

Automation in routine bacteriology - experience with the WASP inoculation robot

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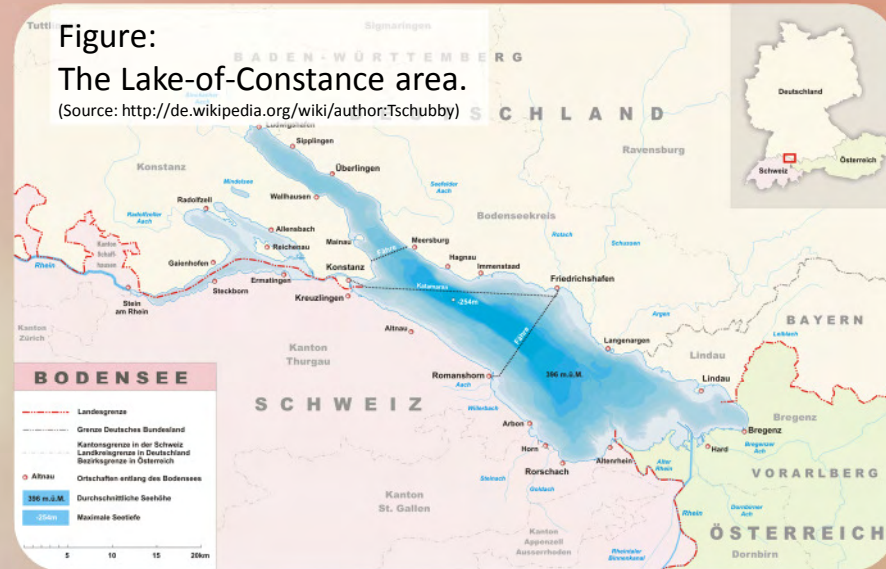
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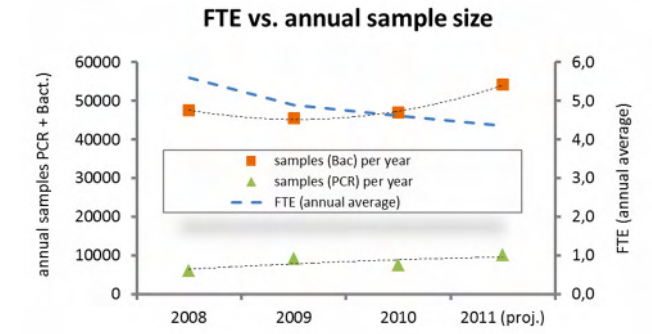
Laboratory characteristics:

- privately owned laboratory, founded 1977
- serving the Lake of Constance region (two counties with appr. 870,000 inhabitants)
- 42 employees (MD's, PhD, Tech, field)
- we are serving:
 - 8 regional hospitals (largest: 425 bed unit/13,000 patients/2008)
 - > 350 office physicians
 - pharmaceutical and food industries, Constance university, ...



Sample development and workforce

- increasing number of orders in PCR and bacteriology
- increasing requirements for QA
- decrease in available high trained personnel
- need for automation



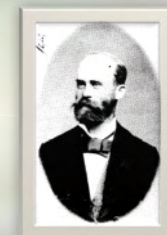
Manual streaking pattern, all of which were implemented into the WASP software.

Figures: Development in personnel and annual sample size (bacteriology and PCR, only) since 2008* (top right) and inoculation and streaking prior to (left) and after WASP implementation (right).

(*Data for 2011 are projections, based on the Jan./Feb. data 2011.)



Milestones in bacteriology:



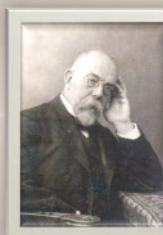
Walter HESSE cultivated airborne bacteria but struggled with low melting gelatine...



Angelina HESSE proposed agar agar (isolated from *Gelidium corneum*, the Japanese seaweed) as solidifying agent and became a historic figure!



Julius Richard PETRI, (no contemporary picture available) inventor of the so-called Petri-dish



Robert KOCH, the father of modern bacteriology, reported the invention of agar agar in 1882

In 1882, in his now classic preliminary note on the tubercle bacillus, Koch made what is the first printed reference to the use of agar—just one short sentence for a technical improvement so fundamental and epoch making. No formal paper was ever published.



