interpretation (in vitro- vs. in vivo-effectiveness of antibiotics)

implicates some problems!

(e.g. the Oxacillin-testing for the detection of MRSA)



dispenser





• important rules - who is the „Expert“?

... it must be assured, that important rules are considered like (short excerpt):

• **Enterococcus faecium:**

- natural resistance ; always R at nearly all β -lactam-antibiotics (Cephalosporines/Penicillines; even combinations with β -lactam-inhibitors)

• **Klebsiella pneumoniae:**

- natural resistance ; always R at Ampicillin-/Amoxicillin and Mezlocillin-/Piperacillin
- Imipenem-R: Carbapenemases / Carbapenem-resistance !

• **Proteus spp.:**

- natural resistance ; always R at Nitrofurantoin and Tetracyclin
- Imipenem-R: NO Carbapenemases (poor target for Proteus spp.)

• **Pseudomonas aeruginosa:**

- natural resistance ; always R at Ampicillin-/Amoxicillin (even combinations with β -lactam-inhibitors) and most cephalosporines (e.g. Cefaclor, Cefazolin, Cefotaxim / Ceftriaxon) and Cotrimoxazol, Nitrofurantoin, Tetracyclin, Moxifloxacin, Trimethoprim, Tigecyclin ...
- Imipenem-R: Carbapenemases/Carbapenem-resistance !

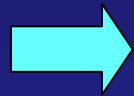
• **Staphylococcus aureus:**

- if MRSA (Oxacillin-R): all β -lactam-substances and Carbapenems are R



• range of antibiotics, that should be tested

The measured values must always be revised (plausibility!) and sometimes adopted to the rules, because the communicated results should be:



advice for an effective antimicrobial treatment!

Sometimes not all relevant antibiotics are tested because of the lack of availability - perhaps because of the lack of money.

Very important first:

- **to set terms of susceptibility-testing**
(which spectre of antibiotics should be tested for the bacteria-groups?)
- **to assure the availability of all these substances and then**
- **to establish this as a "standard"**
(... ideally in all microbiological laboratories in UB (a challenge!))

Practical hint:

... for methods like agar-diffusion and also minimal-inhibitory-concentration (e.g. VITEK) the inoculation has to be done with a

- **defined amount of bacteria (NCCLS/CLSI, McFarland etc.) and**
- **only pure monocultures**

will give sufficient results.



• automatisisation – the „Expert“ is included !

... a more modern kind of susceptibility-testing of bacteria:

- usage of an automated system

like VITEK/BioMerieux® or Phoenix/BectonDickinson®



great advantage is:

- the included "Expert-Program"-software

adopted to hundreds of rules concerning the susceptibility-testing

... software verifies the measured values and gives some suggestions for changing the values:

- 3 values during the examination:

