AB1334

AN OPEN-SOURCE WEB-BASED ANALYTICS PLATFORM FOR THE HUMAN IMMUNE ATLAS

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Background: Mass cytometry (CyTOF) measures the expression of many proteins (currently up to 40) in single cells. TII applies CyTOF to characterise cellular diversity of the immune system in peripheral blood and other tissues. Using a growing collection of CyTOF data acquired from blood of clinically and demographically diverse human subjects, we have built our version of the immune atlas, called EPIC (Extended Poly-dimensional Immune characterisation).

Objectives: We will discuss two main objectives of this project. To integrate CyTOF data, metadata, cell annotations or other inferred data into the immune atlas, we developed a novel data analytics pipeline. To provide a user-friendly gateway that helps researchers explore the immune atlas and gain new insights about their own CyTOF data, we implemented a web-based data analytics application using the R Shiny programming environment.

Methods: The core components of the atlas are 'immune maps', which comprise CyTOF data of samples labeled with identical antibody panels and grouped according to a common biological theme. Besides protein expression patterns, immune maps contain clinical and demographic metadata, as well as phenotypic information inferred from clustering and cell type annotation. To intuitively analyse these complex multi-dimensional data, we developed a Shiny/R web application that has two main objectives. First, clients can explore the immunome at different levels of details using a wide range of interactive visualisation methods, such as bar charts comparing the abundance of all or subsets of immune cell types in different age groups, or tSNE/UMAP scatter plots providing global perspectives of expression domains. Second, users can upload their own CyTOF data and, through pattern matching, obtain instant estimates about the abundance of selected immune cell populations in their own samples.

Results: We tested our system using immune maps constructed from healthy paediatric samples. Manually gated ground truth data along with interactive visualisation techniques were used to measure the accuracy of our pipeline in detecting and annotating homogenous cell populations. In addition, we will demonstrate how immune maps can be applied to classify uploaded CyTOF data.

Conclusion: Our interactive immune atlas platform promises to improve our understanding of the changing immunome landscape in response to disease, treatment and ageing.

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NA

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AB1335

AGE-RELATED MUSCULOSKELETAL STIFFNESS AMONGST HEALTHY SUBJECTS

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Background: A patient questionnaire for evaluating musculoskeletal stiffness (MSQ) has been developed for rheumatoid arthritis (RA) (Halls 2015) and also tested in chikungunya disease. Joint stiffness is associated with older age in adults.

Objectives: The aim of this study was to evaluate the variation in MSQ scores with age in a cohort of healthy adults.

Methods: Subjects ≥ 18 years old were enrolled at two sites. Subjects were engaged in, or had completed, tertiary education. Subjects with a diagnosis of joint disease, Parkinson's disease or multiple sclerosis were excluded. Each subject completed a 21-item questionnaire designed to evaluate the severity of musculoskeletal stiffness, its physical impact and psychosocial impact, and to provide an overall stiffness score. Results are expressed as a percentage of the maximum possible score.

Results: Two hundred and fifty-eight subjects were included, 120 males and 138 females. Subjects were $>95\%$ Caucasian. The mean age of subjects was 40 ± 16 years. No differences were seen in the stiffness scores between males and females. The percentage of subjects reporting any stiffness was over 50% in every age group, and markedly higher in those aged ≥ 60 years (Table). The average overall MSQ scores and those of its three components were low and showed little variation between the three lower age cohorts, but scores increased in the upper age cohort (Table).

