

# THE LANCET Rheumatology

## Supplementary appendix

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## **Autoantibodies against citrullinated and native proteins and prediction of rheumatoid arthritis-associated interstitial lung disease: A nested case-control study**

### **Supplemental material:**

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**Table S18.** All adjusted\* associations between autoantibodies after subtraction of results of native from citrullinated proteins and incident RA-ILD

**Figure S1.** Receiver operating characteristic curves for incident RA-ILD risk among 84 cases and 233 RA-noILD controls in BRASS, for 6 novel biomarkers

**Figure S2.** Receiver operating characteristic curves for incident RA-ILD risk among 84 cases and 233 RA-noILD controls in BRASS for novel biomarkers grouped as autoantibodies to citrullinated or native proteins

**Table S19.** Pairwise comparisons of AUCs between different models for incident RA-ILD risk

**Table S20.** Model coefficients and odds ratios used for RA-ILD risk score development

**Table S1. Clinical characteristics of incident RA-ILD cases (n=84)**

| <b>RA-ILD subtype, n (%)</b>                                      | <b>n (%)</b>                    |
|---|---------------------------------|
| Cellular NSIP   | 44 (52.4)                       |
| UIP/Fibrotic NSIP   | 29 (34.5)                       |
| AIP/DAD/others  | 11 (13.1)                       |
| <b>RA-ILD radiographic severity, n (%)</b>                        | <b>n (%)</b>                    |
| Mild  | 17 (20.2)                       |
| Moderate/severe   | 67 (79.8)                       |
| <b>Pulmonary function test results*, mean <math>\pm</math> SD</b> | <b>Mean <math>\pm</math> SD</b> |
| FEV <sub>1</sub> % predicted, mean $\pm$ SD                       | 73.0 $\pm$ 22.0                 |
| FVC % predicted, mean $\pm$ SD                                    | 76.9 $\pm$ 17.2                 |
| FEV <sub>1</sub> /FVC, mean $\pm$ SD                              | 0.74 $\pm$ 0.11                 |
| TLC % predicted, mean $\pm$ SD                                    | 88.4 $\pm$ 19.5                 |
| DLco % predicted, mean $\pm$ SD                                   | 60.9 $\pm$ 20.6                 |

\*Available on n=53 patients

AIP = acute interstitial pneumonia, DAD = diffuse alveolar damage, DLco = diffusing capacity for carbon monoxide, FEV<sub>1</sub> = forced expiratory volume in 1 second, FVC = forced vital capacity, NSIP = non-specific interstitial pneumonia, RA-ILD = rheumatoid arthritis-associated interstitial lung disease, SD = standard deviation, TLC = total lung capacity

**Table S2. Additional adjusted associations between autoantibodies to citrullinated antigens and incident RA-ILD**

| <b>Targeted citrullinated antigen*</b>  | <b>Adjusted** OR (95% CI)</b> | <b>FDR p-value</b> |
|---|-------------------------------|--------------------|
| FibrinogenB 285-305 cit (IgG)           | 1.34 (0.97,1.86)              | 0.49               |
| FibrinogenB 62-81 cit 74 (IgA1)         | 0.80 (0.62,1.03)              | 0.49               |
| H4 33-48 cit 39 (IgG)                   | 1.29 (0.97,1.73)              | 0.49               |
| Biglycan 247-266 cit cyclic (IgA1)      | 0.80 (0.58,1.09)              | 0.73               |
| H2A/a-2 1-20 cit (IgA1)                 | 0.81 (0.60,1.09)              | 0.73               |
| FibrinogenA 41-60 cit3 cyclic (IgA2)    | 1.84 (0.77,4.39)              | 0.73               |
| FibrinogenB 62-81 cit 72 (IgA1)         | 0.83 (0.64,1.09)              | 0.73               |
| H2B/a 62-81 cit cyclic (IgG)            | 0.81 (0.59,1.11)              | 0.73               |
| Vimentin 58-77 cit3 cyclic (IgA1)       | 0.83 (0.63,1.10)              | 0.73               |
| FibrinogenA 27-43 cit (IgA2)            | 0.77 (0.50,1.17)              | 0.73               |
| H2A/a 1-20 cit cyclic (IgA1)            | 0.85 (0.66,1.10)              | 0.73               |
| Vimentin 58-77 cit3 cyclic (IgA2)       | 1.42 (0.81,2.49)              | 0.73               |
| Biglycan 247-266 cit cyclic (IgA2)      | 0.63 (0.28,1.39)              | 0.73               |
| Collagen Type II 281-298 cit 290 (IgA1) | 0.84 (0.62,1.14)              | 0.73               |
| H2B/a 62-81 cit cyclic (IgA1)           | 0.82 (0.58,1.16)              | 0.73               |
| B-actin 191-216 cit 196.206.210 (IgG)   | 1.18 (0.88,1.59)              | 0.73               |
| FibrinogenB 54-74 cit 60 72 74 (IgA1)   | 0.83 (0.60,1.16)              | 0.73               |
| Clusterin 221-240 cit cyclic (IgA1)     | 0.85 (0.64,1.14)              | 0.73               |
| FibrinogenA 616-635 cit3 cyclic (IgA1)  | 0.87 (0.67,1.12)              | 0.73               |
| FibrinogenA 563-583 cit 573 (IgA2)      | 1.26 (0.83,1.90)              | 0.73               |
| Enolase-1A 5-21 cit (IgA2)              | 1.27 (0.82,1.98)              | 0.73               |
| Fibronectin cit 1035 1036 (IgA2)        | 1.15 (0.87,1.52)              | 0.78               |
| FibrinogenA 27-43 cit (IgA1)            | 0.88 (0.67,1.15)              | 0.78               |
| FibrinogenB 54-74 cit 60 72 74(IgG)     | 1.18 (0.83,1.68)              | 0.78               |
| FibrinogenB 246-267 cit (IgG)           | 1.16 (0.84,1.61)              | 0.78               |
| Vimentin 1-16 cit (IgA1)                | 0.86 (0.60,1.22)              | 0.78               |
| H4 33-48 cit 39 40 (IgA1)               | 1.09 (0.90,1.33)              | 0.78               |
| Enolase-1A 5-21 cit (IgA1)              | 0.90 (0.71,1.15)              | 0.78               |
| FibrinogenA 211-230 cit cyclic (IgG)    | 0.85 (0.58,1.25)              | 0.78               |
| FibrinogenB 285-305 cit (IgA1)          | 0.86 (0.61,1.22)              | 0.78               |
| FibrinogenB 285-305 cit (IgA2)          | 0.81 (0.48,1.36)              | 0.78               |
| B-actin 191-216 cit 196.206.210 (IgA2)  | 1.18 (0.79,1.77)              | 0.78               |
| FibrinogenB 62-81 cit 72 (IgA2)         | 0.84 (0.55,1.30)              | 0.78               |
| FibrinogenB 62-81 cit 74 (IgG)          | 0.89 (0.66,1.20)              | 0.78               |
| Clusterin 221-240 cit cyclic (IgA2)     | 1.26 (0.68,2.33)              | 0.82               |
| FibrinogenB 36-52 cit (IgG)             | 0.87 (0.60,1.28)              | 0.82               |
| FibrinogenB 62-81 cit 72 (IgG)          | 0.90 (0.65,1.25)              | 0.89               |
| Collagen Type II 281-298 cit 290 (IgG)  | 0.90 (0.63,1.28)              | 0.90               |
| FibrinogenB 246-267 cit (IgA1)          | 0.90 (0.62,1.30)              | 0.92               |
| H2B/a 62-81 cit cyclic (IgA2)           | 0.69 (0.17,2.72)              | 0.92               |
| FibrinogenB 246-267 cit (IgA2)          | 0.86 (0.44,1.67)              | 0.96               |
| FibrinogenA 563-583 cit 573 (IgG)       | 1.07 (0.80,1.43)              | 0.96               |
| FibrinogenB 54-74 cit 60 72 74 (IgA2)   | 1.19 (0.56,2.52)              | 0.96               |
| H4 33-48 cit 39 (IgA1)                  | 1.07 (0.79,1.44)              | 0.96               |
| Vimentin 58-77 cit3 cyclic (IgG)        | 0.94 (0.71,1.26)              | 0.97               |
| FibrinogenB 62-81 cit 74 (IgA2)         | 0.91 (0.58,1.44)              | 0.97               |
| Fibronectin cit 1035 1036 (IgA1)        | 1.03 (0.84,1.27)              | 0.98               |

|   |                  |      |
|---|------------------|------|
| FibrinogenA 616-635 cit3 cyclic (IgG)   | 0.96 (0.69,1.33) | 0.98 |
| Clusterin 231-250 cit cyclic (IgA2)     | 0.97 (0.78,1.21) | 0.98 |
| Collagen Type II 281-298 cit 290 (IgA2) | 0.94 (0.55,1.61) | 0.98 |
| FibrinogenA 616-635 cit3 cyclic (IgA2)  | 1.05 (0.68,1.61) | 0.98 |
| Vimentin 1-16 cit (IgG)                 | 0.96 (0.66,1.40) | 0.98 |
| Vimentin 1-16 cit (IgA2)                | 0.89 (0.25,3.10) | 0.98 |
| B-actin 191-216 cit 196.206.210 (IgA1)  | 1.03 (0.79,1.34) | 0.98 |
| Biglycan 247-266 cit cyclic (IgG)       | 1.03 (0.74,1.43) | 0.98 |
| H2A/a-2 1-20 cit (IgG)                  | 1.03 (0.72,1.48) | 0.98 |
| FibrinogenA 211-230 cit cyclic (IgA1)   | 0.98 (0.73,1.31) | 0.98 |
| FibrinogenA 41-60 cit3 cyclic (IgA1)    | 0.98 (0.73,1.32) | 0.98 |
| FibrinogenB 36-52 cit (IgA1)            | 0.98 (0.71,1.35) | 0.98 |
| Enolase-1A 5-21 cit (IgG)               | 0.99 (0.78,1.25) | 0.98 |
| Clusterin 221-240 cit cyclic (IgG)      | 1.02 (0.76,1.36) | 0.98 |
| H4 33-48 cit 39 40 (IgA2)               | 1.01 (0.78,1.31) | 0.98 |
| Clusterin 231-250 cit cyclic (IgA1)     | 0.99 (0.81,1.21) | 0.98 |
| FibrinogenA 27-43 cit (IgG)             | 0.99 (0.75,1.30) | 0.98 |
| H2A/a 1-20 cit cyclic (IgG)             | 1.01 (0.75,1.36) | 0.98 |
| FibrinogenA 211-230 cit cyclic (IgA2)   | 0.98 (0.48,2.01) | 0.98 |
| FibrinogenA 563-583 cit 573 (IgA1)      | 1.0 (0.78,1.29)  | 0.99 |
| FibrinogenA 41-60 cit3 cyclic (IgG)     | 1.0 (0.68,1.48)  | 0.99 |

BMI = body mass index, CI = confidence interval, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Presented by level of significance.

