Discovery of Novel Autoantigens in Sjögren's Syndrome with Potential for Subgrouping of Disease

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ACR2016 #1079

Introduction

- Primary Sjögren's syndrome (pSS) is a chronic autoimmune disease affecting salivary and lacrimal glands and associated with multi-organ involvement and lymphoma.
- Current diagnostic criteria for pSS utilize anti-Ro/SSA and anti-La/SSB autoantibodies as diagnostic markers.
- However, several studies have found the existence of many patients with pSS lacking these marker, but suggested the existence of additional autoantibodies in pSS.
- With the growing interest in conducting clinical trials in primary Sjögren's syndrome (pSS), there is a need for new biomarkers that can be used to diagnose pSS, identify clinical subsets of pSS, predict treatment outcome and allow for assessment of disease activity.

Objectives

- The current study was undertaken to identify novel autoantigens in pSS with a special focus on proteins and cytokines (BAFF, TNFα, IL1, IL6, IL12), which are upregulated in salivary gland tissue and saliva of pSS patients
- We designed a targeted screen comprising 1,596 antigens which are directly relevant to Sjögren's syndrome associated processes such as cytokines, chemokines, salivary gland proteins, proteins involved in apoptosis as well as diagnostic antigens.

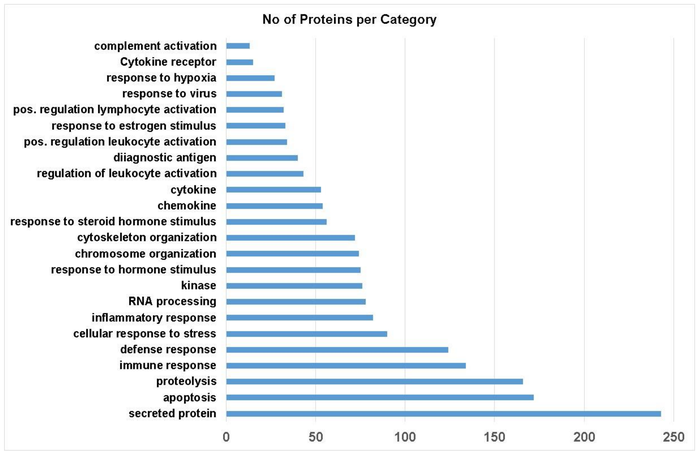
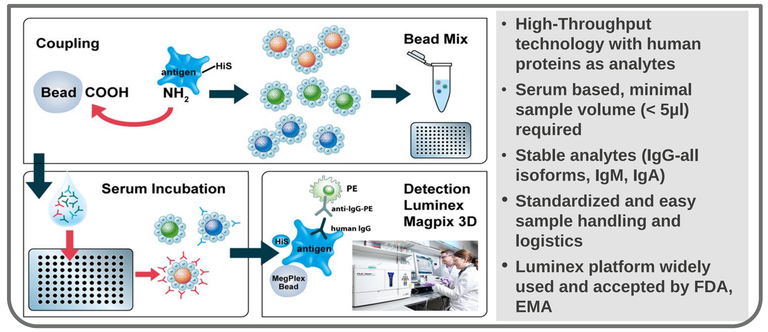


Fig. 1: Overview of antigens included in this study

Methods

Autoantibody screening was performed using Protagens SeroTag approach and 1,596 selected human protein antigens from our hPEX® protein library of 8,000 recombinant proteins.



- **High-Throughput technology with human proteins as analytes**
- **Serum based, minimal sample volume (< 5µl) required**
- **Stable analytes (IgG-all isoforms, IgM, IgA)**
- **Standardized and easy sample handling and logistics**
- **Luminex platform widely used and accepted by FDA, EMA**

Fig. 2: Schematic SeroTag workflow of bead-based assays

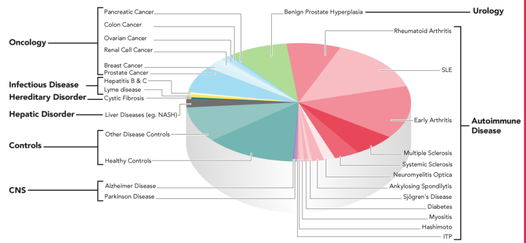
Samples included in this study are shown in Fig. 3a. Supporting information on autoantibody reactivity in other diseases from over 14,000 patient samples is available through our autoantibody reactivity data (3b).

1,596 human antigens were coupled to Luminex magnetic beads and assayed against 176 patient samples and HC

SjS samples:
pSS: n=31; pSS + PNP: n=19
sSS: n=31

Control samples:
SSc: n=32, SLE: n=32, HC: n=31

Fig. 3a: Sjögren biomarker discovery study



3b: Database information on disease-associated autoantibodies

Results

In order to rank relevant autoantibody specificities in a list of interest, we used a set of complementing statistical tests. We choose to complement the Wilcoxon rank sum test with two additional methods (SAMR, and a 90th quantile comparison). SAMR thresholds were set to SAMR delta value of 2.4, which corresponds to local FDR of 20%. In total, 27 candidate antigens were found with different specificities for all SjS or pSS (Fig. 4).

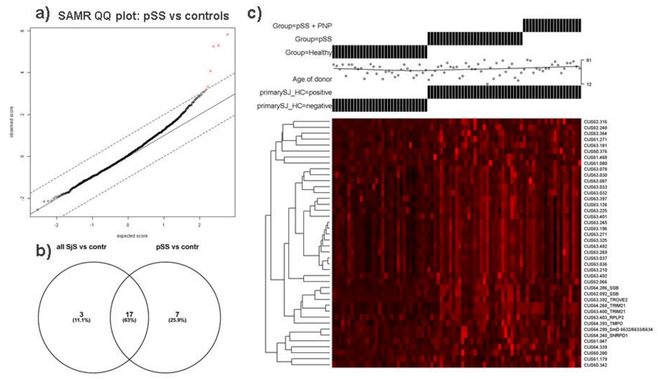


Fig. 4: Identification of novel autoantigens and clustered heatmap of autoantibody reactivity

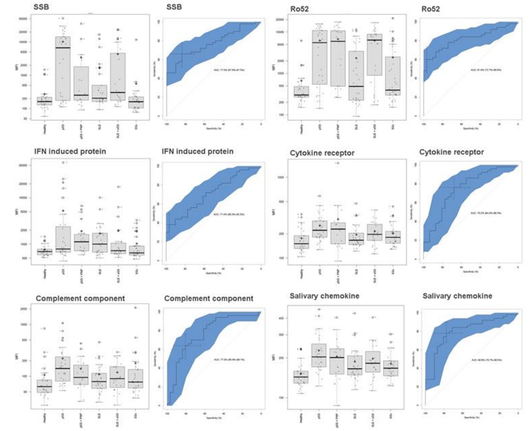


Fig. 5: ROC curve analysis of selected autoantibodies and group-wise reactivity in SjS and control samples

Conclusions

Apart from clear confirmation of the benchmark autoantigens known for many years we have discovered a small set of additional, novel autoantibodies with prevalences from 8 to >20% in primary Sjögrens syndrome. Accumulation of autoantibody reactivities allows for a first subgroup definition of Sjögrens, and for clear segregation of SjS/SLE overlap syndrome patients.