Synthetic Peptides are Better Than Native Antigens for Development of ELISA Assay for Diagnosis of Tuberculosis

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Abstract

Immunodiagnosis of both pulmonary tuberculosis (PTB) and extrapulmonary tuberculosis has remained challenging. In the present work, in-house developed synthetic peptide based antibody detection assay was assessed and validated with antigen based assay for effective diagnosis of tuberculosis (TB). The study population included both tuberculous meningitis (TBM) (n = 60) admitted to Neurology IPD wards of our Institute hospital and PTB cases (n = 57) recruited from high TB endemic zones. Peptides of five highly immunogenic *Mycobacterium tuberculosis* (MTB) proteins (Ag85B, 45 kDa, HSP-16, CFP-10 and ESAT-6) were designed and synthesized. The designed peptides were evaluated in samples of both TBM and PTB cases, respectively, using in-house developed antibody detection method. The developed tests were further compared and validated with MTB native proteins based antibody detection ELISA. Sensitivity and specificity of peptide assay were significantly higher or almost similar ($p < 0.05$) in TBM and PTB as compared to native proteins based ELISA. Among all peptides, diagnostic reliability of Ag 85B peptide A1 was higher for both forms of TB. Peptide-based antibody assay is cost effective, simple and may be interchangeable with conventional Antigen based ELISA assays for effective diagnosis of TB in the developing world.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Abbreviations

TBM:

Tuberculous meningitis

TB:

Tuberculosis

PTB:

Pulmonary tuberculosis

EPTB:

Extra pulmonary tuberculosis

ELISA:

Enzyme-linked immunosorbent assay

PCR:

Polymerase chain reaction

Ag85B:

Antigen 85 B

45 kDa:

45 kilo Dalton

HSP 16:

Heat Shock Protein 16

CFP-10:

10 kDa culture filtrate protein

ESAT-6:

6 kDa Early secretory antigenic target

CIIMS:

Central India Institute of Medical Sciences

MTB:

Mycobacterium tuberculosis

MAHAN:

Meditation Addiction Health AIDS Nutrition

NTBM:

Non-tuberculous meningitis

NPTB:

Non pulmonary tuberculosis

WHO:

World Health Organization

MIF:

Molecular Immunology Foundation-Bioinformatics software

Bcepred:

Prediction of linear B-cell epitopes—Bioinformatics software

ABCpred:

Artificial neural network based B-cell epitope prediction server

NCBI:

National Center for Biotechnology Information

BLAST:

Basic local alignment search tool

CSF:

Cerebrospinal fluid

ATT:

Anti tuberculosis treatment

QFT:

QuantiFERON-TB Gold test

TST:

Tuberculin skin test

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Ethics declarations

Conflicts of Interest

The authors affirm that this article content has no conflict of interest.

Informed Consents

The study was approved by the Institutional Ethics Committee. Written consents were obtained from each participant and oral explanation about the research study was presented to all participants.

Electronic Supplementary Material

Below is the link to the electronic supplementary material.

Supplementary material 1 (DOC 490 kb)

Supplementary material 2 (DOCX 33 kb)

Supplementary material 3 (DOCX 79 kb)

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- *Mycobacterium tuberculosis*
- Tuberculous meningitis
- Serodiagnosis
- B-cell epitopes
- Peptide ELISA

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