\*\*Per log-transformed unit. Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S3. Additional adjusted associations between autoantibodies to native antigens and incident RA-ILD**

| <b>Targeted native antigen*</b> | <b>Adjusted** OR (95% CI)</b> | <b>FDR p-value</b> |
|---------------------------------|-------------------------------|--------------------|
| FibrinogenB 62-81 (IgA1)        | 0.81 (0.61,1.09)              | 0.57               |
| H2A/a-2 1-20 (IgA1)             | 1.21 (0.88,1.66)              | 0.72               |
| tenascin C 5 (IgG)              | 0.81 (0.57,1.16)              | 0.72               |
| H2A/a 1-20 cyclic (IgA1)        | 1.20 (0.87,1.66)              | 0.72               |
| tenascin C 5 (IgA1)             | 0.82 (0.58,1.18)              | 0.72               |
| Filaggrin 48-65 cyclic (IgA1)   | 1.35 (0.77,2.37)              | 0.72               |
| FibrinogenB 285-305 (IgG)       | 0.84 (0.58,1.24)              | 0.78               |
| FibrinogenB 285-305 (IgA1)      | 0.86 (0.60,1.22)              | 0.78               |
| Vimentin 58-77 cyclic (IgA1)    | 1.15 (0.84,1.58)              | 0.78               |
| FibrinogenB 54-74 (IgA1)        | 0.88 (0.65,1.19)              | 0.78               |
| FibrinogenB 62-81 (IgA2)        | 0.80 (0.44,1.45)              | 0.79               |
| Vimentin 265-278 (IgG)          | 0.88 (0.61,1.27)              | 0.79               |
| FibrinogenB 54-74 (IgG)         | 0.88 (0.60,1.29)              | 0.79               |
| Collagen Type II 281-298 (IgA1) | 0.90 (0.65,1.24)              | 0.79               |
| FibrinogenB 54-74 (IgA2)        | 0.84 (0.48,1.46)              | 0.79               |
| Filaggrin 48-65 cyclic (IgA2)   | 0.67 (0.19,2.38)              | 0.79               |
| H2B/a 62-81 cyclic (IgG)        | 0.90 (0.64,1.28)              | 0.79               |
| Collagen Type II 281-298 (IgG)  | 0.90 (0.62,1.30)              | 0.79               |
| Vimentin 1-16 (IgA2)            | 0.83 (0.41,1.69)              | 0.80               |
| Vimentin 1-16 (IgA1)            | 0.92 (0.67,1.27)              | 0.80               |
| H2B/a 62-81 cyclic (IgA1)       | 0.93 (0.67,1.29)              | 0.80               |
| Vimentin 265-278 (IgA1)         | 0.93 (0.67,1.29)              | 0.80               |
| Vimentin 265-278 (IgA2)         | 0.91 (0.46,1.79)              | 0.93               |
| Collagen Type II 281-298 (IgA2) | 0.93 (0.49,1.75)              | 0.94               |
| FibrinogenB 62-81 (IgG)         | 1.03 (0.74,1.43)              | 0.94               |
| Vimentin 1-16 (IgG)             | 1.03 (0.69,1.54)              | 0.94               |
| H2B/a 62-81 cyclic (IgA2)       | 1.04 (0.57,1.89)              | 0.94               |
| tenascin C 5 (IgA2)             | 0.95 (0.38,2.41)              | 0.94               |
| FibrinogenB 285-305 (IgA2)      | 0.99 (0.48,2.03)              | 0.98               |

BMI = body mass index, CI = confidence interval, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Presented by level of significance.

\*\*Per log-transformed unit. Adjusting for significant covariates including BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S4. All unadjusted associations between autoantibodies to citrullinated proteins and incident RA-ILD**

| Targeted antigen                        | OR    | Lower 95% CL | Upper 95% CL | p-value | FDR-p   |
|---|-------|--------------|--------------|---------|---------|
| H4 33-48 cit 39 (IgA2)                  | 0.090 | 0.038        | 0.212        | <0.0001 | <0.0001 |
| H2A/a-2 1-20 cit (IgA2)                 | 4.406 | 2.323        | 8.359        | <0.0001 | 0.0002  |
| Filaggrin 48-65 cit2 cyclic (IgG)       | 3.469 | 1.806        | 6.662        | 0.0002  | 0.0049  |
| Clusterin 231-250 cit cyclic (IgG)      | 1.350 | 1.148        | 1.589        | 0.0003  | 0.0056  |
| H4 33-48 cit 39 40 (IgG)                | 1.262 | 1.080        | 1.474        | 0.0033  | 0.0521  |
| H2A/a 1-20 cit cyclic (IgA2)            | 1.790 | 1.197        | 2.677        | 0.0046  | 0.0596  |
| Filaggrin 48-65 cit2 cyclic (IgA2)      | 4.959 | 1.448        | 16.992       | 0.0108  | 0.1205  |
| Fibronectin cit 1035 1036 (IgG)         | 1.210 | 1.038        | 1.412        | 0.0150  | 0.1459  |
| Vimentin 58-77 cit3 cyclic (IgA2)       | 1.822 | 1.106        | 3.003        | 0.0185  | 0.1607  |
| Enolase-1A 5-21 cit (IgA2)              | 1.497 | 1.036        | 2.162        | 0.0318  | 0.2477  |
| Filaggrin 48-65 cit2 cyclic (IgA1)      | 1.756 | 1.028        | 3.001        | 0.0393  | 0.2788  |
| Clusterin 221-240 cit cyclic (IgA2)     | 1.596 | 1.000        | 2.547        | 0.0500  | 0.3091  |
| H4 33-48 cit 39 (IgG)                   | 1.241 | 0.998        | 1.544        | 0.0523  | 0.3091  |
| H4 33-48 cit 39 40 (IgA1)               | 1.161 | 0.997        | 1.353        | 0.0555  | 0.3091  |
| FibrinogenB 285-305 cit(IgA2)           | 0.667 | 0.437        | 1.017        | 0.0597  | 0.3106  |
| Clusterin 231-250 cit cyclic (IgA2)     | 1.169 | 0.990        | 1.381        | 0.0653  | 0.3181  |
| FibrinogenB 285-305 cit(IgA1)           | 0.780 | 0.591        | 1.030        | 0.0799  | 0.3470  |
| FibrinogenB 36-52 cit (IgA2)            | 0.445 | 0.180        | 1.102        | 0.0801  | 0.3470  |
| Enolase-1A 5-21 cit (IgG)               | 1.179 | 0.974        | 1.427        | 0.0903  | 0.3670  |
| Clusterin 231-250 cit cyclic (IgA1)     | 1.147 | 0.977        | 1.347        | 0.0941  | 0.3670  |
| FibrinogenB 246-267 cit (IgA1)          | 0.786 | 0.586        | 1.055        | 0.1087  | 0.4017  |
| Fibronectin cit 1035 1036 (IgA2)        | 1.185 | 0.960        | 1.463        | 0.1136  | 0.4017  |
| FibrinogenA 211-230 cit cyclic (IgG)    | 0.775 | 0.560        | 1.074        | 0.1256  | 0.4017  |
| FibrinogenB 54-74 cit 60 72 74 (IgA1)   | 0.811 | 0.619        | 1.062        | 0.1277  | 0.4017  |
| FibrinogenB 62-81 cit 74 (IgA1)         | 0.849 | 0.687        | 1.049        | 0.1288  | 0.4017  |
| Collagen Type II 281-298 cit 290 (IgG)  | 0.805 | 0.605        | 1.070        | 0.1345  | 0.4036  |
| FibrinogenB 36-52 cit (IgG)             | 0.802 | 0.587        | 1.096        | 0.1670  | 0.4825  |
| H4 33-48 cit 39 (IgA1)                  | 1.163 | 0.929        | 1.456        | 0.1882  | 0.5135  |
| FibrinogenA 563-583 cit 573 (IgA2)      | 1.219 | 0.906        | 1.640        | 0.1920  | 0.5135  |
| FibrinogenB 285-305 (IgG)               | 1.175 | 0.920        | 1.500        | 0.1975  | 0.5135  |
| FibrinogenB 246-267 cit (IgA2)          | 0.727 | 0.439        | 1.204        | 0.2160  | 0.5435  |
| FibrinogenA 41-60 cit3 cyclic (IgA2)    | 1.500 | 0.760        | 2.962        | 0.2427  | 0.5864  |
| H2B/a 62-81 cit cyclic (IgA1)           | 0.849 | 0.642        | 1.123        | 0.2511  | 0.5864  |
| Vimentin 1-16 cit (IgG)                 | 0.841 | 0.622        | 1.135        | 0.2574  | 0.5864  |
| FibrinogenA 616-635 cit3 cyclic (IgA2)  | 1.207 | 0.863        | 1.687        | 0.2711  | 0.5864  |
| Biglycan 247-266 cit cyclic (IgA1)      | 0.868 | 0.674        | 1.118        | 0.2740  | 0.5864  |
| Collagen Type II 281-298 cit 290 (IgA1) | 0.869 | 0.675        | 1.120        | 0.2782  | 0.5864  |
| H2B/a 62-81 cit cyclic (IgG)            | 0.866 | 0.662        | 1.133        | 0.2934  | 0.5963  |
| Fibronectin cit 1035 1036 (IgA1)        | 1.093 | 0.924        | 1.294        | 0.2981  | 0.5963  |



|   |       |       |       |        |        |
|---|-------|-------|-------|--------|--------|
| Clusterin 221-240 cit cyclic (IgG)      | 1.119 | 0.886 | 1.414 | 0.3456 | 0.6739 |
| FibrinogenB 62-81 cit 72 (IgG)          | 0.885 | 0.681 | 1.149 | 0.3585 | 0.6819 |
| Vimentin 1-16 cit (IgA1)                | 0.883 | 0.661 | 1.180 | 0.4011 | 0.7449 |
| FibrinogenB 62-81 cit 72 (IgA1)         | 0.912 | 0.731 | 1.138 | 0.4169 | 0.7485 |
| H2A/a-2 1-20 cit (IgA1)                 | 0.903 | 0.702 | 1.161 | 0.4256 | 0.7485 |
| FibrinogenA 27-43 cit (IgG)             | 1.090 | 0.879 | 1.353 | 0.4318 | 0.7485 |
| Vimentin 1-16 cit (IgA2)                | 0.691 | 0.248 | 1.922 | 0.4790 | 0.8122 |
| B-actin 191-216 cit 196.206.210 (IgA1)  | 0.928 | 0.750 | 1.148 | 0.4911 | 0.8150 |
| Vimentin 58-77 cit3 cyclic (IgG)        | 1.077 | 0.855 | 1.355 | 0.5285 | 0.8289 |
| FibrinogenB 36-52 cit (IgA1)            | 0.925 | 0.720 | 1.187 | 0.5400 | 0.8289 |
| Vimentin 58-77 cit3 cyclic (IgA1)       | 0.933 | 0.737 | 1.181 | 0.5648 | 0.8289 |
| FibrinogenA 616-635 cit3 cyclic (IgA1)  | 0.936 | 0.748 | 1.172 | 0.5662 | 0.8289 |
| FibrinogenB 62-81 cit 72 (IgA2)         | 0.909 | 0.643 | 1.285 | 0.5895 | 0.8289 |
| Collagen Type II 281-298 cit 290 (IgA2) | 0.890 | 0.579 | 1.370 | 0.5971 | 0.8289 |
| Clusterin 221-240 cit cyclic (IgA1)     | 0.938 | 0.735 | 1.197 | 0.6071 | 0.8289 |
| H2A/a 1-20 cit cyclic (IgA1)            | 0.945 | 0.761 | 1.174 | 0.6085 | 0.8289 |
| Enolase-1A 5-21 cit (IgA1)              | 1.053 | 0.863 | 1.285 | 0.6098 | 0.8289 |
| FibrinogenB 62-81 cit 74 (IgG)          | 0.941 | 0.744 | 1.189 | 0.6100 | 0.8289 |
| FibrinogenA 27-43 cit (IgA1)            | 0.944 | 0.752 | 1.186 | 0.6223 | 0.8289 |
| H4 33-48 cit 39 40 (IgA2)               | 1.049 | 0.864 | 1.273 | 0.6270 | 0.8289 |
| Biglycan 247-266 cit cyclic (IgA2)      | 0.867 | 0.470 | 1.597 | 0.6464 | 0.8307 |
| H2A/a 1-20 cit cyclic (IgG)             | 1.055 | 0.838 | 1.326 | 0.6496 | 0.8307 |
| H2A/a-2 1-20 cit (IgG)                  | 1.054 | 0.806 | 1.378 | 0.6997 | 0.8597 |
| Biglycan 247-266 cit cyclic (IgG)       | 1.053 | 0.808 | 1.373 | 0.7037 | 0.8597 |
| H2B/a 62-81 cit cyclic (IgA2)           | 0.812 | 0.276 | 2.390 | 0.7054 | 0.8597 |
| FibrinogenA 41-60 cit3 cyclic (IgG)     | 0.944 | 0.685 | 1.301 | 0.7242 | 0.8691 |
| B-actin 191-216 cit 196.206.210 (IgG)   | 1.038 | 0.824 | 1.306 | 0.7531 | 0.8900 |
| FibrinogenB 62-81 cit 74 (IgA2)         | 0.949 | 0.669 | 1.346 | 0.7691 | 0.8927 |
| FibrinogenB 52-74 cit 60 72 74 (IgG)    | 1.042 | 0.783 | 1.386 | 0.7782 | 0.8927 |
| FibrinogenA 563-583 cit 573 (IgA1)      | 1.027 | 0.839 | 1.257 | 0.7973 | 0.9012 |
| FibrinogenA 211-230 cit cyclic (IgA2)   | 0.941 | 0.492 | 1.800 | 0.8540 | 0.9434 |
| FibrinogenB 246-267 cit (IgG)           | 1.022 | 0.792 | 1.320 | 0.8653 | 0.9434 |
| FibrinogenA 41-60 cit3 cyclic (IgA1)    | 0.979 | 0.763 | 1.257 | 0.8708 | 0.9434 |
| FibrinogenA 27-43 cit (IgA2)            | 1.019 | 0.737 | 1.408 | 0.9117 | 0.9656 |
| FibrinogenA 211-230 cit cyclic (IgA1)   | 0.986 | 0.766 | 1.271 | 0.9161 | 0.9656 |
| FibrinogenA 563-583 cit 573 (IgG)       | 1.009 | 0.805 | 1.265 | 0.9364 | 0.9694 |
| FibrinogenB 54-74 cit 60 72 74 (IgA2)   | 1.023 | 0.544 | 1.921 | 0.9445 | 0.9694 |
| B-actin 191-216 cit 196.206.210 (IgA2)  | 0.993 | 0.714 | 1.382 | 0.9678 | 0.9804 |
| FibrinogenA 616-635 cit3 cyclic (IgG)   | 1.002 | 0.776 | 1.293 | 0.9894 | 0.9894 |