single colonies and – manual streaking

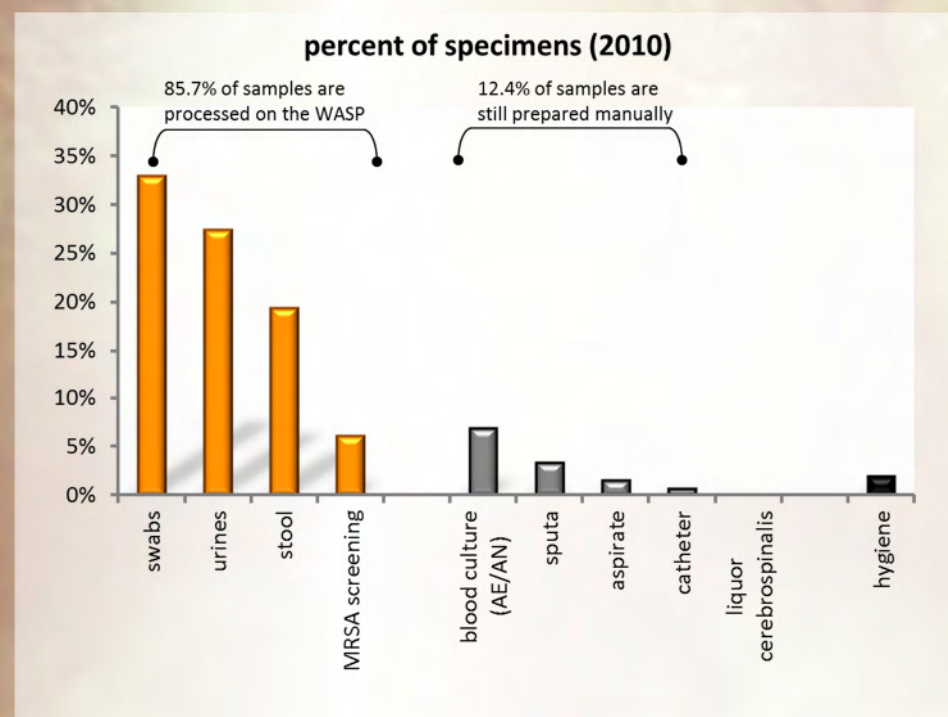


Liquid based microbiology, enabling automated inoculation and streaking.



Sample types and diversity:

27570 orders were processed in 2010 with an average of 1.98 specimens per order. The most prevalent sample types were swabs (33%) followed by urines and stool. Due to sender specific requirements, as much as **87 protocols** are in use for automated streaking!



Processed agar plates:

More than 81,000 agar plates are ordered annually from our media provider (bioMerieux), covering 14 different growth media. Ten media are routinely used for automated streaking whilst the remaining four are used exclusively for downstream analysis or specific specimen processing (such as the A7 Mycoplasma agar, which can't be processed by WASP). The top three media used were Columbia agar, McConkey agar and Mueller-Hinton agar.

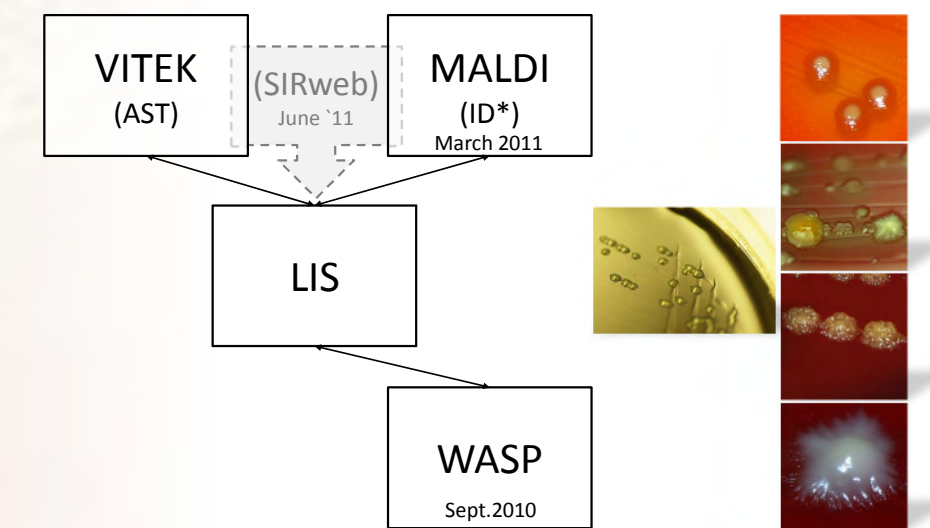
processed media	weekly	yearly turnover	percentage	daily
Columbia	673	35000	42,72%	135
McConkey	212	11000	13,43%	42
Mueller-Hinton	192	10000	12,21%	38
XLD-agar	102	5300	6,47%	20
Schaedler	81	4200	5,13%	16
chocolate agar	52	2700	3,30%	10
CHROMID <i>Candida</i>	50	2600	3,17%	10
Yersinia	48	2500	3,05%	10
Campylobacter	48	2500	3,05%	10
<i>Sabouraud-Gentamicin</i>	40	2100	2,56%	8
<i>A7 Mycoplasma</i>	25	1280	1,56%	5
<i>chocolate VCAT3</i>	15	800	0,98%	3
<i>Legionella</i>	11	570	0,70%	2
CHROMID MRSA	26	1370	1,67%	5
	1575	81920	100,00%	315

Table (left): Media processed in our routine work. Media shown in gray italic letters are not processed on WASP.

Prior to moving to automated streaking, chromogenic media and some standard media were inoculated with two specimens (Q/A approved by external audit). Plate sharing is an option for single plate protocols, which we don't use at this time on our WASP. The actual projection for 2011 predicts an increase in the number of plates processed daily to approx. 400.

Experience with WASP:

- extremely robust and reliable, downtime negligible
- need for re-streaking due to insufficient segregation of single colonies dropped to less than 2%
- customized labels on agar plates allow for optimal traceability
- in conjunction with MALDI-TOF identification, time-to-result could be significantly reduced for clinical specimens.



Equipment inventory in the bacteriology unit.
* MALDI-TOF identification only for clinical specimens

Conclusion:

WASP was successfully integrated in our routine laboratory. More than 85% of the daily specimens are managed by WASP. Standard swabs, still being in the pipeline of our customers, require transfer to prefilled tubes compatible with WASP. Following implementation as much as 1.25 FTE equivalents were saved by WASP which could be re-allocated to areas, where high technical skills are needed (e.g. molecular biology lab; 16S rDNA analysis [see Poster P1735], etc.). Although technicians were afraid of automation when we started planning, WASP is highly accepted and waded the path for further automation. Consequently, even smaller sized laboratories may take benefit from modern automation concepts.