

## Supplementary material

### **IgM antibodies against malondialdehyde and phosphorylcholine in different systemic rheumatic diseases**

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Supplementary table 1. Cross-disease comparison of anti-PC and anti-MDA IgM levels

A. FDR-corrected p-values of pairwise comparisons: Mann-Whitney

| MDA_IgM | Control | MCTD  | PAPs  | RA    | SjS   | SLE   | SSc   | UCTD  |
|---------|---------|-------|-------|-------|-------|-------|-------|-------|
| Control |         | 0.174 | 0.004 | 0.004 | 0.306 | 0.639 | 0.042 | 0.174 |
| MCTD    | 0.174   |       | 0.004 | 0.008 | 0.455 | 0.163 | 0.027 | 0.053 |
| PAPs    | 0.004   | 0.004 |       | 0.095 | 0.002 | 0.008 | 0.042 | 0.055 |
| RA      | 0.004   | 0.008 | 0.095 |       | 0.002 | 0.027 | 0.412 | 0.455 |
| SjS     | 0.306   | 0.455 | 0.002 | 0.002 |       | 0.174 | 0.008 | 0.058 |
| SLE     | 0.639   | 0.163 | 0.008 | 0.027 | 0.174 |       | 0.164 | 0.306 |
| SSc     | 0.042   | 0.027 | 0.042 | 0.412 | 0.008 | 0.164 |       | 0.874 |
| UCTD    | 0.174   | 0.053 | 0.055 | 0.455 | 0.058 | 0.306 | 0.874 |       |

  

| PC_IgM  | Control | MCTD   | PAPs  | RA     | SjS    | SLE    | SSc   | UCTD  |
|---------|---------|--------|-------|--------|--------|--------|-------|-------|
| Control |         | 0.006  | 0.024 | ~.0001 | 0.001  | 0.002  | 0.806 | 0.327 |
| MCTD    | 0.006   |        | 0.001 | <.0001 | 0.350  | 0.266  | 0.006 | 0.087 |
| PAPs    | 0.024   | 0.001  |       | 0.806  | 0.001  | 0.001  | 0.047 | 0.021 |
| RA      | ~.0001  | <.0001 | 0.806 |        | <.0001 | <.0001 | 0.001 | 0.001 |
| SjS     | 0.001   | 0.350  | 0.001 | <.0001 |        | 0.586  | 0.001 | 0.177 |
| SLE     | 0.002   | 0.266  | 0.001 | <.0001 | 0.586  |        | 0.003 | 0.342 |
| SSc     | 0.806   | 0.006  | 0.047 | 0.001  | 0.001  | 0.003  |       | 0.299 |
| UCTD    | 0.327   | 0.087  | 0.021 | 0.001  | 0.177  | 0.342  | 0.299 |       |

**B. FDR-corrected p-values of pairwise comparisons: two-tailed t-test**

| MDA_IgM | Control | MCTD  | PAPs  | RA     | SjS    | SLE   | SSc   | UCTD  |
|---------|---------|-------|-------|--------|--------|-------|-------|-------|
| Control |         | 0.169 | 0.006 | 0.002  | 0.508  | 0.290 | 0.020 | 0.025 |
| MCTD    | 0.169   |       | 0.002 | 0.002  | 0.317  | 0.055 | 0.011 | 0.017 |
| PAPs    | 0.006   | 0.002 |       | 0.091  | 0.004  | 0.014 | 0.035 | 0.097 |
| RA      | 0.002   | 0.002 | 0.091 |        | <.0001 | 0.035 | 0.317 | 0.850 |
| SjS     | 0.508   | 0.317 | 0.004 | <.0001 |        | 0.135 | 0.011 | 0.035 |
| SLE     | 0.290   | 0.055 | 0.014 | 0.035  | 0.135  |       | 0.239 | 0.228 |
| SSc     | 0.020   | 0.011 | 0.035 | 0.317  | 0.011  | 0.239 |       | 0.618 |
| UCTD    | 0.025   | 0.017 | 0.097 | 0.850  | 0.035  | 0.228 | 0.618 |       |

| PC_IgM  | Control | MCTD   | PAPs  | RA     | SjS    | SLE    | SSc    | UCTD  |
|---------|---------|--------|-------|--------|--------|--------|--------|-------|
| Control |         | 0.004  | 0.024 | <.0001 | 0.006  | 0.003  | 0.001  | 0.027 |
| MCTD    | 0.004   |        | 0.002 | <.0001 | 0.474  | 0.474  | 0.022  | 0.117 |
| PAPs    | 0.024   | 0.002  |       | 0.474  | 0.002  | 0.002  | 0.037  | 0.002 |
| RA      | <.0001  | <.0001 | 0.474 |        | <.0001 | <.0001 | <.0001 | 0.002 |
| SjS     | 0.006   | 0.474  | 0.002 | <.0001 |        | 0.997  | 0.005  | 0.172 |
| SLE     | 0.003   | 0.474  | 0.002 | <.0001 | 0.997  |        | 0.003  | 0.165 |
| SSc     | 0.001   | 0.022  | 0.037 | <.0001 | 0.005  | 0.003  |        | 0.552 |
| UCTD    | 0.027   | 0.117  | 0.002 | 0.002  | 0.172  | 0.165  | 0.552  |       |