cit = citrullinated, CL = confidence limit, OR = odds ratio.

**Table S5. All unadjusted associations between autoantibodies to native proteins and incident RA-ILD**

| Targeted antigen                | OR     | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|--------|--------------|--------------|---------|--------|
| H2A/a 1-20 cyclic (IgA2)        | 12.345 | 3.483        | 43.756       | <0.0001 | 0.0039 |
| H2A/a-2 1-20 (IgA2)             | 7.457  | 2.459        | 22.611       | 0.0004  | 0.0075 |
| Filaggrin 48-65 cyclic (IgG)    | 3.472  | 1.588        | 7.595        | 0.0018  | 0.0237 |
| H2A/a 1-20 cyclic (IgG)         | 2.233  | 1.238        | 4.029        | 0.0076  | 0.0744 |
| H2A/a-2 1-20 (IgG)              | 2.106  | 1.180        | 3.758        | 0.0117  | 0.0913 |
| H2A/a-2 1-20 (IgA1)             | 1.461  | 0.974        | 2.191        | 0.0667  | 0.4334 |
| FibrinogenB 62-81 (IgA1)        | 0.733  | 0.516        | 1.041        | 0.0823  | 0.4587 |
| Vimentin 58-77 cyclic (IgA2)    | 2.015  | 0.880        | 4.615        | 0.0976  | 0.4756 |
| Vimentin 58-77 cyclic (IgG)     | 1.411  | 0.915        | 2.175        | 0.1191  | 0.5004 |
| tenascin C 5 (IgA1)             | 0.719  | 0.466        | 1.107        | 0.1341  | 0.5004 |
| tenascin C 5 (IgG)              | 0.715  | 0.457        | 1.118        | 0.1411  | 0.5004 |
| Collagen Type II 281-298 (IgG)  | 0.717  | 0.453        | 1.134        | 0.1545  | 0.5020 |
| H2A/a 1-20 cyclic (IgA1)        | 1.309  | 0.893        | 1.917        | 0.1675  | 0.5026 |
| Collagen Type II 281-298 (IgA1) | 0.773  | 0.517        | 1.155        | 0.2082  | 0.5800 |
| tenascin C 1 (IgA1)             | 0.807  | 0.567        | 1.149        | 0.2347  | 0.6102 |
| FibrinogenB 285-305 (IgG)       | 0.781  | 0.486        | 1.256        | 0.3079  | 0.6915 |
| Vimentin 1-16 (IgA1)            | 0.819  | 0.553        | 1.213        | 0.3195  | 0.6915 |
| FibrinogenB 285-305 (IgA1)      | 0.809  | 0.524        | 1.247        | 0.3363  | 0.6915 |
| Vimentin 265-278 (IgA1)         | 0.819  | 0.540        | 1.243        | 0.3487  | 0.6915 |
| Filaggrin 48-65 cyclic (IgA1)   | 1.357  | 0.700        | 2.634        | 0.3662  | 0.6915 |
| FibrinogenB 54-74 (IgA1)        | 0.862  | 0.604        | 1.230        | 0.4124  | 0.6915 |
| H2B/a 62-81 cyclic (IgA2)       | 1.315  | 0.683        | 2.531        | 0.4124  | 0.6915 |
| tenascin C 5 (IgA2)             | 0.624  | 0.200        | 1.953        | 0.4183  | 0.6915 |
| H2B/a 62-81 cyclic (IgG)        | 0.831  | 0.527        | 1.311        | 0.4255  | 0.6915 |
| Vimentin 58-77 cyclic (IgA1)    | 1.141  | 0.795        | 1.640        | 0.4743  | 0.6947 |
| Vimentin 265-278 (IgG)          | 0.856  | 0.558        | 1.315        | 0.4777  | 0.6947 |
| FibrinogenB 54-74 (IgG)         | 0.846  | 0.532        | 1.346        | 0.4809  | 0.6947 |
| tenascin C 1 (IgG)              | 0.871  | 0.573        | 1.325        | 0.5181  | 0.7217 |
| FibrinogenB 285-305 (IgA2)      | 1.235  | 0.556        | 2.742        | 0.6044  | 0.8128 |
| Vimentin 1-16 (IgG)             | 0.902  | 0.553        | 1.471        | 0.6798  | 0.8837 |
| FibrinogenB 62-81 (IgA2)        | 0.897  | 0.494        | 1.632        | 0.7229  | 0.9095 |
| Vimentin 1-16 (IgA2)            | 0.909  | 0.413        | 2.002        | 0.8128  | 0.9279 |
| Filaggrin 48-65 cyclic (IgA2)   | 0.847  | 0.214        | 3.355        | 0.8134  | 0.9279 |
| H2B/a 62-81 cyclic (IgA1)       | 0.963  | 0.650        | 1.428        | 0.8515  | 0.9279 |
| Vimentin 265-278 (IgA2)         | 0.938  | 0.435        | 2.021        | 0.8698  | 0.9279 |
| tenascin C 1 (IgA2)             | 1.068  | 0.462        | 2.467        | 0.8785  | 0.9279 |
| FibrinogenB 62-81 (IgG)         | 0.971  | 0.664        | 1.420        | 0.8803  | 0.9279 |
| FibrinogenB 54-74 (IgA2)        | 1.029  | 0.590        | 1.795        | 0.9200  | 0.9442 |
| Collagen Type II 281-298 (IgA2) | 0.988  | 0.488        | 2.002        | 0.9741  | 0.9741 |

CL = confidence limit, OR = odds ratio.

**Table S6. All adjusted\* associations between autoantibodies to citrullinated proteins and incident cellular NSIP subtype of RA-ILD**

| Targeted antigen                        | OR     | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---|--------|--------------|--------------|---------|--------|
| H2A/a-2 1-20 cit (IgA2)                 | 10.939 | 3.011        | 39.741       | 0.0003  | 0.0217 |
| Filaggrin 48-65 cit2 cyclic (IgG)       | 22.712 | 2.417        | 213.400      | 0.0063  | 0.1798 |
| H4 33-48 cit 39 (IgA2)                  | 0.140  | 0.034        | 0.583        | 0.0069  | 0.1798 |
| FibrinogenB 62-81 cit 74 (IgA1)         | 0.597  | 0.391        | 0.911        | 0.0168  | 0.3280 |
| H2A/a 1-20 cit cyclic (IgA2)            | 2.777  | 1.158        | 6.657        | 0.0221  | 0.3441 |
| Biglycan 247-266 cit cyclic (IgA1)      | 0.511  | 0.271        | 0.963        | 0.0379  | 0.4747 |
| Filaggrin 48-65 cit2 cyclic (IgA1)      | 3.287  | 0.986        | 10.956       | 0.0527  | 0.4747 |
| FibrinogenA 616-635 cit3 cyclic (IgA1)  | 0.641  | 0.408        | 1.007        | 0.0537  | 0.4747 |
| Vimentin 58-77 cit3 cyclic (IgA2)       | 3.448  | 0.873        | 13.621       | 0.0774  | 0.4747 |
| Collagen Type II 281-298 cit 290 (IgA1) | 0.638  | 0.386        | 1.053        | 0.0785  | 0.4747 |
| Clusterin 221-240 cit cyclic (IgA1)     | 0.598  | 0.337        | 1.061        | 0.0790  | 0.4747 |
| FibrinogenB 54-74 60 72 74 cit (IgA1)   | 0.593  | 0.330        | 1.065        | 0.0802  | 0.4747 |
| Filaggrin 48-65 cit2 cyclic (IgA2)      | 8.251  | 0.761        | 89.402       | 0.0826  | 0.4747 |
| FibrinogenB 285-305 cit (IgG)           | 1.817  | 0.921        | 3.587        | 0.0852  | 0.4747 |
| FibrinogenB 62-81 cit 72 (IgA1)         | 0.698  | 0.458        | 1.064        | 0.0949  | 0.4933 |
| Enolase-1A 5-21 cit (IgA1)              | 0.685  | 0.434        | 1.082        | 0.1045  | 0.5094 |
| H2B/a 62-81 cit cyclic (IgA1)           | 0.566  | 0.270        | 1.187        | 0.1321  | 0.6061 |
| Vimentin 1-16 cit (IgA1)                | 0.636  | 0.332        | 1.218        | 0.1726  | 0.7480 |
| B-actin 191-216 cit 196.206.210 (IgG)   | 1.387  | 0.844        | 2.279        | 0.1971  | 0.7688 |
| FibrinogenA 41-60 cit3 cyclic (IgA2)    | 2.613  | 0.607        | 11.245       | 0.1971  | 0.7688 |
| FibrinogenA 563-583 cit 573 (IgA2)      | 1.544  | 0.759        | 3.143        | 0.2310  | 0.8263 |
| Fibronectin cit 1035 1036 (IgG)         | 1.219  | 0.872        | 1.702        | 0.2462  | 0.8263 |
| Fibronectin cit 1035 1036 (IgA2)        | 1.264  | 0.849        | 1.882        | 0.2494  | 0.8263 |
| Vimentin 58-77 cit3 cyclic (IgA1)       | 0.740  | 0.433        | 1.266        | 0.2718  | 0.8263 |
| FibrinogenB 54-74 cit 60 72 74 (IgG)    | 1.374  | 0.767        | 2.462        | 0.2858  | 0.8263 |
| FibrinogenB 246-267 cit (IgG)           | 1.364  | 0.741        | 2.511        | 0.3188  | 0.8263 |
| FibrinogenA 616-635 cit3 cyclic (IgA2)  | 0.678  | 0.310        | 1.483        | 0.3308  | 0.8263 |
| FibrinogenA 27-43 cit (IgA1)            | 0.769  | 0.451        | 1.311        | 0.3338  | 0.8263 |
| FibrinogenA 563-583 cit 573 (IgA1)      | 0.807  | 0.518        | 1.257        | 0.3431  | 0.8263 |
| Vimentin 1-16 cit (IgA2)                | 0.274  | 0.018        | 4.076        | 0.3470  | 0.8263 |
| H4 33-48 cit 39 40 (IgG)                | 1.150  | 0.852        | 1.552        | 0.3605  | 0.8263 |
| H4 33-48 cit 39 40 (IgA2)               | 1.153  | 0.844        | 1.574        | 0.3703  | 0.8263 |
| H2A/a 1-20 cit cyclic (IgA1)            | 0.810  | 0.510        | 1.288        | 0.3737  | 0.8263 |
| B-actin 191-216 cit 196.206.210 (IgA2)  | 1.256  | 0.757        | 2.084        | 0.3784  | 0.8263 |
| H2B/a 62-81 cit cyclic (IgG)            | 0.793  | 0.472        | 1.330        | 0.3786  | 0.8263 |
| Enolase-1A 5-21 cit (IgA2)              | 1.289  | 0.727        | 2.284        | 0.3843  | 0.8263 |
| FibrinogenB 285-305 (IgA1)              | 0.789  | 0.454        | 1.371        | 0.4005  | 0.8263 |