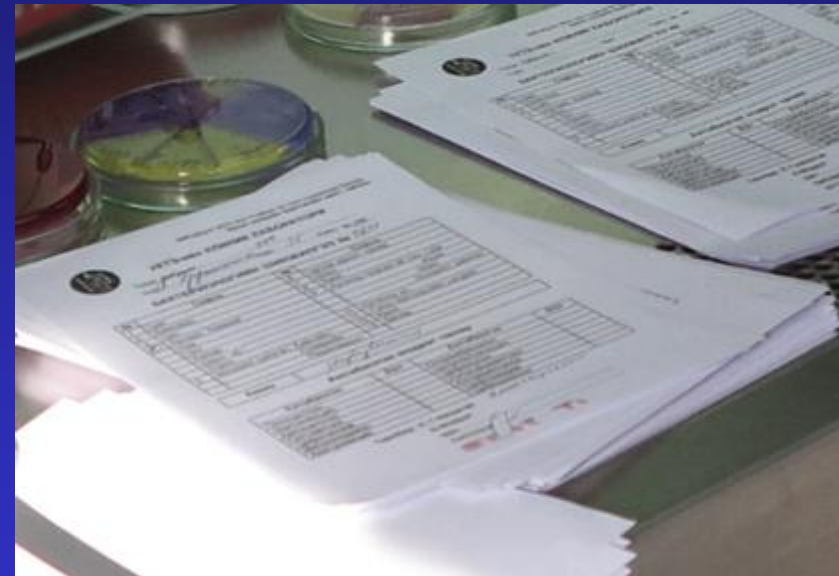
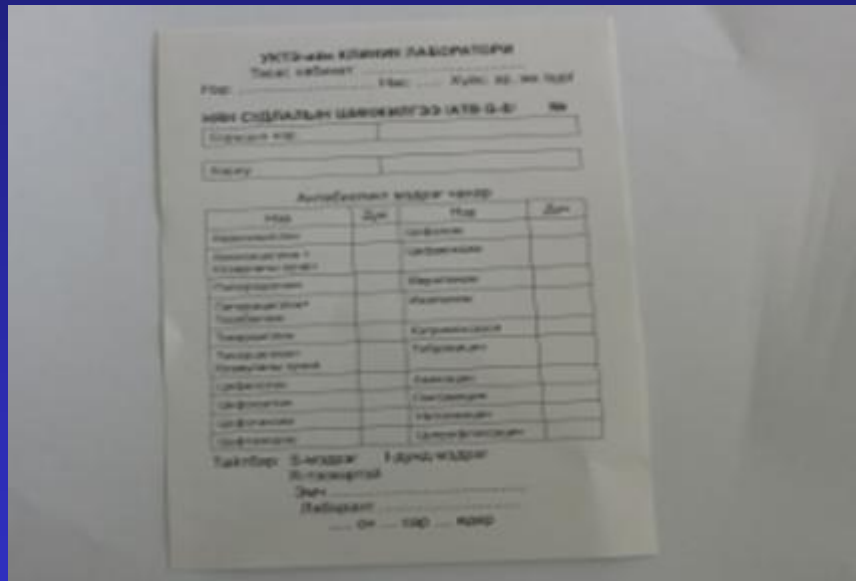
measured value ➡ **suggestion (Expert-Program)** ➡ **result**

To find a result for an effective antimicrobial treatment, this way is more comfortable and also better documented in the case of quality management.



results / reports / software / statistics

... results are mostly communicated as handwritten sheets - including patient-data, identification and susceptibility-testing of bacteria.



... sometimes the results afterwards are put into a software program to be able to do some statistics; in some cases periodically sent to governmental health-institution



• comments on important results:

... e.g. MRSA,
VRE, other
multi-drug-resistant
bacteria ...

Abnahmedatum: 31.12.12 01:00

Klinische Angaben:

UNTERSUCHUNGSMATERIAL:

Nährmedium MRSA (NRR)

ANGEFORDERTE UNTERSUCHUNGEN:

Staphylococcus aureus: MRSA
(Methicillin-/Oxacillin-resistent)

NACHGEWIESENE KEIME:

1. Staphylococcus aureus
(mäßig viel)

BEMERKUNG:

**C A V E ! MRSA: Methicillin/Oxacillin-
resistenter Staphylococcus aureus!**

mecA-Gen [PCR] : POSITIV

mecC/LGA251-Gen [PCR] : negativ

PVL-Gen (community-
acquired/CA-MRSA) [PCR] : negativ

Sequenztyp ST398 (livestock-
associated/LA-MRSA) [PCR] : negativ

casus vorab telefonisch mitgeteilt

HINWEIS zum Infektionsschutzgesetz:

Folgende hier nachgewiesenen Keime
sind aufgrund ihrer Resistenz in der
Liste der gemäß §23 IfSG zu erfassen-
den Erreger aufgeführt:

* Staphylococcus aureus

Unverbindliche Kodierempfehlung:

S. aureus als Erreger: B95.6!

zusätzlich zu kodieren:

Staphylococcus aureus mit Resistenz
gegen Oxacillin: U80.0!