*p*<0.05

Color scheme: *p*<0.005

**Supplementary Table 2.** The most prominent differences between anti-PC and anti-PC-FT as well as anti-MDA and anti-MDA-FT, respectively. Numbers are reported as log(ppm) of the relative peptide distribution in respective sample. CDR peptide sequence regions are bolded. Peptides with a ppm <1, were set as 0. – peptide was not detected. p<0.05 (significant) are marked out.

| Type | Region                        | Sequence                         | anti-PC | anti-PC-<br>FT | anti-<br>MDA | anti-MDA-<br>FT | p-values -anti PC vs |              |                 |
|------|-------------------------------|----------------------------------|---------|----------------|--------------|-----------------|----------------------|--------------|-----------------|
|      |                               |                                  |         |                |              |                 | anti-PC-<br>FT       | anti-<br>MDA | anti-<br>MDA-FT |
| HV   | CDR3                          | <b>EESFWGQGTLVTVSSASTK</b>       | 2.4±0.1 | 0.3±0.3        | -            | -               | 1.4E-05              | -            | -               |
|      |                               | <b>ENDNKFSFDYWGQGTLVTVSSASTK</b> | 3.1±0.2 | 0.5±0.5        | 1.2±1.1      | -               | 1.1E-04              | 8.8E-02      | -               |
|      |                               | <b>FSFDYWGQGTLVTVSSASTK</b>      | 3.9±0.1 | 1.6±0.4        | 3.2±0.2      | 0.2±0.2         | 1.7E-05              | 2.1E-03      | 7.9E-07         |
|      | CDR2                          | <b>GLEWLGYYVYSGVTR</b>           | 1.5±1.1 | 0.1±0.3        | -            | -               | 7.6E-02              | -            | -               |
|      |                               | <b>GLEWVAVVSSDGR</b>             | 2.3±0.3 | 0.1±0.1        | -            | -               | 3.5E-06              | -            | -               |
|      |                               | <b>GLEWVSSLNSDSK</b>             | 1.6±0.5 | -              | -            | -               | -                    | -            | -               |
|      | <b>GLEWVSSMSASDGGTYADSVK</b>  | 1.8±1.3                          | 0.4±0.3 | -              | 0.6±0.6      | 7.7E-02         | -                    | 1.9E-01      |                 |
| FR3  | <b>NTRYLQMNSLTTEDTALYYCAK</b> | 3.3±0.2                          | 1.1±0.2 | 2.6±0.1        | 0.0±0.0      | 1.2E-05         | 4.7E-03              | 9.3E-05      |                 |
| KV   | CDR2                          | <b>ASTLQSGVPSR</b>               | 4.5±0.2 | 2.0±0.2        | 4.5±0.2      | 1.7±0.2         | 5.3E-06              | 8.0E-01      | 1.2E-05         |
|      |                               | <b>LLLYAASTLQSGVPSR</b>          | 2.7±0.2 | 2.4±0.1        | 2.7±0.4      | 2.2±0.3         | 4.6E-02              | 9.0E-01      | 4.0E-02         |
|      | FR1                           | <b>ELTQSPATLSLSPGER</b>          | 1.1±0.8 | -              | -            | -               | -                    | -            |                 |
| LV   | CDR1                          | <b>VTLSCSGSSANLGK</b>            | 2.2±0.3 | -              | -            | -               | -                    | -            | -               |
|      |                               | <b>NYVSWYQQLPGTAPK</b>           | 2.0±0.6 | 1.3±0.1        | -            | 1.3±0.1         | 8.9E-02              | -            | 9.2E-02         |
|      | CDR2                          | <b>LLLYGNNERPSGLPDR</b>          | 2.0±0.8 | 0.1±0.3        | -            | 0.3±0.5         | 4.5E-03              | -            | 7.6E-03         |

**Supplement Figure 1. Low levels of anti-PC and anti-MDA IgMs across systemic rheumatic diseases and in healthy controls**

For each subset % of samples with the IgM level lower than overall 25<sup>th</sup> or 10<sup>th</sup> percentile is shown.