|   |       |       |        |        |        |
|---|-------|-------|--------|--------|--------|
| Clusterin 231-250 cit cyclic (IgG)      | 1.148 | 0.831 | 1.585  | 0.4026 | 0.8263 |
| FibrinogenB 62-81 cit 74 (IgG)          | 0.823 | 0.515 | 1.314  | 0.4139 | 0.8278 |
| H4 33-48 cit 39 (IgG)                   | 1.198 | 0.762 | 1.883  | 0.4334 | 0.8281 |
| FibrinogenA 616-635 cit3 cyclic (IgG)   | 0.792 | 0.440 | 1.424  | 0.4353 | 0.8281 |
| Clusterin 231-250 cit cyclic (IgA1)     | 0.869 | 0.603 | 1.252  | 0.4518 | 0.8391 |
| FibrinogenA 211-230 cit cyclic (IgA2)   | 1.422 | 0.537 | 3.763  | 0.4784 | 0.8678 |
| Biglycan 247-266 cit cyclic (IgG)       | 0.852 | 0.526 | 1.381  | 0.5163 | 0.9152 |
| FibrinogenA 27-43 cit (IgA2)            | 0.732 | 0.262 | 2.045  | 0.5516 | 0.9446 |
| H2A/a-2 1-20 cit (IgA1)                 | 0.862 | 0.510 | 1.455  | 0.5776 | 0.9446 |
| FibrinogenB 62-81 cit 72 (IgA2)         | 0.860 | 0.481 | 1.538  | 0.6119 | 0.9446 |
| FibrinogenB 62-81 cit 74 (IgA2)         | 0.863 | 0.481 | 1.550  | 0.6219 | 0.9446 |
| Biglycan 247-266 cit cyclic (IgA2)      | 0.740 | 0.221 | 2.478  | 0.6251 | 0.9446 |
| FibrinogenA 41-60 cit3 cyclic (IgG)     | 1.152 | 0.649 | 2.044  | 0.6293 | 0.9446 |
| Vimentin 1-16 cit (IgG)                 | 1.150 | 0.652 | 2.027  | 0.6295 | 0.9446 |
| Clusterin 221-240 cit cyclic (IgA2)     | 1.229 | 0.531 | 2.843  | 0.6297 | 0.9446 |
| Collagen Type II 281-298 cit 290 (IgA2) | 0.861 | 0.414 | 1.794  | 0.6904 | 0.9558 |
| FibrinogenA 211-230 cit cyclic (IgG)    | 0.887 | 0.486 | 1.622  | 0.6977 | 0.9558 |
| FibrinogenA 41-60 cit3 cyclic (IgA1)    | 0.903 | 0.538 | 1.514  | 0.6984 | 0.9558 |
| Enolase-1A 5-21 cit (IgG)               | 0.936 | 0.634 | 1.381  | 0.7395 | 0.9558 |
| FibrinogenA 27-43 cit (IgG)             | 1.076 | 0.660 | 1.755  | 0.7682 | 0.9558 |
| Vimentin 58-77 cit3 cyclic (IgG)        | 1.059 | 0.706 | 1.589  | 0.7805 | 0.9558 |
| FibrinogenB 285-305 cit (IgA2)          | 0.912 | 0.467 | 1.781  | 0.7879 | 0.9558 |
| FibrinogenA 211-230 cit cyclic (IgA1)   | 0.940 | 0.599 | 1.476  | 0.7884 | 0.9558 |
| Clusterin 221-240 cit cyclic (IgG)      | 0.945 | 0.613 | 1.454  | 0.7956 | 0.9558 |
| FibrinogenA 563-583 cit 573 (IgG)       | 1.061 | 0.669 | 1.682  | 0.8010 | 0.9558 |
| Collagen Type II 281-298 cit 290 (IgG)  | 0.940 | 0.568 | 1.556  | 0.8092 | 0.9558 |
| FibrinogenB 36-52 cit (IgA2)            | 0.849 | 0.192 | 3.746  | 0.8285 | 0.9558 |
| FibrinogenB 246-267 cit (IgA2)          | 0.911 | 0.367 | 2.261  | 0.8408 | 0.9558 |
| FibrinogenB 62-81 cit 72 (IgG)          | 0.950 | 0.561 | 1.608  | 0.8484 | 0.9558 |
| H2A/a-2 1-20 cit (IgG)                  | 0.952 | 0.571 | 1.589  | 0.8518 | 0.9558 |
| H4 33-48 cit 39 (IgA1)                  | 0.959 | 0.608 | 1.512  | 0.8572 | 0.9558 |
| FibrinogenB 246-267 cit (IgA1)          | 0.947 | 0.510 | 1.758  | 0.8625 | 0.9558 |
| Clusterin 231-250 cit cyclic (IgA2)     | 1.025 | 0.759 | 1.384  | 0.8719 | 0.9558 |
| B-actin 191-216 cit 196.206.210 (IgA1)  | 1.029 | 0.698 | 1.517  | 0.8858 | 0.9558 |
| H2A/a 1-20 cit cyclic (IgG)             | 0.972 | 0.634 | 1.491  | 0.8972 | 0.9558 |
| FibrinogenB 36-52 cit (IgA1)            | 0.968 | 0.577 | 1.624  | 0.9005 | 0.9558 |
| FibrinogenB 36-52 cit (IgG)             | 0.970 | 0.576 | 1.634  | 0.9099 | 0.9558 |
| FibrinogenB 54-74 cit 60 72 74 (IgA2)   | 0.957 | 0.338 | 2.706  | 0.9334 | 0.9558 |
| H4 33-48 cit 39 40 (IgA1)               | 1.011 | 0.759 | 1.347  | 0.9400 | 0.9558 |
| Fibronectin cit 1035 1036 (IgA1)        | 1.011 | 0.740 | 1.383  | 0.9436 | 0.9558 |
| H2B/a 62-81 cit cyclic (IgA2)           | 0.938 | 0.080 | 10.962 | 0.9596 | 0.9596 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S7. All adjusted\* associations between autoantibodies to native proteins and incident cellular NSIP subtype of RA-ILD**

| Targeted antigen                | OR     | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|--------|--------------|--------------|---------|--------|
| H2A/a 1-20 cyclic (IgA2)        | 50.247 | 6.923        | 364.701      | 0.0001  | 0.0034 |
| H2A/a-2 1-20 (IgA2)             | 16.755 | 3.850        | 72.908       | 0.0002  | 0.0034 |
| Filaggrin 48-65 cyclic (IgG)    | 5.903  | 1.590        | 21.921       | 0.0080  | 0.1039 |
| H2A/a 1-20 cyclic (IgG)         | 3.307  | 1.239        | 8.825        | 0.0169  | 0.1652 |
| H2A/a-2 1-20 (IgG)              | 3.104  | 1.172        | 8.225        | 0.0227  | 0.1770 |
| Vimentin 58-77 cyclic (IgG)     | 2.043  | 1.005        | 4.155        | 0.0485  | 0.3154 |
| Vimentin 58-77 cyclic (IgA2)    | 3.123  | 0.848        | 11.506       | 0.0869  | 0.4759 |
| H2A/a-2 1-20 (IgA1)             | 1.642  | 0.913        | 2.953        | 0.0976  | 0.4759 |
| tenascin C 1 (IgA1)             | 0.681  | 0.423        | 1.097        | 0.1140  | 0.4941 |
| FibrinogenB 62-81 (IgA1)        | 0.729  | 0.475        | 1.120        | 0.1495  | 0.5832 |
| H2A/a 1-20 cyclic (IgA1)        | 1.473  | 0.826        | 2.625        | 0.1896  | 0.6583 |
| tenascin C 5 (IgA1)             | 0.652  | 0.338        | 1.259        | 0.2025  | 0.6583 |
| Collagen Type II 281-298 (IgA1) | 0.719  | 0.422        | 1.223        | 0.2235  | 0.6706 |
| FibrinogenB 54-74 (IgA1)        | 0.761  | 0.474        | 1.221        | 0.2571  | 0.7009 |
| FibrinogenB 285-305 (IgA1)      | 0.709  | 0.385        | 1.306        | 0.2696  | 0.7009 |
| Vimentin 58-77 cyclic (IgA1)    | 1.287  | 0.785        | 2.110        | 0.3171  | 0.7730 |
| Filaggrin 48-65 cyclic (IgA1)   | 1.555  | 0.623        | 3.881        | 0.3446  | 0.7886 |
| Vimentin 265-278 (IgA1)         | 0.776  | 0.447        | 1.350        | 0.3698  | 0.7886 |
| Vimentin 1-16 (IgA1)            | 0.798  | 0.475        | 1.341        | 0.3947  | 0.7886 |
| H2B/a 62-81 cyclic (IgA1)       | 0.789  | 0.452        | 1.377        | 0.4044  | 0.7886 |
| tenascin C 5 (IgA2)             | 0.546  | 0.102        | 2.929        | 0.4797  | 0.8910 |
| tenascin C 5 (IgG)              | 0.819  | 0.439        | 1.527        | 0.5296  | 0.9294 |
| FibrinogenB 62-81 (IgG)         | 1.136  | 0.677        | 1.907        | 0.6283  | 0.9294 |
| tenascin C 1 (IgA2)             | 0.758  | 0.244        | 2.357        | 0.6327  | 0.9294 |
| Vimentin 1-16 (IgG)             | 1.166  | 0.614        | 2.217        | 0.6383  | 0.9294 |
| tenascin C 1 (IgG)              | 0.896  | 0.536        | 1.497        | 0.6746  | 0.9294 |
| Vimentin 265-278 (IgG)          | 0.888  | 0.500        | 1.577        | 0.6843  | 0.9294 |
| Collagen Type II 281-298 (IgA2) | 0.871  | 0.384        | 1.975        | 0.7411  | 0.9294 |
| Filaggrin 48-65 cyclic (IgA2)   | 0.755  | 0.115        | 4.977        | 0.7706  | 0.9294 |
| H2B/a 62-81 cyclic (IgG)        | 1.076  | 0.607        | 1.908        | 0.8012  | 0.9294 |
| Vimentin 265-278 (IgA2)         | 0.892  | 0.364        | 2.188        | 0.8027  | 0.9294 |
| H2B/a 62-81 cyclic (IgA2)       | 1.067  | 0.469        | 2.430        | 0.8771  | 0.9294 |
| FibrinogenB 285-305 (IgA2)      | 1.075  | 0.400        | 2.883        | 0.8864  | 0.9294 |
| Vimentin 1-16 (IgA2)            | 0.939  | 0.379        | 2.326        | 0.8913  | 0.9294 |
| FibrinogenB 54-74 (IgG)         | 1.037  | 0.581        | 1.850        | 0.9023  | 0.9294 |
| FibrinogenB 54-74 (IgA2)        | 0.958  | 0.468        | 1.960        | 0.9060  | 0.9294 |
| FibrinogenB 62-81 (IgA2)        | 0.959  | 0.454        | 2.026        | 0.9121  | 0.9294 |
| Collagen Type II 281-298 (IgG)  | 0.973  | 0.557        | 1.701        | 0.9233  | 0.9294 |
| FibrinogenB 285-305 (IgG)       | 0.972  | 0.524        | 1.805        | 0.9294  | 0.9294 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S8. All adjusted\* associations between autoantibodies to citrullinated proteins and incident UIP/fibrotic NSIP subtype of RA-ILD**