Keimträger von MRSA: Z22.3

ggf.: Isolierung wegen MRSA: Z29.0

Auch an OPS 8-987 denken (Krankenhaus-
hygienische Komplexbehandlung)!

ANTIBIOGRAMME

1.

Ampi-/Amoxicillin R

Mezlocillin R

Piperacillin R

Penicillin G R

Amoxicillin+Clavulans. R

Ampicil.+Sulbactam R

Piperacil.+Tazobactam R

Cefazolin R

Cefuroxim R

Cefotaxim/Ceftriaxon R

Imipenem R

Meropenem R

Oxacillin R

Gentamicin S

Tobramycin S

Fosfomycin S

Ciprofloxacin R

Levofloxacin R

Cotrimoxazol S

Tetracyclin S

Erythromycin S

Clindamycin S

Vancomycin S

Teicoplanin S

Linezolid S

Fusidinsäure S

Rifampicin S

Mupirocin S

(S=sens. I=interm. R=resistent)



- **important role: Laboratory-Information-System (LIS)**

advantage of a powerful LIS: paperless documentation!

- all diagnostical steps in the LIS-network - until the results!
 - even for quality management - in a comfortable way!
- ... and additionally this workflow could support cost management!

1. step: workflow incoming specimen / start of examination:

- incoming specimen with the patient data and desired diagnostics
- labelling (unique identification-number) and entering data into the LIS
- start of examination (inoculation/cultural methods)

2. step: workflow ongoing examination at following day(s) / results:

- calling ID in the LIS (barcode)
- entering single results/data (methods)
- last day: printing a result

All data of patient, sender, kind of specimen, desired diagnostics and results are available in an electronical/paperless form:

... in most cases the LIS also provides sufficient Statistics and a connection to other computers (via intranet to doctors).





• HTML- results by "virtual-private-net"/ VPN:

criteria: name,
date of birth
etc.

list of viewable
current results
concerning the
selected patient

The screenshot shows a web browser window titled "HTML-Befund - Microsoft Internet Explorer". The address bar displays a URL starting with "http://hmbefi/loginesult.php?P=...". The main content area is a search interface with the following elements:

- Logout nach: 10 Minuten | Max. Treffer: 100
- Suchkriterien**
 - Nachname:
 - Vorname:
 - Geburtsdatum: / /
 - Labornummer:
 - Fahrnummer:
 - Lebensnummer:
 - Auftragsnummer:
 - Auftragsdatum: 10 / 11 / 2004
 - Suchbereich: -14 Tage
 - Alle
 - Einsender:
- Buttons: **Befundsuche starten**, **Felder zurücksetzen**, **Einsender abbekommen**
- Sortierung: Befunde sortiert nach: Nachname

On the left side, there is a list of patient names under the heading "Patient-Nachname":

- 002_0064_B
- 5005002
- 5005006
- 5113032
- 5144609
- 5102251
- 542174
- 542179
- 542714
- 543194
- 543456** (highlighted in red)



HTML-Befund - Microsoft Internet Explorer

Adresse: <http://htmlbef/loginresult.php?PHPSESSID=b7efe7604d6c2f6747dce9f609476f4c>

100
selektierbar
1 11

Patient-Nachname

- 002_0964_B
- 31.07.1979
- BA625832_26.10.2004**
- 5007402
- 507806
- 51632
- 4689
- 2251
- 2174
- 2179
- 42714
- 43194
- 43496

Laboratoriumsmedizin Dortmund
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Patient
002_0964 B.,

Thyssen Krupp Stahl AG
(570) Betriebsärztl. Dienst Dortmund

Eberhardstr. 12
44145 Dortmund

Tagennummer	Geburtsdatum	Eingangsdatum
625832	31.07.1979	26.10.04
Ihr Zeichen	Ausgangsdatum	
	28.10.04	

Status: END-BEFUND | Blatt: 1

Mikrobiologischer Befundbericht

Abnahmedatum : o. Ang.
Klinische Angaben:

UNTERSUCHUNGSMATERIAL:
Stuhl

ANGEFORDERTE UNTERSUCHUNGEN:
Campylobacter
Salmonellen / Shigellen
Yersinien

selection and
preview of the
result

... fast communication of results for all senders !



