Confirmation of pulmonary tuberculosis in Lviv/UA: a pilot study evaluating two diagnostic procedures

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Revised abstract

Background: Microbiological confirmation of patients with pulmonary tuberculosis (TB) is the first step in breaking the chain of TB transmission and initiating successful treatment. The STOP TB LVIV Study Group launched an initiative to improve the performance of the TB laboratories of the Lviv Oblast (Ukraine) by comparing a new alternative method with the existing laboratory procedure.

Patients and procedures: Between 16.06.08 and 02.07.08 fifty consecutive patients with new pulmonary TB were enrolled. All patients were screened for HIV. Three sputum specimens per patient were collected. The first two specimens per patient, i.e. a total of 100 specimens, were split: one half was immediately processed by the standard laboratory procedure (Na3PO4 [12%] decontamination, low-efficiency centrifugation, Ziehl-Neelsen stain, and culture on solid-media only); the other half was kept at +4°C until further processing by the alternative procedure (NALC decontamination, high-efficiency centrifugation, fluorescent stain, and both solid- and liquid-culture).

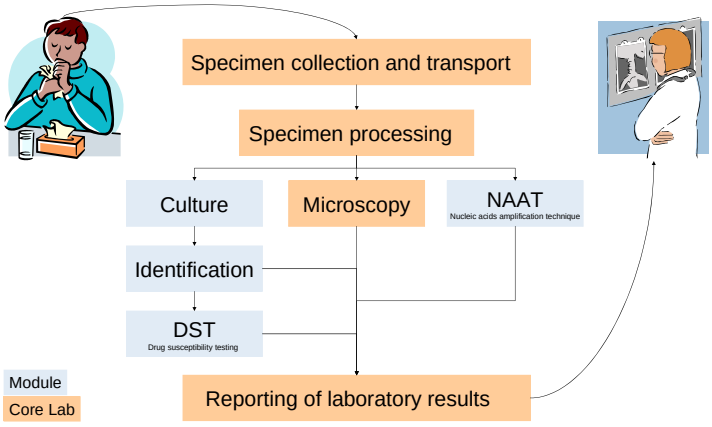
Results: The mean age of patients was 47.1 years (SD, +/-16.6), and 36 (72%) were male. HIV testing was negative for all patients. The mean delay prior to processing (alternative method) was 35.7 (SD, +/- 4.2) days. Acid-fast bacilli were detected in 12 (12%) and 27 (27%) specimens by the reference and the alternative method, respectively. *Mycobacterium tuberculosis* was cultured from 33 and 38 specimens by the reference and the alternative method, respectively. Combining the culture results of both methods, 29 (58%) patients had culture-confirmed TB: 18 (62%) patients were detected by both methods (of these, 6 (21%) were only detected by the third culture of the reference method). Five (17%) and 6 (21%) patients were only detected by the reference and the alternative method, respectively.

Conclusions: These results provide a basis for informed decisions regarding the future evolution of TB testing in the Lviv Oblast/UA.

Background

Microbiological diagnosis of patients with pulmonary tuberculosis (TB) and the timely detection of drug-resistant strains require high-quality diagnostic laboratory support (1,2). The STOP TB LVIV Study Group thus proposed improving the laboratory detection of infectious TB by implementing the concept of functional laboratory modules. A pilot study was undertaken to compare a new alternative method to Sykhiv's existing laboratory procedure and to familiarise the laboratory staff with it.