| Targeted antigen                        | OR     | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---|--------|--------------|--------------|---------|--------|
| FibrinogenA 211-230 cit cyclic (IgA2)   | 0.005  | <0.001       | 0.313        | 0.0123  | 0.5045 |
| FibrinogenB 36-52 cit (IgA2)            | <0.001 | <0.001       | 0.247        | 0.0167  | 0.5045 |
| Biglycan 247-266 cit cyclic (IgA2)      | 0.112  | 0.015        | 0.871        | 0.0364  | 0.5045 |
| H4 33-48 cit 39 (IgA2)                  | <0.001 | <0.001       | 0.916        | 0.0475  | 0.5045 |
| H2A/a-2 1-20 cit (IgA1)                 | 0.500  | 0.246        | 1.014        | 0.0547  | 0.5045 |
| Clusterin 231-250 cit cyclic (IgG)      | 1.691  | 0.988        | 2.894        | 0.0552  | 0.5045 |
| Filaggrin 48-65 cit2 cyclic (IgA2)      | 18.564 | 0.883        | 390.260      | 0.0601  | 0.5045 |
| H2B/a 62-81 cit cyclic (IgA1)           | 0.384  | 0.139        | 1.066        | 0.0661  | 0.5045 |
| FibrinogenB 285-305 cit (IgA2)          | 0.142  | 0.017        | 1.162        | 0.0688  | 0.5045 |
| H2A/a-2 1-20 cit (IgA2)                 | 4.653  | 0.880        | 24.598       | 0.0703  | 0.5045 |
| H4 33-48 cit 39 40 (IgG)                | 1.551  | 0.963        | 2.500        | 0.0711  | 0.5045 |
| H4 33-48 cit 39 (IgG)                   | 1.766  | 0.894        | 3.486        | 0.1014  | 0.5491 |
| FibrinogenB 62-81 cit 74 (IgA1)         | 0.541  | 0.256        | 1.145        | 0.1083  | 0.5491 |
| Collagen Type II 281-298 cit 290 (IgA2) | 0.207  | 0.029        | 1.469        | 0.1151  | 0.5491 |
| FibrinogenA 616-635 cit3 cyclic (IgA1)  | 0.510  | 0.220        | 1.179        | 0.1154  | 0.5491 |
| FibrinogenA 211-230 cit cyclic (IgA1)   | 0.482  | 0.190        | 1.219        | 0.1231  | 0.5491 |
| FibrinogenB 62-81 cit 74 (IgA2)         | 0.317  | 0.072        | 1.401        | 0.1298  | 0.5491 |
| FibrinogenB 54-74 cit 60 72 74 (IgA1)   | 0.515  | 0.213        | 1.241        | 0.1392  | 0.5491 |
| FibrinogenB 246-267 cit (IgA2)          | 0.177  | 0.017        | 1.861        | 0.1491  | 0.5491 |
| FibrinogenA 211-230 cit cyclic (IgG)    | 0.560  | 0.253        | 1.241        | 0.1535  | 0.5491 |
| Enolase-1A 5-21 cit (IgA1)              | 0.659  | 0.368        | 1.181        | 0.1615  | 0.5491 |
| FibrinogenB 62-81 cit 72 (IgA2)         | 0.454  | 0.148        | 1.387        | 0.1655  | 0.5491 |
| FibrinogenB 36-52 cit (IgG)             | 0.575  | 0.261        | 1.267        | 0.1698  | 0.5491 |
| H4 33-48 cit 39 40 (IgA2)               | 0.597  | 0.277        | 1.288        | 0.1890  | 0.5491 |
| FibrinogenB 285-305 cit (IgA1)          | 0.490  | 0.169        | 1.423        | 0.1895  | 0.5491 |
| Collagen Type II 281-298 cit 290 (IgA1) | 0.534  | 0.205        | 1.385        | 0.1970  | 0.5491 |
| FibrinogenB 246-267 cit (IgA1)          | 0.498  | 0.171        | 1.447        | 0.2004  | 0.5491 |
| Vimentin 58-77 cit3 cyclic (IgA1)       | 0.664  | 0.354        | 1.243        | 0.2007  | 0.5491 |
| FibrinogenA 41-60 cit3 cyclic (IgG)     | 0.570  | 0.239        | 1.358        | 0.2041  | 0.5491 |
| H2A/a 1-20 cit cyclic (IgA1)            | 0.733  | 0.442        | 1.216        | 0.2288  | 0.5727 |
| H2B/a 62-81 cit cyclic (IgG)            | 0.714  | 0.413        | 1.236        | 0.2290  | 0.5727 |
| FibrinogenA 27-43 cit (IgA1)            | 0.712  | 0.399        | 1.273        | 0.2521  | 0.5727 |
| Filaggrin 48-65 cit2 cyclic (IgG)       | 1.558  | 0.728        | 3.337        | 0.2535  | 0.5727 |
| Fibronectin cit 1035 1036 (IgA1)        | 0.725  | 0.416        | 1.263        | 0.2561  | 0.5727 |
| Biglycan 247-266 cit cyclic (IgA1)      | 0.678  | 0.345        | 1.336        | 0.2616  | 0.5727 |
| FibrinogenB 62-81 cit 72 (IgA1)         | 0.679  | 0.342        | 1.350        | 0.2696  | 0.5727 |
| H2B/a 62-81 cit cyclic (IgA2)           | 0.227  | 0.015        | 3.327        | 0.2788  | 0.5727 |
| H4 33-48 cit 39 (IgA1)                  | 0.662  | 0.314        | 1.397        | 0.2790  | 0.5727 |
| H2A/a 1-20 cit cyclic (IgA2)            | 1.770  | 0.615        | 5.093        | 0.2895  | 0.5789 |



|  |       |       |       |        |        |
|--|-------|-------|-------|--------|--------|
| Clusterin 221-240 cit cyclic (IgA1)    | 0.665 | 0.308 | 1.434 | 0.2979 | 0.5789 |
| Clusterin 231-250 cit cyclic (IgA2)    | 0.784 | 0.489 | 1.257 | 0.3117 | 0.5789 |
| FibrinogenA 27-43 cit (IgA2)           | 0.725 | 0.389 | 1.351 | 0.3117 | 0.5789 |
| FibrinogenB 36-52 cit (IgA1)           | 0.628 | 0.244 | 1.614 | 0.3342 | 0.6062 |
| Vimentin 1-16 cit (IgA2)               | 0.260 | 0.016 | 4.285 | 0.3460 | 0.6134 |
| Vimentin 1-16 cit (IgA1)               | 0.711 | 0.333 | 1.518 | 0.3780 | 0.6531 |
| Collagen Type II 281-298 cit 290 (IgG) | 0.709 | 0.326 | 1.540 | 0.3852 | 0.6531 |
| Clusterin 231-250 cit cyclic (IgA1)    | 0.852 | 0.579 | 1.253 | 0.4157 | 0.6899 |
| FibrinogenA 563-583 cit 573 (IgA2)     | 0.716 | 0.301 | 1.704 | 0.4504 | 0.7319 |
| Fibronectin cit 1035 1036 (IgG)        | 1.180 | 0.754 | 1.845 | 0.4696 | 0.7403 |
| Fibronectin cit 1035 1036 (IgA2)       | 0.792 | 0.418 | 1.502 | 0.4752 | 0.7403 |
| Enolase-1A 5-21 cit (IgG)              | 0.829 | 0.489 | 1.403 | 0.4841 | 0.7403 |
| FibrinogenA 563-583 cit 573 (IgG)      | 0.808 | 0.389 | 1.677 | 0.5665 | 0.8474 |
| B-actin 191-216 cit 196.206.210 (IgA1) | 0.854 | 0.492 | 1.483 | 0.5758 | 0.8474 |
| B-actin 191-216 cit 196.206.210 (IgA2) | 0.744 | 0.248 | 2.227 | 0.5968 | 0.8616 |
| B-actin 191-216 cit 196.206.210 (IgG)  | 0.859 | 0.476 | 1.551 | 0.6149 | 0.8616 |
| Vimentin 1-16 cit (IgG)                | 0.836 | 0.405 | 1.726 | 0.6285 | 0.8616 |
| Enolase-1A 5-21 cit (IgA2)             | 0.778 | 0.280 | 2.165 | 0.6310 | 0.8616 |
| FibrinogenB 246-267 cit (IgG)          | 0.883 | 0.519 | 1.500 | 0.6446 | 0.8616 |
| FibrinogenB 54-74 cit 60 72 74 (IgA2)  | 0.653 | 0.102 | 4.160 | 0.6517 | 0.8616 |
| FibrinogenB 62-81 cit 72 (IgG)         | 0.879 | 0.477 | 1.620 | 0.6799 | 0.8740 |
| Clusterin 221-240 cit cyclic (IgG)     | 1.131 | 0.626 | 2.041 | 0.6835 | 0.8740 |
| FibrinogenA 41-60 cit3 cyclic (IgA2)   | 0.724 | 0.132 | 3.983 | 0.7106 | 0.8874 |
| Biglycan 247-266 cit cyclic (IgG)      | 1.131 | 0.541 | 2.366 | 0.7428 | 0.8874 |
| Vimentin 58-77 cit3 cyclic (IgA2)      | 0.898 | 0.467 | 1.724 | 0.7456 | 0.8874 |
| FibrinogenA 27-43 cit (IgG)            | 0.932 | 0.606 | 1.434 | 0.7481 | 0.8874 |
| H2A/a-2 1-20 cit (IgG)                 | 0.888 | 0.420 | 1.875 | 0.7547 | 0.8874 |
| FibrinogenB 36-52 cit (IgG)            | 0.912 | 0.504 | 1.652 | 0.7622 | 0.8874 |
| Filaggrin 48-65 cit2 cyclic (IgA1)     | 0.829 | 0.214 | 3.208 | 0.7859 | 0.8972 |
| H2A/a 1-20 cit cyclic (IgG)            | 0.916 | 0.474 | 1.770 | 0.7937 | 0.8972 |
| FibrinogenB 62-81 cit 74 (IgG)         | 0.922 | 0.482 | 1.762 | 0.8058 | 0.8979 |
| FibrinogenA 41-60 cit3 cyclic (IgA1)   | 0.921 | 0.447 | 1.898 | 0.8233 | 0.9044 |
| H4 33-48 cit 39 40 (IgA1)              | 1.035 | 0.676 | 1.585 | 0.8747 | 0.9476 |
| Clusterin 221-240 cit cyclic (IgA2)    | 0.937 | 0.294 | 2.980 | 0.9120 | 0.9476 |
| FibrinogenA 616-635 cit3 cyclic (IgA2) | 1.062 | 0.332 | 3.392 | 0.9194 | 0.9476 |
| FibrinogenB 285-305 cit (IgG)          | 0.974 | 0.580 | 1.636 | 0.9211 | 0.9476 |
| FibrinogenA 616-635 cit3 cyclic (IgG)  | 0.973 | 0.512 | 1.851 | 0.9336 | 0.9476 |
| FibrinogenA 563-583 cit 573 (IgA1)     | 0.976 | 0.541 | 1.760 | 0.9355 | 0.9476 |
| Vimentin 58-77 cit3 cyclic (IgG)       | 0.987 | 0.537 | 1.813 | 0.9654 | 0.9654 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S9. All adjusted associations between autoantibodies to native proteins and incident UIP/fibrotic NSIP subtype of RA-ILD**