	18-30 years (n=97)	30-44 years (n=51)	45-59 years (n=77)	≥ 60 years (n=32)
Subjects (%) reporting any stiffness	71 (73)	30 (59)	54 (70)	30 (94)
Overall MSQ score: median% (IQR)	3.3 (0, 10.6)	4.2 (0, 9.6)	6.3 (0, 11.9)	12.0 (4.1, 22.4)
Stiffness severity: median% (IQR)	7.9 (0, 17.8)	6.9 (0, 15.1)	13.3 (0, 20.4)	18.9 (10.4, 31.9)
Physical impact: median% (IQR)	0 (0, 4.1)	0 (0, 4.1)	0 (0, 8.3)	8.3 (0, 16.5)
Psychosocial impact: median% (IQR)	0 (0, 13.2)	0 (0, 6.6)	0 (0, 13.2)	6.6 (0, 24.8)

Conclusion: The prevalence of musculoskeletal stiffness in healthy subjects as measured with this questionnaire is not negligible. Overall stiffness scores in this study were low in the subjects aged 18-59 years when compared to those in RA and chikungunya disease. However, the high frequency of stiffness and the higher average scores in the upper age cohort suggest that the background joint stiffness amongst older subjects should be considered when interpreting stiffness scores in patients.

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AB1336

COMPARATIVE STUDY OF ANTI-CCP ANTIBODIES BY LATEX ENHANCED TURBIDIMETRIC IMMUNOASSAY AND ELISA

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Background: Some of the autoantibodies found in RA are primarily directed against these citrullinated protein epitopes and can be found even before the symptoms of arthritis appear [1]. So the detection of these antibodies can be used in clinical practice to help develop therapeutic strategies. The classic method for detecting anti-CCP antibodies in serum is ELISA. However, the traditional ELISA method still has some inevitable limitations, such as time-consuming, complicated process and low degree of automation, may not be able to provide clinicians with quick answers. Therefore, the purpose of our study was to determine whether the LETIA, which was faster than ELISA, can be used in routine experiments, and to explore the clinical application value of the LETIA in the detection of anti-CCP antibodies.

Objectives: The purpose of our study was to evaluate the consistency of Latex Enhanced Turbidimetric Immunoassay (LETIA) and ELISA in the detection of anti-cyclic citrullinated peptide antibodies (anti-CCP antibodies) in 139 patients, for the diagnosis of early rheumatoid arthritis (RA), and to determine that LETIA can be used in daily practice.

Methods: A total of 139 serum or plasma samples were collected from patients with or suspected of having RA. The anti-CCP antibodies of these samples were detected by LETIA and ELISA simultaneously, all tests were carried out in accordance with the manufacturer's standard procedures. Finally, we compared the technical performance and diagnostic accuracy, and assessed the clinical sensitivity and specificity of these two methods.

Results: The Kappa coefficient and consistency rate measured between LETIA and ELISA were greater than 0.91. The sensitivity and specificity values of LETIA were 83.33% and 95.6%, respectively. The positive predictive value and negative predictive value were 90.91% and 91.58%, respectively. The confidence interval of 95% positive coincidence rate was 78.97-82.75%, while the confidence interval of 95% negative

coincidence rate was 92.72%-94.79%. The sensitivity and specificity values of ELISA proposed by the manufacturer for clinical diagnosis RA were 82% and 95%. The two methods had the same detection effect.

Conclusion: The current commercially available methods for detecting anti-CCP antibodies were roughly the same, and the consistency between LETIA and ELISA were high. In general, the LETIA was more accurate and sensitive than the ELISA in the detection of anti-CCP antibodies in serum. Overall diagnostic performance of LETIA can be compared. LETIA provided reliable information about antibody levels that made it useful in monitoring disease activity. Comparable to the classic ELISA, ELISA may even be replaced in the future.

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AB1336B

PERFORMANCE EVALUATION OF PARTICLE-ENHANCED TURBIDIMETRIC IMMUNOASSAY FOR ANTINUCLEAR ANTIBODIES DETECTION IN COMPARISON WITH LINE IMMUNOASSAY

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Background: Detection of antinuclear antibodies (ANAs) supports the clinical diagnosis of ANA-associated rheumatic diseases, such as systemic sclerosis (SSc), systemic lupus erythematosus (SLE), primary Sjögren's syndrome (SjS) and mixed connective tissue disease (MCTD) [1-3]. Throughout history, a number of autoantibody detection methods have emerged, for instance, indirect immunofluorescence (IIF), radioimmunoassay (RIA), enzyme-linked immunosorbent assay (ELISA) and line immunoassay (LIA) [4]. With the development of detection technology, new methods to detect ANAs were continuously developed by numerous manufacturers, for example, particle-enhanced turbidimetric immunoassay (PETIA). Therefore, in the current study, we evaluated for the first time the performance of PETIA in the detection of anti-nuclear antibody and compared it with commercial LIA.