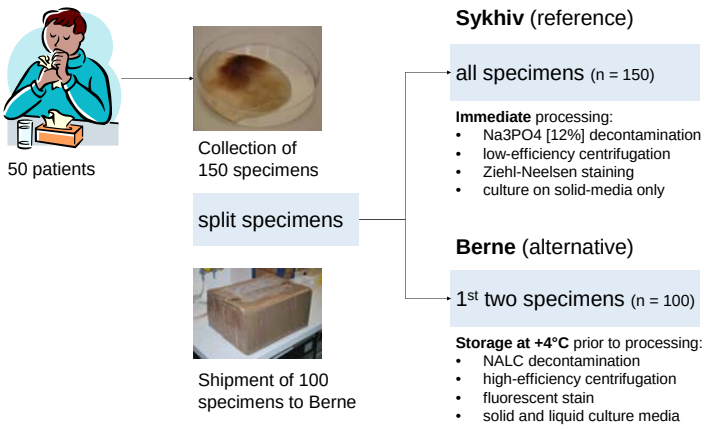
Figure 1. The concept of functional laboratory modules



Patients and procedures

Between 16.06.08 and 02.07.08 fifty consecutive patients with new pulmonary TB were enrolled. Three sputum specimens per patient were collected and processed as outlined in figure 2:

Figure 2. Specimen collection and processing



Results

Patients' characteristics are shown in table 1: most (72%) patients were men, the median age was 47.1 years, and all were HIV-negative.

Table 1. Patients' characteristics

Characteristic	All subjects (n = 50)	
Age, mean (SD), yr	47.1	(16.6)
Men, n (%)	36	(72%)
Foreign born, n (%)	0	(0%)
Prior TB therapy, n (%)	0	(0%)
HIV positive, n (%)	0	(0%)

Table 2 delineates the respective microscopy and culture results of the two study sites: In Sykhiv, 6 (35%) patients were only detected by culturing the 3rd specimen; the 3rd specimen did not add positive microscopy results.

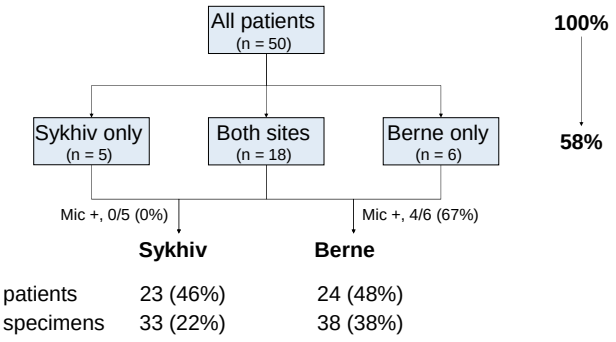
Table 2. Microscopy and culture results

Study site	Sykhiv*		Berne**	
Microscopy	**N**	**%**	**N**	**%**
per specimen	12	8	27	27
per patient	11 (0)	22 (0)	18	36
Culture				
per specimen	33	22	38	38
per patient	17 (6)	34 (46)	24	48

* reference, 2 specimens/patient (3 specimens/patient)
**2 specimens/patient; processing delay, mean (±SD) 35.7 days (±4.2)

The combined sensitivity of culture (both sites) in patients with suspected primary pulmonary TB was 58%.

Figure 3. Patients with culture-confirmed TB, both sites



Only 40% of the patients were detected by both sites (Figure 3). Potential explanations are:

- ✓ the splitting of inhomogeneous specimens (sampling error)
- ✓ the prolonged storage of specimens (alternative protocol)
- ✓ the use of different, site-specific culture media

Conclusions

- The alternative method detected more sputum smear-positive patients than the current reference method (reference, 22%; alternative, 36%).
- Patient detection rates were similar for both culture methods when all specimens were considered (reference, 46%; alternative, 48%); if only the first two specimens were taken into account the detection rate of the alternative culture method was higher (reference, 34%; alternative, 48%).
- These results indicate the value of implementing the alternative method in the local laboratory; this will increase positivity rates, shorten turn-around times, and eventually reduce the workload of the laboratory.

References

1. Atun, R., and I. Olynik. Resistance to implementing policy change: the case of Ukraine. Bull. WHO 2008; **86**: 147-154.
2. Dye, C. Doomsday postponed? Preventing and reversing epidemics of drug-resistant tuberculosis. Nature Rev. Microbiol. 2009; **7**: 81-87.

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