| Targeted antigen                | OR     | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|--------|--------------|--------------|---------|--------|
| tenascin C 1 (IgA2)             | <0.001 | <0.001       | 0.321        | 0.0201  | 0.3402 |
| FibrinogenB 54-74 (IgA2)        | 0.025  | 0.001        | 0.606        | 0.0232  | 0.3402 |
| tenascin C 1 (IgG)              | 0.352  | 0.130        | 0.954        | 0.0400  | 0.3402 |
| tenascin C 1 (IgA1)             | 0.279  | 0.082        | 0.946        | 0.0404  | 0.3402 |
| FibrinogenB 62-81 (IgA2)        | 0.148  | 0.018        | 1.205        | 0.0742  | 0.3402 |
| H2A/a 1-20 cyclic (IgA2)        | 3.407  | 0.866        | 13.403       | 0.0793  | 0.3402 |
| Vimentin 265-278 (IgA2)         | 0.096  | 0.007        | 1.323        | 0.0800  | 0.3402 |
| FibrinogenB 62-81 (IgA1)        | 0.479  | 0.207        | 1.109        | 0.0856  | 0.3402 |
| Vimentin 58-77 cyclic (IgA1)    | 0.350  | 0.100        | 1.228        | 0.1013  | 0.3402 |
| Vimentin 265-278 (IgG)          | 0.538  | 0.251        | 1.152        | 0.1106  | 0.3402 |
| FibrinogenB 54-74 (IgG)         | 0.495  | 0.208        | 1.177        | 0.1117  | 0.3402 |
| H2A/a-2 1-20 (IgA2)             | 3.227  | 0.757        | 13.766       | 0.1134  | 0.3402 |
| Vimentin 265-278 (IgA1)         | 0.339  | 0.089        | 1.293        | 0.1134  | 0.3402 |
| FibrinogenB 285-305 (IgG)       | 0.488  | 0.188        | 1.263        | 0.1393  | 0.3791 |
| FibrinogenB 54-74 (IgA1)        | 0.485  | 0.182        | 1.294        | 0.1486  | 0.3791 |
| Collagen Type II 281-298 (IgA2) | 0.124  | 0.007        | 2.209        | 0.1555  | 0.3791 |
| Vimentin 1-16 (IgA2)            | 0.159  | 0.011        | 2.395        | 0.1841  | 0.4186 |
| tenascin C 5 (IgA1)             | 0.484  | 0.162        | 1.444        | 0.1932  | 0.4186 |
| Collagen Type II 281-298 (IgA1) | 0.560  | 0.224        | 1.403        | 0.2161  | 0.4306 |
| H2B/a 62-81 cyclic (IgA1)       | 0.518  | 0.180        | 1.485        | 0.2208  | 0.4306 |
| tenascin C 5 (IgG)              | 0.647  | 0.315        | 1.328        | 0.2351  | 0.4366 |
| Vimentin 1-16 (IgA1)            | 0.594  | 0.243        | 1.456        | 0.2551  | 0.4522 |
| H2B/a 62-81 cyclic (IgG)        | 0.721  | 0.386        | 1.348        | 0.3054  | 0.4868 |
| H2B/a 62-81 cyclic (IgA2)       | 0.322  | 0.036        | 2.867        | 0.3097  | 0.4868 |
| H2A/a-2 1-20 (IgA1)             | 0.721  | 0.382        | 1.360        | 0.3120  | 0.4868 |
| Vimentin 1-16 (IgG)             | 0.720  | 0.350        | 1.479        | 0.3708  | 0.5563 |
| Collagen Type II 281-298 (IgG)  | 0.751  | 0.370        | 1.525        | 0.4283  | 0.6187 |
| Filaggrin 48-65 cyclic (IgA1)   | 0.607  | 0.158        | 2.328        | 0.4669  | 0.6399 |
| Filaggrin 48-65 cyclic (IgG)    | 1.288  | 0.643        | 2.581        | 0.4758  | 0.6399 |
| FibrinogenB 285-305 (IgA1)      | 1.249  | 0.536        | 2.911        | 0.6059  | 0.7877 |
| H2A/a 1-20 cyclic (IgA1)        | 0.869  | 0.439        | 1.719        | 0.6863  | 0.8634 |
| FibrinogenB 285-305 (IgA2)      | 1.502  | 0.133        | 16.918       | 0.7419  | 0.9042 |
| FibrinogenB 62-81 (IgG)         | 0.913  | 0.495        | 1.685        | 0.7709  | 0.9111 |
| tenascin C 5 (IgA2)             | 0.712  | 0.042        | 12.138       | 0.8142  | 0.9248 |
| H2A/a 1-20 cyclic (IgG)         | 1.085  | 0.515        | 2.288        | 0.8299  | 0.9248 |
| Vimentin 58-77 cyclic (IgA2)    | 0.824  | 0.056        | 12.145       | 0.8882  | 0.9622 |
| Filaggrin 48-65 cyclic (IgA2)   | 1.071  | 0.097        | 11.864       | 0.9555  | 0.9845 |
| H2A/a-2 1-20 (IgG)              | 0.983  | 0.445        | 2.171        | 0.9666  | 0.9845 |
| Vimentin 58-77 cyclic (IgG)     | 1.007  | 0.504        | 2.013        | 0.9845  | 0.9845 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S10.** All adjusted\* associations between autoantibodies to citrullinated proteins and incident RA-ILD among **seropositive RA**

| Targeted antigen                        | OR    | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---|-------|--------------|--------------|---------|--------|
| H4 33-48 cit 39 (IgA2)                  | 0.101 | 0.035        | 0.287        | <.0001  | 0.0013 |
| H2A/a-2 1-20 cit (IgA2)                 | 3.573 | 1.765        | 7.232        | 0.0004  | 0.0157 |
| Filaggrin 48-65 cit2 cyclic (IgG)       | 2.841 | 1.426        | 5.661        | 0.0030  | 0.0777 |
| Clusterin 231-250 cit cyclic (IgG)      | 1.290 | 1.046        | 1.592        | 0.0173  | 0.3368 |
| H4 33-48 cit 39 40 (IgG)                | 1.263 | 1.029        | 1.552        | 0.0259  | 0.3652 |
| FibrinogenB 36-52 cit (IgA2)            | 0.386 | 0.164        | 0.911        | 0.0297  | 0.3652 |
| Fibronectin cit 1035 1036 (IgG)         | 1.248 | 1.013        | 1.538        | 0.0371  | 0.3652 |
| Biglycan 247-266 cit cyclic (IgA1)      | 0.699 | 0.499        | 0.979        | 0.0375  | 0.3652 |
| Filaggrin 48-65 cit2 cyclic (IgA2)      | 4.806 | 0.983        | 23.491       | 0.0525  | 0.4547 |
| FibrinogenB 285-305 cit (IgG)           | 1.392 | 0.978        | 1.981        | 0.0665  | 0.4798 |
| FibrinogenB 62-81 cit 74 (IgA1)         | 0.781 | 0.599        | 1.018        | 0.0677  | 0.4798 |
| Vimentin 58-77 cit3 cyclic (IgA1)       | 0.773 | 0.577        | 1.036        | 0.0847  | 0.5131 |
| H2A/a 1-20 cit cyclic (IgA2)            | 1.530 | 0.932        | 2.512        | 0.0926  | 0.5131 |
| H4 33-48 cit 39 (IgG)                   | 1.272 | 0.948        | 1.709        | 0.1092  | 0.5131 |
| Clusterin 221-240 cit cyclic (IgA1)     | 0.787 | 0.582        | 1.064        | 0.1190  | 0.5131 |
| H2A/a-2 1-20 cit (IgA1)                 | 0.780 | 0.570        | 1.068        | 0.1213  | 0.5131 |
| H2B/a 62-81 cit cyclic (IgA1)           | 0.757 | 0.527        | 1.088        | 0.1329  | 0.5131 |
| FibrinogenA 27-43 cit (IgA2)            | 0.721 | 0.468        | 1.111        | 0.1383  | 0.5131 |
| FibrinogenB 54-74 cit 60 72 74 (IgA1)   | 0.770 | 0.541        | 1.095        | 0.1456  | 0.5131 |
| Biglycan 247-266 cit cyclic (IgA2)      | 0.537 | 0.232        | 1.243        | 0.1464  | 0.5131 |
| B-actin 191-216 cit 196.206.210 (IgG)   | 1.250 | 0.921        | 1.695        | 0.1522  | 0.5131 |
| FibrinogenA 27-43 cit (IgA1)            | 0.815 | 0.614        | 1.081        | 0.1558  | 0.5131 |
| Vimentin 1-16 cit (IgA1)                | 0.765 | 0.528        | 1.109        | 0.1578  | 0.5131 |
| H2A/a 1-20 cit cyclic (IgA1)            | 0.824 | 0.629        | 1.078        | 0.1579  | 0.5131 |
| FibrinogenB 62-81 cit 72 (IgA1)         | 0.822 | 0.620        | 1.090        | 0.1737  | 0.5419 |
| FibrinogenA 41-60 cit3 cyclic (IgA2)    | 1.804 | 0.722        | 4.507        | 0.2069  | 0.6052 |
| Collagen Type II 281-298 cit 290 (IgA1) | 0.815 | 0.592        | 1.122        | 0.2095  | 0.6052 |
| FibrinogenB 54-74 cit 60 72 74 (IgG)    | 1.251 | 0.871        | 1.797        | 0.2258  | 0.6230 |
| FibrinogenA 616-635 cit3 cyclic (IgA1)  | 0.854 | 0.656        | 1.112        | 0.2409  | 0.6230 |
| FibrinogenA 563-583 cit 573 (IgA2)      | 1.282 | 0.842        | 1.953        | 0.2474  | 0.6230 |
| Enolase-1A 5-21 cit (IgA1)              | 0.865 | 0.677        | 1.106        | 0.2476  | 0.6230 |
| Vimentin 58-77 cit3 cyclic (IgA2)       | 1.372 | 0.788        | 2.387        | 0.2633  | 0.6417 |
| FibrinogenB 246-267 cit (IgG)           | 1.211 | 0.858        | 1.708        | 0.2754  | 0.6508 |
| FibrinogenB 246-267 cit (IgA1)          | 0.809 | 0.543        | 1.204        | 0.2958  | 0.6786 |
| H2B/a 62-81 cit cyclic (IgG)            | 0.849 | 0.611        | 1.180        | 0.3290  | 0.7331 |
| FibrinogenB 285-305 cit (IgA1)          | 0.843 | 0.587        | 1.210        | 0.3540  | 0.7671 |
| Filaggrin 48-65 cit2 cyclic (IgA1)      | 1.371 | 0.693        | 2.713        | 0.3652  | 0.7691 |
| H4 33-48 cit 39 40 (IgA1)               | 1.092 | 0.897        | 1.329        | 0.3818  | 0.7691 |
| Fibronectin cit 1035 1036 (IgA2)        | 1.132 | 0.855        | 1.498        | 0.3870  | 0.7691 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S11.** All adjusted\* associations between autoantibodies to native proteins and incident RA-ILD among **seropositive RA**