Objectives: To evaluate the clinical performance of PETIA for the detection of ANAs in comparison to the currently commonly used LIA.

Methods: Total 606 serum samples from diseased and healthy controls were assayed to simultaneously determine SSA, Sm/RNP, SSB, Sm and U1-SnRNP antibodies by the PETIA and LIA. The sensitivity, specificity, consistency and area under curve (AUC) were analyzed for each antibody between PETIA and LIA.

Results: The positive rate and specificity of PETIA and LIA for ANA specific target antibodies were comparable. Compared with LIA, the sensitivity of SSA, SSB and Sm were 100.00%, 88.89% and 90.00%, while Sm/RNP and U1-SnRNP were 75.00%, 70.59%, respectively; Sm/RNP, SSB, Sm and U1-SnRNP have high specificity, respectively 97.87%, 98.90%, 97.80% and 94.68%, while SSA specificity is general, 81.52%. Under manufacturer's cut-off values, the consistent rates of SSA, Sm/RNP, SSB, Sm, and U1-SnRNP between PETIA and LIA were 87.22% (116/133), 92.06% (116/126), 96.61% (114/118), 97.03% (98/101) and 88.28 (113/128), respectively. Excellent consistencies were found between PETIA and LIA for the detection of Sm/RNP, SSB and Sm antibodies ($\kappa > 0.75$), and kappa coefficients were 0.776 ($p < 0.001$), 0.901 ($p < 0.001$) and 0.841 ($p < 0.001$), while the coincidence for anti-SSA and U1-SnRNP detection were moderate ($0.40 < \kappa < 0.75$), and Kappa coefficient was 0.731 ($p < 0.001$) and 0.685 ($p < 0.001$), respectively.

Conclusion: The performance of PETIA for the detection of antibodies to nuclear specific antigen was satisfying to correlate with that of LIA. With the additional benefits of short detection time, quantitative output and high universality. PETIA can better meet the requirements of quantitative detection of specific target antibodies.

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Rehabilitation

AB1336C

COMPARISON OF NORMALIZED MUSCLE ACTIVATION EFFECTS OF THREE DIFFERENT EXERCISES ON SUPRAHYOID MUSCLES IN HEALTHY SUBJECTS

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Background: The most important airway protection mechanism during swallowing is adequate laryngeal elevation. Suprahyoid muscles are responsible for laryngeal elevation. There are many treatment approaches to improve laryngeal elevation in swallowing rehabilitation. The most common methods are exercises including Shaker exercises, Chin-Tuck Against Resistance (CTAR) exercise, Neuromuscular Electrical Stimulation of suprahyoid muscles and Expiratory Muscle Strength Training (1-4).

Objectives: The aim of our study was to compare the effects of three different exercises including Shaker, CTAR and a new method Chin Tuck with TheraBand Exercises on suprahyoid muscles activity.

Methods: Forty-two healthy subjects with a mean age of 27.92 ± 5.02 years (min=18, max=40), of which 50% were male were included. All individuals were divided into three groups; Chin Tuck Against Resistance (CTAR); Group 1, Shaker exercise; Group 2, Chin Tuck Exercise with TheraBand; Group 3, with computerized randomization. Surface EMG evaluation was performed to determine electrical activity of the suprahyoid muscles during maximal voluntary isometric contraction (Figure1) and during performing CTAR, Shaker exercise and Chin Tuck with TheraBand (Figure 2-4). Normalized suprahyoid muscle activations were calculated as: Recorded Maximum Electrical Activity During Exercise (mV) / Recorded Maximum Electrical Activity During Maximum Isometric Contraction (mV).

Figure 1. Evaluation of Maximum Isometric Suprahyoid Muscle Activity