• statistics of UB: wards/bacteria

Wards	Total probe	Positive																		
		Blood				Stool				Sputum				Wound						
		Gram (+)	Gram (-)	Fungi	Other	Gram (+)	Gram (-)	Fungi	Other	Gram (+)	Gram (-)	Fungi	Other	Gram (+)	Gram (-)	Fungi	Other			
ICU and ER	148	76	2	3					2				19	7	10		7	2		
General Surgery	71	28							1				1		2		7	9	1	
Gastroenterology	72	25	1	1									2							
Nephrology	90	38	1										2	2	3		1			
Hematology	64	43											9		4					
Cardiology	29	12											1	1	1		1			
Pulmonology	40	28											17	3	7					
Endocrinology	17	7		1									1		1		2			
Urology	36	9															1	3		
Proctology	35	28											1		1		5	16	1	
Maxillofacial surgery	62	26	2										1				21	1		

	Total number	Ampicillini		Erythromycin		Cefotaxim		Chloramphenicol		Ciprofloxacin		Gentamycin		Cefuroxime	
		S	R	S	R	S	R	S	R	S	R	S	R	S	R
		Gram (+)													
S.aureus	85	15	68	12	13	60	4	35	33	44	16	13	7	57	17
Other staphilococci	54	5	49	1	9	32	12	44	25	58	13	11	1	34	16
Streptococcus	39	11	28	1	15	32	1	12	21	16	18	4	10	28	12
Enterococcus	25	4	21	1	5	10	10	15	7	10	11	1	9	6	17
S.pneumoniae															
gram (+) bacillii	1		1			1		1							1
Aerococcus viridans															
Gram (-)															
E.Coli	54	3	51	2	16	36	6	37	9	24	15	5	15	24	21
Ps.aeruginosa	7		6			1	5	1	5	2	4	1	1		6
Citrobacter															
Klebsiella	4		4	1	1	2		2		2	1	1		1	2
Proteus	1		1								1				1
Enterobacteriaceae	15		14	4	6	3	7	5	4	5	7	2	1	2	11
E.agglomerans															
Providencia rettgerii															

seemingly non-plausible results (lists not complete?):

- **gastroenterology:**
 - no detection of bacteria in stool?
- **cardiology:**
 - no positive blood culture (inoculating volume to little? no endocarditis?)
- **nephrology/urology:**
 - only few positive urines
(unusual: nephrology same amount as in gastroenterology;
more gram(+) bacteria than gram(-)?
Enterococcus / Staphylococcus / contamination?)



● **statistics of UB: bacteria/drug-resistance**

- **Oxacillin / Vancomycin:**
 - not tested (Staphylococcus aureus: MRSA!; Enterococcus: VRE!)
- **Erythromycin:**
 - all gram(-) bacteria like E.coli, Klebsiella, Acinetobacter usually resistant!
- **Staphylococcus aureus:**
 - Penicilline and Oxacilline not tested in routine?
 - difference between the Cephalosporines
(depending on Oxacilline > should be the same!)
- **Staphylococcus (other):**
 - difference between the Cephalosporines
(Oxacilline not in routine?)
 - Penicilline tested only for 1 isolate?
- **Streptococcus:**
 - Penicilline not tested?
 - Ampicilline-resistance usually rare
(lokal situation?)
 - Cephalosporine-resistance usually rare
(lokal situation? ... perhaps Enterococcus?)
 - Aminoglycosides nearly always resistant
(not obligatory "high resistance")