| Targeted antigen                | OR    | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|-------|--------------|--------------|---------|--------|
| H2A/a 1-20 cyclic (IgA2)        | 5.066 | 2.163        | 11.866       | 0.0002  | 0.0036 |
| H2A/a-2 1-20 (IgA2)             | 4.357 | 2.021        | 9.392        | 0.0002  | 0.0036 |
| Filaggrin 48-65 cyclic (IgG)    | 2.191 | 1.260        | 3.810        | 0.0055  | 0.0709 |
| H2A/a 1-20 cyclic (IgG)         | 1.858 | 1.128        | 3.058        | 0.0149  | 0.1444 |
| tenascin C 1 (IgA1)             | 0.692 | 0.507        | 0.944        | 0.0201  | 0.1444 |
| H2A/a-2 1-20 (IgG)              | 1.804 | 1.088        | 2.990        | 0.0222  | 0.1444 |
| tenascin C 1 (IgG)              | 0.711 | 0.509        | 0.993        | 0.0454  | 0.2532 |
| Vimentin 58-77 cyclic (IgG)     | 1.474 | 0.978        | 2.221        | 0.0636  | 0.3098 |
| tenascin C 1 (IgA2)             | 0.497 | 0.214        | 1.153        | 0.1034  | 0.4480 |
| tenascin C 5 (IgA1)             | 0.748 | 0.509        | 1.098        | 0.1385  | 0.5032 |
| Vimentin 58-77 cyclic (IgA2)    | 1.764 | 0.827        | 3.763        | 0.1419  | 0.5032 |
| FibrinogenB 62-81 (IgA1)        | 0.812 | 0.601        | 1.097        | 0.1749  | 0.5685 |
| H2A/a-2 1-20 (IgA1)             | 1.243 | 0.891        | 1.734        | 0.2006  | 0.5815 |
| H2A/a 1-20 cyclic (IgA1)        | 1.244 | 0.885        | 1.747        | 0.2087  | 0.5815 |
| FibrinogenB 285-305 (IgA1)      | 0.812 | 0.555        | 1.186        | 0.2806  | 0.7296 |
| FibrinogenB 54-74 (IgA1)        | 0.851 | 0.620        | 1.168        | 0.3174  | 0.7736 |
| FibrinogenB 285-305 (IgG)       | 0.829 | 0.554        | 1.239        | 0.3598  | 0.8253 |
| Collagen Type II 281-298 (IgA1) | 0.877 | 0.625        | 1.231        | 0.4487  | 0.8906 |
| Filaggrin 48-65 cyclic (IgA2)   | 0.639 | 0.172        | 2.381        | 0.5049  | 0.8906 |
| Vimentin 1-16 (IgA1)            | 0.900 | 0.638        | 1.268        | 0.5461  | 0.8906 |
| tenascin C 5 (IgG)              | 0.893 | 0.615        | 1.296        | 0.5515  | 0.8906 |
| Vimentin 265-278 (IgA1)         | 0.906 | 0.638        | 1.286        | 0.5797  | 0.8906 |
| H2B/a 62-81 cyclic (IgA1)       | 0.908 | 0.636        | 1.295        | 0.5935  | 0.8906 |
| Filaggrin 48-65 cyclic (IgA1)   | 1.180 | 0.641        | 2.169        | 0.5950  | 0.8906 |
| FibrinogenB 54-74 (IgG)         | 0.901 | 0.607        | 1.339        | 0.6068  | 0.8906 |
| Vimentin 265-278 (IgG)          | 0.904 | 0.615        | 1.329        | 0.6083  | 0.8906 |
| FibrinogenB 54-74 (IgA2)        | 0.868 | 0.491        | 1.533        | 0.6248  | 0.8906 |
| Vimentin 58-77 cyclic (IgA1)    | 1.081 | 0.764        | 1.529        | 0.6615  | 0.8906 |
| H2B/a 62-81 cyclic (IgA2)       | 1.145 | 0.624        | 2.101        | 0.6623  | 0.8906 |
| FibrinogenB 62-81 (IgA2)        | 0.884 | 0.481        | 1.626        | 0.6924  | 0.9001 |
| FibrinogenB 62-81 (IgG)         | 1.059 | 0.748        | 1.500        | 0.7458  | 0.9166 |
| FibrinogenB 285-305 (IgA2)      | 1.124 | 0.544        | 2.321        | 0.7521  | 0.9166 |
| Vimentin 1-16 (IgA2)            | 0.909 | 0.439        | 1.881        | 0.7960  | 0.9395 |
| Vimentin 1-16 (IgG)             | 1.050 | 0.693        | 1.591        | 0.8191  | 0.9395 |
| H2B/a 62-81 cyclic (IgG)        | 0.972 | 0.672        | 1.405        | 0.8791  | 0.9636 |
| Collagen Type II 281-298 (IgG)  | 0.973 | 0.659        | 1.435        | 0.8895  | 0.9636 |
| tenascin C 5 (IgA2)             | 1.035 | 0.398        | 2.694        | 0.9437  | 0.9890 |
| Collagen Type II 281-298 (IgA2) | 0.995 | 0.518        | 1.911        | 0.9881  | 0.9890 |
| Vimentin 265-278 (IgA2)         | 1.005 | 0.503        | 2.006        | 0.9890  | 0.9890 |

**Table S12.** All adjusted\* associations between autoantibodies to citrullinated proteins and incident RA-ILD among seronegative RA

| Targeted antigen                | OR    | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|-------|--------------|--------------|---------|--------|
| H2A/a 1-20 cyclic (IgA2)        | 5.066 | 2.163        | 11.866       | 0.0002  | 0.0036 |
| H2A/a-2 1-20 (IgA2)             | 4.357 | 2.021        | 9.392        | 0.0002  | 0.0036 |
| Filaggrin 48-65 cyclic (IgG)    | 2.191 | 1.260        | 3.810        | 0.0055  | 0.0709 |
| H2A/a 1-20 cyclic (IgG)         | 1.858 | 1.128        | 3.058        | 0.0149  | 0.1444 |
| tenascin C 1 (IgA1)             | 0.692 | 0.507        | 0.944        | 0.0201  | 0.1444 |
| H2A/a-2 1-20 (IgG)              | 1.804 | 1.088        | 2.990        | 0.0222  | 0.1444 |
| tenascin C 1 (IgG)              | 0.711 | 0.509        | 0.993        | 0.0454  | 0.2532 |
| Vimentin 58-77 cyclic (IgG)     | 1.474 | 0.978        | 2.221        | 0.0636  | 0.3098 |
| tenascin C 1 (IgA2)             | 0.497 | 0.214        | 1.153        | 0.1034  | 0.4480 |
| tenascin C 5 (IgA1)             | 0.748 | 0.509        | 1.098        | 0.1385  | 0.5032 |
| Vimentin 58-77 cyclic (IgA2)    | 1.764 | 0.827        | 3.763        | 0.1419  | 0.5032 |
| FibrinogenB 62-81 (IgA1)        | 0.812 | 0.601        | 1.097        | 0.1749  | 0.5685 |
| H2A/a-2 1-20 (IgA1)             | 1.243 | 0.891        | 1.734        | 0.2006  | 0.5815 |
| H2A/a 1-20 cyclic (IgA1)        | 1.244 | 0.885        | 1.747        | 0.2087  | 0.5815 |
| FibrinogenB 285-305 (IgA1)      | 0.812 | 0.555        | 1.186        | 0.2806  | 0.7296 |
| FibrinogenB 54-74 (IgA1)        | 0.851 | 0.620        | 1.168        | 0.3174  | 0.7736 |
| FibrinogenB 285-305 (IgG)       | 0.829 | 0.554        | 1.239        | 0.3598  | 0.8253 |
| Collagen Type II 281-298 (IgA1) | 0.877 | 0.625        | 1.231        | 0.4487  | 0.8906 |
| Filaggrin 48-65 cyclic (IgA2)   | 0.639 | 0.172        | 2.381        | 0.5049  | 0.8906 |
| Vimentin 1-16 (IgA1)            | 0.900 | 0.638        | 1.268        | 0.5461  | 0.8906 |
| tenascin C 5 (IgG)              | 0.893 | 0.615        | 1.296        | 0.5515  | 0.8906 |
| Vimentin 265-278 (IgA1)         | 0.906 | 0.638        | 1.286        | 0.5797  | 0.8906 |
| H2B/a 62-81 cyclic (IgA1)       | 0.908 | 0.636        | 1.295        | 0.5935  | 0.8906 |
| Filaggrin 48-65 cyclic (IgA1)   | 1.180 | 0.641        | 2.169        | 0.5950  | 0.8906 |
| FibrinogenB 54-74 (IgG)         | 0.901 | 0.607        | 1.339        | 0.6068  | 0.8906 |
| Vimentin 265-278 (IgG)          | 0.904 | 0.615        | 1.329        | 0.6083  | 0.8906 |
| FibrinogenB 54-74 (IgA2)        | 0.868 | 0.491        | 1.533        | 0.6248  | 0.8906 |
| Vimentin 58-77 cyclic (IgA1)    | 1.081 | 0.764        | 1.529        | 0.6615  | 0.8906 |
| H2B/a 62-81 cyclic (IgA2)       | 1.145 | 0.624        | 2.101        | 0.6623  | 0.8906 |
| FibrinogenB 62-81 (IgA2)        | 0.884 | 0.481        | 1.626        | 0.6924  | 0.9001 |
| FibrinogenB 62-81 (IgG)         | 1.059 | 0.748        | 1.500        | 0.7458  | 0.9166 |
| FibrinogenB 285-305 (IgA2)      | 1.124 | 0.544        | 2.321        | 0.7521  | 0.9166 |
| Vimentin 1-16 (IgA2)            | 0.909 | 0.439        | 1.881        | 0.7960  | 0.9395 |
| Vimentin 1-16 (IgG)             | 1.050 | 0.693        | 1.591        | 0.8191  | 0.9395 |
| H2B/a 62-81 cyclic (IgG)        | 0.972 | 0.672        | 1.405        | 0.8791  | 0.9636 |
| Collagen Type II 281-298 (IgG)  | 0.973 | 0.659        | 1.435        | 0.8895  | 0.9636 |
| tenascin C 5 (IgA2)             | 1.035 | 0.398        | 2.694        | 0.9437  | 0.9890 |
| Collagen Type II 281-298 (IgA2) | 0.995 | 0.518        | 1.911        | 0.9881  | 0.9890 |
| Vimentin 265-278 (IgA2)         | 1.005 | 0.503        | 2.006        | 0.9890  | 0.9890 |

Per log-transformed unit.



BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S13.** All adjusted\* associations between autoantibodies to native proteins and incident RA-ILD among **seronegative RA**

| Targeted antigen                | OR       | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|----------|--------------|--------------|---------|--------|
| tenascin C 5 (IgG)              | 0.128    | 0.020        | 0.801        | 0.0280  | 0.5611 |
| tenascin C 1 (IgG)              | 0.120    | 0.017        | 0.835        | 0.0322  | 0.5611 |
| H2B/a 62-81 cyclic (IgG)        | 0.023    | <0.001       | 0.936        | 0.0461  | 0.5611 |
| Collagen Type II 281-298 (IgG)  | 0.148    | 0.020        | 1.079        | 0.0595  | 0.5611 |
| H2A/a 1-20 cyclic (IgA2)        | >999.999 | 0.483        | >999.999     | 0.0755  | 0.5611 |
| Filaggrin 48-65 cyclic (IgG)    | 64.275   | 0.500        | >999.999     | 0.0929  | 0.5611 |
| H2A/a-2 1-20 (IgA2)             | 43.200   | 0.481        | >999.999     | 0.1007  | 0.5611 |
| Filaggrin 48-65 cyclic (IgA1)   | 3.638    | 0.691        | 19.154       | 0.1276  | 0.6024 |
| Vimentin 58-77 cyclic (IgA1)    | 1.886    | 0.807        | 4.408        | 0.1429  | 0.6024 |
| Vimentin 265-278 (IgG)          | 0.398    | 0.108        | 1.465        | 0.1657  | 0.6024 |
| H2A/a 1-20 cyclic (IgG)         | 3.738    | 0.539        | 25.899       | 0.1819  | 0.6024 |
| FibrinogenB 54-74 (IgG)         | 0.380    | 0.086        | 1.685        | 0.2030  | 0.6024 |
| tenascin C 1 (IgA1)             | 2.865    | 0.547        | 15.003       | 0.2128  | 0.6024 |
| FibrinogenB 62-81 (IgA2)        | 0.183    | 0.012        | 2.771        | 0.2204  | 0.6024 |
| H2A/a-2 1-20 (IgG)              | 3.456    | 0.423        | 28.223       | 0.2471  | 0.6024 |
| tenascin C 5 (IgA2)             | 0.156    | 0.007        | 3.630        | 0.2472  | 0.6024 |
| Vimentin 1-16 (IgG)             | 0.493    | 0.113        | 2.161        | 0.3483  | 0.7837 |
| Filaggrin 48-65 cyclic (IgA2)   | 10.350   | 0.055        | >999.999     | 0.3813  | 0.7837 |
| H2B/a 62-81 cyclic (IgA2)       | 0.421    | 0.048        | 3.730        | 0.4372  | 0.7837 |
| Vimentin 265-278 (IgA2)         | 0.361    | 0.024        | 5.484        | 0.4628  | 0.7837 |
| Vimentin 58-77 cyclic (IgG)     | 1.777    | 0.382        | 8.269        | 0.4637  | 0.7837 |
| Vimentin 1-16 (IgA2)            | 0.334    | 0.018        | 6.334        | 0.4652  | 0.7837 |
| tenascin C 5 (IgA1)             | 1.634    | 0.413        | 6.463        | 0.4842  | 0.7837 |
| Collagen Type II 281-298 (IgA2) | 0.416    | 0.035        | 4.959        | 0.4880  | 0.7837 |
| FibrinogenB 285-305 (IgA2)      | 0.401    | 0.024        | 6.704        | 0.5248  | 0.7837 |
| FibrinogenB 285-305 (IgG)       | 0.684    | 0.199        | 2.356        | 0.5475  | 0.7837 |
| FibrinogenB 62-81 (IgG)         | 0.699    | 0.209        | 2.340        | 0.5613  | 0.7837 |
| FibrinogenB 285-305 (IgA1)      | 1.353    | 0.484        | 3.782        | 0.5646  | 0.7837 |
| FibrinogenB 54-74 (IgA1)        | 1.297    | 0.489        | 3.438        | 0.6012  | 0.7837 |
| Vimentin 58-77 cyclic (IgA2)    | 1.970    | 0.153        | 25.362       | 0.6029  | 0.7837 |
| H2A/a-2 1-20 (IgA1)             | 0.742    | 0.207        | 2.666        | 0.6475  | 0.8146 |
| FibrinogenB 54-74 (IgA2)        | 0.648    | 0.081        | 5.207        | 0.6829  | 0.8219 |
| Vimentin 1-16 (IgA1)            | 1.208    | 0.468        | 3.118        | 0.6955  | 0.8219 |
| H2A/a 1-20 cyclic (IgA1)        | 0.799    | 0.234        | 2.728        | 0.7203  | 0.8262 |
| Vimentin 265-278 (IgA1)         | 1.132    | 0.428        | 2.994        | 0.8029  | 0.8792 |
| Collagen Type II 281-298 (IgA1) | 1.122    | 0.437        | 2.882        | 0.8116  | 0.8792 |
| FibrinogenB 62-81 (IgA1)        | 0.952    | 0.370        | 2.450        | 0.9185  | 0.9681 |
| tenascin C 1 (IgA2)             | 1.163    | 0.011        | 120.371      | 0.9493  | 0.9742 |
| H2B/a 62-81 cyclic (IgA1)       | 1.008    | 0.410        | 2.477        | 0.9862  | 0.9862 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S14.** All adjusted\* associations between autoantibodies to citrullinated proteins and incident RA-ILD among **anti-CCP-positive RA**

