

# Contemporary Microbiological Diagnostic Tests for Rapid Identification and Detection of Resistance of *Mycobacterium tuberculosis*



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## INTRODUCTION

- Tuberculosis (TB) occurs in every part of the world as a top infectious disease killer.
- In 2014, 9.6 million cases (an estimated 1 million children) and 1.5 million deaths (140 000 children) from TB were registered. Over 95% of TB deaths occur in developing countries.
- TB incidence has fallen since 2000 and is now 18% lower, by an average of 1.5% per year.

- TB is a treatable and curable disease with a standard 6 month protocol of 4 antimicrobial drugs. In cases of multi-drug resistant TB (MDR-TB) responds are very weak including the most effective second-line anti-TB drugs. About 480 000 people developed MDR-TB in the world in 2014.
- Standard anti-TB drugs have been used for decades, and resistance to a single anti-TB drug have been documented in every country worldwide.
- Multidrug-resistant tuberculosis (MDR-TB) is a form of TB caused by bacteria that do not respond to, at least, isoniazid and rifampicin, the 2 most powerful, first-line (or standard) anti-TB drugs.

## OBJECTIVE

- To give overview on contemporary microbiological diagnostic tests for rapid identification and detection of resistance of *Mycobacterium tuberculosis*
- To present possibilities of microbiological diagnostic tests for identification and detection of resistance of *Mycobacterium tuberculosis* in National laboratory in Republic of Macedonia
- To present data of results of some methods for rapid identification and detection of resistance of *Mycobacterium tuberculosis*

## MATERIAL and METHODS

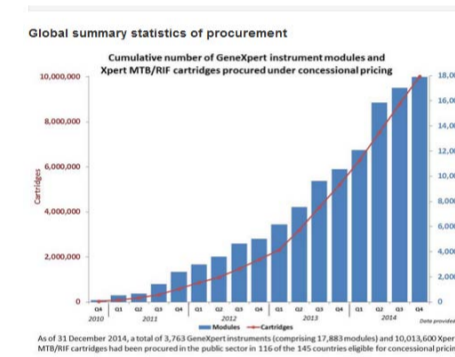
- Material and methods in use in National reference laboratory of Republic of Macedonia (microbiological laboratory at the Institute for lung diseases).
- Standard methods in use:
  - Culture on Löwenstein-Jensen medium
  - Ziehl - Neelsen staining/ or Cold staining- Kinyon method
  - Antituberculous drugs susceptibility testing on modified Löwenstein-Jensen medium for:
    - Isoniazid (H) 0,2 µg/l
    - Rifampicin (R) 40,0 µg/l
    - Ethambutol (E) 2,0 µg/l
    - Streptomycin (S) 4,0 µg/l

## Contemporary methods:

- **Bactec MGIT 960**  
 Is an automated method enable identification of *Mycobacterium tuberculosis* for 4-12 -20 days, and susceptibility testing on : streptomycin, isoniazid, rifampicin, ethambutol and pyrazinamide, and tests for antituberculosis drug of second line.



Bactec MGIT 960



## RESULTS

Year	2010	2011	2012	2013	2014
Positive	502	350	428	376	375
Negative	5339	5594	5519	6060	6061

Culture results on Löwenstein-Jensen medium

Year	2010	2011	2012	2013	2014
Positive	52	62	86	77	?
Negative	335	433	569	835	?

Bactec MGIT 960 results

Year	2009	2010	2011	2012	2013	2014
TB strains	191(100%)	181(100%)	155(100%)	181(100%)	198(100%)	154(100)
Sensitive	175(91,6%)	170(93,9%)	143(92,2%)	163(90%)	191(96,4%)	142(92,%)
Resistant	16 (8,3%)	11 (6%)	12 (7,7%)	18 (10%)	7 (3,5%)	12 (7,5%)
Mono-resistant	14 (7,3%)	3 (1,6%)	9 (5,8%)	11 (6%)	6 (3%)	10 (5,8%)
Rifampicin resistant	3 (1,5%)	/	5 (3,2%)	1 (0,5%)	1 (0,5%)	3 (1,7%)
MDR	1 (0,5%)	7 (3,8%)	1 (0,6%)	4(2,2%)	1 (0,5%)	2 (1,2%)

TB resistance over period 2009 - 2014

## CONCLUSIONS

- In National reference laboratory for Identification and Detection of Resistance of *Mycobacterium tuberculosis*, beside standard Methods, contemporary rapid methods recommended by WHO Experts and Global TB Program, such are: Bactec MGIT and GeneXpert are priority.
- Rapid methods enable final diagnosis of TB, including isolation, identification and susceptibility testing in significantly shorter time.
- Number of new TB infections in Republic of Macedonia is decreasing continuously in past 10 years.
- MDR strains in Republic of Macedonia are at low level.



WHO Goal target is ending the TB epidemic by 2030



Preparing staining and culture