- **Enterococcus:**
 - **Cephalosporines and Aminoglycosides always resistant**
(in vitro "sensitive": result has to be changed to "resistant"
... patient should not be treated with these drugs!)
- **E.coli:**
 - **Cefotaxim and Ceftriaxone quite often resistant**
(a lot of ESBL-positive isolates?)
- **Pseudomonas:**
 - **3. gen. Cephalosporines (Cefotaxim, Ceftriaxone) always resistant**
- **Klebsiella:**
 - **2 isolates Cefotaxim-resistant / 2 isolates Ceftriaxone-sensitive**
(same isolates? Only one antibiotic tested? otherwise not plausible: should be identical)
- **Acinetobacter:**
 - **Cotrimoxazol in our laboratory mostly sensitive - here all resistant?**

... highly recommended:

to use a valid, effective, fast, sensitive and safe method for susceptibility-testing like the automated techniques in the microbiological laboratories, which usually provides most of the relevant antibiotics.



monitoring: clinical/epidemiological relevant bacteria

(statistics every six months ... or on demand)

list of all cases (patients) with relevant bacteria (special drug resistance) including patients name, date of detection, clinic, ward etc.

Hybase 6 Statistik MVZ Dortmund - Mikrobiologie Labor Dr.Eberhard u. Partner Balkenstr. 17-19 44137 Dortmund	separate Niederschrift gemäß §23 IfSG (Erreger mit besonderen Resistenzen)	01.12.2011 bis 10.12.2011 Einsender: Krankenhaus St.Muster	Stat.: Station Muster 05
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Staphylococcus aureus

Ni Patient	Erstnachweis	GENTAMICIN	OXACILLIN	VANCOMYCIN	SYNERCID	TEICoplan	MOXIFLOXACIN	Bemerkung
1 Name / Vorname	Datum / Labor-Nr. / Station	R	S	S	-	S	-	Abstrich Blase
2 Name / Vorname	Datum / Labor-Nr. / Station	S	R	S	-	S	-	Abstrich Nasen-/Rachenraum oder Wunde nicht gekennzeichnet
3 Name / Vorname	Datum / Labor-Nr. / Station	S	R	S	-	S	-	Urin-Tauchmedium

Streptococcus pneumoniae (Pneumok.)
 --- Kein Befund ---

Enterococcus faecalis
 --- Kein Befund ---

Enterococcus faecium
 --- Kein Befund ---

Escherichia coli

Ni Patient	Erstnachweis	CEFOTAXIM	OFLOXACIN	CIPROFLOXACIN	AMIKACIN	IMIPENEM	CEFTAZIDIM	PIPERAC.+TICLACIDIN	CEFOTAXIM	MEROPENEM	LEVOFLOXACIN	Bemerkung
1 Name / Vorname	Datum / Labor-Nr. / Station	-	-	R	-	S	S	S	S	S	R	Urin-Tauchmedium
2 Name / Vorname	Datum / Labor-Nr. / Station	-	-	R	-	S	R	R	R	S	R	Abstrich Abdomen



list of all bacteria and the corresponding specimen / total frequency; revised > same patient and same specimen > counted only once

Hybase 6 Statistik MVZ Dortmund - Mikrobiologie Labor Dr.Eberhard u. Partner Balkenstr. 17-19 44137 Dortmund (Tel. Hr.Roßburg: 0231 / 9572-614)	Statistik - Verteilung Erreger - Material	01.12.2011 bis 10.12.2011 Einsender: Krankenhaus St.Muster	Stat.: Station Muster 05
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nur ein Erregernachweis pro Patient, im gleichen Material

