THE DETECTION OF MYCOBACTERIUM TUBERCULOSIS AMONG THE PATIENTS OF THE YAKUTSK CITY CLINICAL HOSPITAL BY AUTOMATED BACTEC MGIT-960 SYSTEM

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Summary

In this study, conventional culture test for tuberculosis was comparatively analyzed against automated BACTEC MGIT–960 test system, the latter showed high effectiveness.

Keywords: *Mycobacterium tuberculosis*, culture diagnosis, BACTEC MGIT–960 automated systems.

In Russian Federation, the diagnosis of tuberculosis (TB) is performed both in clinical diagnostic laboratories of the primary network (these laboratories conduct primary detection of sputum-positive patients), and in tertiary bacteriologic laboratories of the anti-TB service.

The existing epidemiologic situation for TB in Russia and in the world demands quick and effective detection of *M.tuberculosis*.

At the same time, more accurate and evidence-based approach to formulating indications for diagnostic culture tests for TB infection has become a necessity, so that patients subject to further examination could be selected more wisely. In immobile patients, it is reasonable to use triple microscopy by means of primary network laboratories instead of sputum culture test. But in case of suspicion for the diagnosis of TB and in case of presence of relevant symptoms, the patient must undergo a proper full examination at the anti-TB hospital [4].

Microbiologic investigations have profound meaning in the detection of TB patients and are ones of the basic TB diagnosis verification tools. Culture diagnosis with solid media is the current "gold standard" for the detection of the causative agent of TB, but slow growth of *M.tuberculosis* substantially delays verification of diagnoses and complicates the choice of chemotherapy regimens. Following the introduction of the rapid automated BACTEC MGIT-960 detection system to daily practice, completely new level of bacteriological diagnostics has been achieved [1,2,3,].

Starting in 2008, automated BACTEC MGIT–960 system is used to perform liquid medium-based TB diagnosis in the Bacteriologic Laboratory of the "Phthisiatry" Research & Practice Center. In our experience, mean time to detection of the TB causative agent using liquid medium was 11.8 days, while mean detection time for solid egg-based medium was 40.6 days, i.e. the detection of *M.tuberculosis* was made 3.4 times more rapid. Inoculability of *M.tuberculosis* was 31% for liquid medium, which was 2.6 times quicker than that for solid medium (11.5%) [5].

In this study, we explored inoculability of *M.tuberculosis* by automated BACTEC MGIT–960 system among the patients of the Pulmonology Department of the Yakutsk City Clinical Hospital.

All patients underwent minimum compulsory clinical examination at the admission – triple Ziehl-Neelsen sputum microscopy at the Clinical Diagnostic Laboratory of the Yakutsk City Clinical Hospital. This examination did not detect any positive case in this patient group.

During 2011, 364 specimens from 223 patients with various inflammatory or obstructive forms of lung diseases had been referred to the laboratory, after the TB doctor's advice. Of them, 234 (64.3%) specimens from 143 (64.1%) patients had been tested by automated BACTEC MGIT–960 system.

As a result of the study, 14 (6.3%) sputum-positive patients were detected, of them 11 (7.7%) were detected by rapid automated test, 3 (3.7%) were detected using the classical method. Inoculability of *M.tuberculosis* from specimens using liquid media was 7.3% (17 out of 234), which was 1.9 times higher, compared to inoculability by classical method using solid media (3.8% – 5 out of 130).

Starting in 2007, activities necessary to improve anti-TB service in Yakutsk have been undertaken among the primary network physicians: workshop in cooperation with the WHO representatives, educational lectures on the requirements to specimen collection and transportation to the laboratory. One of the key questions at the workshop was a more evidence-based approach to referring patients to bacteriological laboratory for TB test.

We compared the data for 2011 with the data for 2005. In 2005, only persons from the risk group, i.e. patients with acute, chronic lung diseases or immobile patients without adequate evidence-based indications, were subject to conventional bacteriological culture test for TB. Total number of inoculations performed was 6548, with the specimens obtained from a total of 3242 patients. Inoculability rate was 1.8% – this was a reliable estimation showing a wasteful approach to patient referral to culture tests. In 2011, with the use of automated BACTEC MGIT–960 system, detectability of positive results increased by a factor of 4.3 and reached 7.3% (17 out of 234). This comparative analysis showed the effectiveness of measures aimed at improving the indications for

diagnostic culture tests for TB infection.

In conclusion, the study results have shown high effectiveness of BACTEC MGIT-960 system used to detect TB among the patients of the Pulmonology Department of the Yakutsk City Clinical Hospital, who somehow had not been recognized as epidemiologically risky based on Ziehl-Neelsen microscopic sputum test results. But concluding from their existing medical records, and after TB doctor's consultation, these patients were selected for further examination, which allowed a more early detection of sputum-positive cases with various forms of airway TB.

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