Erreger-Gruppe / Materialien - Gruppe	Gesamt	Abstrich (Sonstige)	Abstrich Bauch-raum	Abstrich Cervix/ Uterus	Abstrich Fuß/ Diabetes	Abstrich Gelenk/ Knochen	Abstrich Körper-oberfläche	Abstrich obere Atemwege	Abstrich Organe	Abstrich untere Atemwege	Abstrich Urethra	Abstrich Wunde/ Eiter	Biopsat/ Excision	Katheter: venös	Kult aer Blut
Gesamt	555	18	3	4	2	1	48	93	2	3	2	27	1	12	
Anzahl ausgewerteter Materialien	335	10	2	2	1	1	21	46	1	1	1	16	1	11	
Materialien mit einem Erreger	178	7	1	0	0	1	6	8	0	0	0	8	1	10	
Materialien mit 2 Erregern	109	0	1	2	1	0	10	30	1	0	1	5	0	1	
Materialien mit 3 Erregern und mehr	48	3	0	0	0	0	5	8	0	1	0	3	0	0	
E1 Acinetobacter spp.	4							1							
E1 Bacteroides spp.	4	1						1				2			
E1 Campylobacter jejuni	1														
E1 Candida albicans	24	1					1	1				1		1	
E1 Candida glabrata	6						1								
E1 Candida spp. (non-albicans/-krusei/-glabrata)	4														
E1 Citrobacter spp.	1														
E1 Clostridium spp. (non-perfringens/-tetani)	9														
E1 Corynebacterium spp. (non-diphtheriae)	1						1								
E1 Coryneforme Bakterien	5							1							
E1 Enterobacter spp.	9	1						1	2						
E1 Enterococcus faecalis	8	2		1				1				1		1	
E1 Enterococcus faecium	11	1	1					1				1		1	



**sensitive antibiotics for important bacteria / in parenthesis number of isolates;
revised > same bacteria, same patient and same specimen > counted only once**

Hybase 6 Statistik MVZ Dortmund - Mikrobiologie Labor Dr.Eberhard u. Partner Balkenstr. 17-19 44137 Dortmund		Übersicht Erreger-Resistenzen Resistenzen - Vergleich sensibel				01.12.2011 bis 10.12.2011 Einsender: Krankenhaus St.Muster		Stat.: Station Muster 05	
nur ein Erregernachweis pro Patient, im gleichen Material, Strategie: zeitlicher Verlauf					Interpretation: voll sensibel in [%] (Anza				
Antibiotika / Erreger-Gruppen	E1 Enterobacter spp.	E1 Enterococcus faecalis	E1 Enterococcus faecium	E1 Enterococcus spp. (non-faecalis/-faeci	E1 Escherichia coli	E1 Klebsiella pneumoniae	E1 Proteus spp.		
Ampic./ Amoxic.	0% (7)	100% (6)	10% (10)	100% (27)	53% (76)	0% (19)	33% (12)		
Amoxic. + Clavulans.	0% (7)	100% (6)	10% (10)	100% (27)	67% (76)	63% (19)	58% (12)		
Mezlocillin	57% (7)	100% (6)	10% (10)	100% (27)	53% (75)	0% (19)	42% (12)		
Piperacillin	57% (7)	100% (6)	10% (10)	100% (27)	54% (76)	0% (19)	42% (12)		
Gentamicin	86% (7)	0% (6)	0% (10)	0% (27)	92% (73)	83% (18)	92% (12)		
Tobramycin	86% (7)	0% (6)	0% (10)	0% (27)	88% (76)	84% (19)	92% (12)		
Ciprofloxacin	86% (7)	0% (6)	0% (10)	0% (27)	74% (76)	74% (19)	83% (12)		
Cotrimoxazol	86% (7)	0% (6)	0% (10)	0% (27)	68% (76)	79% (19)	42% (12)		
Tetracyclin	86% (7)				59% (76)	79% (19)	0% (12)		
Penicillin									
Erythromycin									
Clindamycin									
Oxacillin									
Vancomycin		100% (6)	80% (10)	100% (27)					
Imipenem	100% (7)	100% (6)	10% (10)	100% (27)	100% (76)	100% (19)	0% (12)		
Ceftazidim	57% (7)				87% (75)	63% (19)	67% (12)		
Ampic.+ Sulbactam	0% (7)	100% (6)	10% (10)	100% (27)	67% (76)	63% (19)	58% (12)		
Piperac.+ Tazobactam	57% (7)	100% (6)	10% (10)	100% (27)	68% (75)	63% (19)	58% (12)		
Cefotaxim/ Ceftriaxon	57% (7)	0% (6)	0% (10)	0% (27)	87% (76)	63% (19)	67% (12)		



quality management

obviously a quality-management seems to be established in most hospitals / institutions ... but it seems to vary:

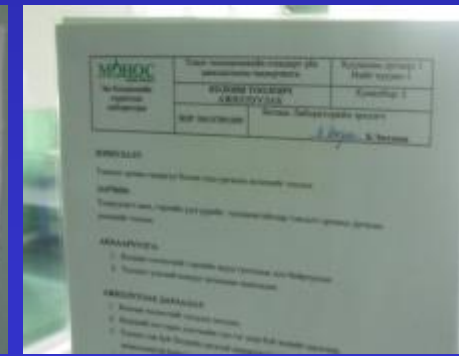
- the range

... documentation of some single methods vs. discription of all/most relevant prodedures in SOP's

- the implementation

... is everyone familiar with the main rules? ... see "Air-Flow-failure" on the display of a used working-bench!

During the implementation of a QMS and the accreditation of our microbiological laboratory in 2003 (DACH) we had to prepare a lot of detailed documents (hundreds of SOP's etc.) concerning all relevant procedures.





• **MIQ/ Microbiological-Infectiological Quality Standards Germany - for example: MIQ Urinary-Tract-Infection:**

newest knowledge concerning microbiological diagnostics

... including main target, epidemiology, detection-methods, indication for microbiological diagnostics of urine ...

• **collection of specimen: techniques**

storing and transport of specimen

possible reasons for wrong germination numbers

processing of urine specimen

- microscopy, leucocytes; culture, choice of media
- methods to evaluate germination numbers

additional methods

- identification and susceptibility-testing
- recommended therapy

• **interpretation of results**

not suitable specimen and methods

methods and cost effectiveness

fast transmission of results

quality control: media, calibration of inoculation-loops

instruction: proper collection of urine specimen (example for female/male)





inter-laboratory-tests.....

- **cooperation – a very helpful instrument**

...for example:

National Center of Communicable Diseases / NCCD:

- **a broad range of diagnostics is provided**
(e.g. biochemistry, virology/STI, immunology and microbiology)
- **department of microbiology is divided into several units**
(like e.g. PCR, air-transmitted infections, intestinal infections, hospital acquired infections and media preparation)
- **staff consists of 25 persons - 10 doctors, 8 technicians and assistances**
- **trainings by these doctors to the staff of all medical centers in Mongolia**
(... even in the aimags outside of UB)
- **the given duty: to support laboratory-management and to control**

The NCCD took an active part in several projects (e.g. WHO-projects, Pneumococcus-vaccine for children etc.) and cooperates with 5 other hospitals.



Very impressive: the improvements during the last 4 years!

... inter-laboratory-tests

(last 2 years; cooperation with an Australian doctor)

... trainings (Multi-Drug-Resistance etc.)

inter-laboratory-tests are a helpful instrument to set standards and to check the efficiency of the microbiological diagnostics in part-taking laboratories:

- **sufficient methods of identification and susceptibility-testing**
- **there should also be tested some more difficult species**
... beside the identification of very common species like E.coli, Staph. aureus, Enterococcus etc.
- **susceptibility-testing with a defined / desired range of antibiotics**





summary

During my visits in microbiological laboratories in Mongolia I found:

very cooperative, motivated, engaged staff !

... doctors / technicians, who are working in very different situations in the several microbiological laboratories

equipment with low standard up to a sufficient / high standard

It is to be hoped, that:

more laboratories will become better equipped

a more wide network of knowledge concerning the improvement of microbiological diagnostics can be built up in Mongolia

... even in the situation of low budgets

Some challenges have to be managed in the future (MDR, healthcare-associated infections, hygiene etc.) - and this seems to be the most successful way.



**I am proud to have the opportunity
to visit your laboratories**



and your wonderful country!

And we all have to bear in mind....



... according to all medical issues it is useful to act as qualified, effective and innovative PARTNERS ...



... working hand in hand, and ...



... remembering hand disinfection!



(... the most important vehicle for microorganisms!)

Please support your hygiene-management !

Thanks for your attention!