| Targeted antigen                        | OR    | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---|-------|--------------|--------------|---------|--------|
| H4 33-48 cit 39 (IgA2)                  | 0.132 | 0.047        | 0.375        | 0.0001  | 0.0110 |
| H2A/a-2 1-20 cit (IgA2)                 | 3.556 | 1.655        | 7.644        | 0.0012  | 0.0451 |
| Filaggrin 48-65 cit2 cyclic (IgG)       | 2.625 | 1.347        | 5.114        | 0.0046  | 0.1190 |
| FibrinogenB 36-52 cit (IgA2)            | 0.308 | 0.123        | 0.774        | 0.0122  | 0.2382 |
| Biglycan 247-266 cit cyclic (IgA1)      | 0.683 | 0.476        | 0.981        | 0.0390  | 0.5017 |
| H4 33-48 cit 39 40 (IgG)                | 1.249 | 1.005        | 1.553        | 0.0450  | 0.5017 |
| FibrinogenB 62-81 cit 74 (IgA1)         | 0.752 | 0.567        | 0.996        | 0.0471  | 0.5017 |
| Fibronectin cit 1035 1036 (IgG)         | 1.233 | 0.996        | 1.526        | 0.0543  | 0.5017 |
| H2A/a 1-20 cit cyclic (IgA2)            | 1.654 | 0.951        | 2.875        | 0.0746  | 0.5017 |
| Vimentin 58-77 cit3 cyclic (IgA1)       | 0.755 | 0.548        | 1.040        | 0.0851  | 0.5017 |
| Filaggrin 48-65 cit2 cyclic (IgA2)      | 4.030 | 0.808        | 20.114       | 0.0892  | 0.5017 |
| FibrinogenB 54-74 cit 60 72 74 (IgA1)   | 0.718 | 0.489        | 1.055        | 0.0919  | 0.5017 |
| Clusterin 231-250 cit cyclic (IgG)      | 1.210 | 0.969        | 1.512        | 0.0930  | 0.5017 |
| FibrinogenB 285-305 cit (IgG)           | 1.376 | 0.943        | 2.008        | 0.0981  | 0.5017 |
| H4 33-48 cit 39 (IgG)                   | 1.296 | 0.949        | 1.768        | 0.1026  | 0.5017 |
| Enolase-1A 5-21 cit (IgA1)              | 0.802 | 0.614        | 1.047        | 0.1047  | 0.5017 |
| H2B/a 62-81 cit cyclic (IgA1)           | 0.732 | 0.494        | 1.084        | 0.1194  | 0.5017 |
| FibrinogenB 62-81 cit 72 (IgA1)         | 0.789 | 0.585        | 1.064        | 0.1207  | 0.5017 |
| FibrinogenA 27-43 cit (IgA1)            | 0.792 | 0.589        | 1.064        | 0.1222  | 0.5017 |
| H2A/a-2 1-20 cit (IgA1)                 | 0.778 | 0.561        | 1.080        | 0.1333  | 0.5037 |
| Clusterin 221-240 cit cyclic (IgA1)     | 0.781 | 0.564        | 1.081        | 0.1356  | 0.5037 |
| Vimentin 1-16 cit (IgA1)                | 0.746 | 0.504        | 1.104        | 0.1427  | 0.5059 |
| H2B/a 62-81 cit cyclic (IgG)            | 0.783 | 0.554        | 1.108        | 0.1675  | 0.5240 |
| Collagen Type II 281-298 cit 290 (IgA1) | 0.790 | 0.566        | 1.104        | 0.1676  | 0.5240 |
| H2A/a 1-20 cit cyclic (IgA1)            | 0.820 | 0.619        | 1.087        | 0.1680  | 0.5240 |
| Biglycan 247-266 cit cyclic (IgA2)      | 0.573 | 0.250        | 1.317        | 0.1896  | 0.5688 |
| FibrinogenA 27-43 cit (IgA2)            | 0.759 | 0.498        | 1.157        | 0.1994  | 0.5760 |
| FibrinogenA 616-635 cit3 cyclic (IgA1)  | 0.830 | 0.622        | 1.109        | 0.2074  | 0.5778 |
| H2B/a 62-81 cit cyclic (IgA2)           | 0.381 | 0.071        | 2.045        | 0.2602  | 0.6999 |
| FibrinogenA 41-60 cit3 cyclic (IgA2)    | 1.694 | 0.663        | 4.327        | 0.2707  | 0.7000 |
| FibrinogenB 62-81 cit 74 (IgG)          | 0.831 | 0.596        | 1.161        | 0.2782  | 0.7000 |
| Vimentin 58-77 cit3 cyclic (IgA2)       | 1.337 | 0.778        | 2.299        | 0.2932  | 0.7035 |
| FibrinogenB 246-267 cit (IgA1)          | 0.800 | 0.523        | 1.224        | 0.3038  | 0.7035 |
| Clusterin 231-250 cit cyclic (IgA1)     | 0.892 | 0.716        | 1.111        | 0.3067  | 0.7035 |
| FibrinogenB 285-305 cit (IgA1)          | 0.824 | 0.562        | 1.208        | 0.3214  | 0.7162 |
| B-actin 191-216 cit 196.206.210 (IgG)   | 1.160 | 0.848        | 1.586        | 0.3536  | 0.7662 |
| FibrinogenB 246-267 cit (IgG)           | 1.180 | 0.820        | 1.697        | 0.3737  | 0.7877 |
| FibrinogenA 563-583 cit 573 (IgA2)      | 1.212 | 0.763        | 1.926        | 0.4157  | 0.8254 |
| Fibronectin cit 1035 1036 (IgA2)        | 1.122 | 0.848        | 1.483        | 0.4202  | 0.8254 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S15.** All adjusted\* associations between autoantibodies to native proteins and incident RA-ILD among **anti-CCP-positive RA**

| Targeted antigen                | OR    | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|-------|--------------|--------------|---------|--------|
| H2A/a 1-20 cyclic (IgA2)        | 4.321 | 1.857        | 10.052       | 0.0007  | 0.0133 |
| H2A/a-2 1-20 (IgA2)             | 3.918 | 1.785        | 8.599        | 0.0007  | 0.0133 |
| Filaggrin 48-65 cyclic (IgG)    | 2.065 | 1.171        | 3.639        | 0.0122  | 0.1584 |
| tenascin C 1 (IgA1)             | 0.691 | 0.503        | 0.950        | 0.0230  | 0.2245 |
| H2A/a 1-20 cyclic (IgG)         | 1.750 | 1.051        | 2.913        | 0.0314  | 0.2449 |
| H2A/a-2 1-20 (IgG)              | 1.670 | 0.994        | 2.806        | 0.0529  | 0.3040 |
| tenascin C 1 (IgG)              | 0.709 | 0.499        | 1.007        | 0.0546  | 0.3040 |
| FibrinogenB 285-305 (IgA1)      | 0.702 | 0.462        | 1.066        | 0.0967  | 0.4325 |
| tenascin C 1 (IgA2)             | 0.497 | 0.215        | 1.151        | 0.1028  | 0.4325 |
| tenascin C 5 (IgA1)             | 0.719 | 0.475        | 1.087        | 0.1178  | 0.4325 |
| FibrinogenB 62-81 (IgA1)        | 0.779 | 0.568        | 1.069        | 0.1220  | 0.4325 |
| Vimentin 58-77 cyclic (IgG)     | 1.373 | 0.900        | 2.095        | 0.1414  | 0.4595 |
| H2A/a 1-20 cyclic (IgA1)        | 1.211 | 0.854        | 1.718        | 0.2820  | 0.7793 |
| H2A/a-2 1-20 (IgA1)             | 1.204 | 0.857        | 1.691        | 0.2846  | 0.7793 |
| FibrinogenB 285-305 (IgG)       | 0.799 | 0.518        | 1.231        | 0.3093  | 0.7793 |
| FibrinogenB 54-74 (IgA1)        | 0.847 | 0.610        | 1.175        | 0.3199  | 0.7793 |
| Vimentin 265-278 (IgA1)         | 0.836 | 0.575        | 1.215        | 0.3467  | 0.7793 |
| tenascin C 5 (IgG)              | 0.830 | 0.557        | 1.238        | 0.3618  | 0.7793 |
| Filaggrin 48-65 cyclic (IgA2)   | 0.565 | 0.146        | 2.185        | 0.4078  | 0.7793 |
| Collagen Type II 281-298 (IgA1) | 0.869 | 0.610        | 1.236        | 0.4333  | 0.7793 |
| Vimentin 1-16 (IgA1)            | 0.871 | 0.612        | 1.240        | 0.4446  | 0.7793 |
| Vimentin 58-77 cyclic (IgA2)    | 1.365 | 0.610        | 3.054        | 0.4492  | 0.7793 |
| FibrinogenB 54-74 (IgG)         | 0.856 | 0.567        | 1.293        | 0.4596  | 0.7793 |
| H2B/a 62-81 cyclic (IgA1)       | 0.881 | 0.611        | 1.271        | 0.4994  | 0.8115 |
| Vimentin 265-278 (IgG)          | 0.886 | 0.591        | 1.329        | 0.5590  | 0.8686 |
| FibrinogenB 54-74 (IgA2)        | 0.851 | 0.475        | 1.523        | 0.5862  | 0.8686 |
| FibrinogenB 62-81 (IgA2)        | 0.849 | 0.447        | 1.613        | 0.6167  | 0.8686 |
| Vimentin 1-16 (IgA2)            | 0.829 | 0.392        | 1.752        | 0.6236  | 0.8686 |
| Vimentin 265-278 (IgA2)         | 0.888 | 0.431        | 1.830        | 0.7483  | 0.9732 |
| H2B/a 62-81 cyclic (IgG)        | 0.944 | 0.648        | 1.377        | 0.7653  | 0.9732 |
| H2B/a 62-81 cyclic (IgA2)       | 1.094 | 0.592        | 2.024        | 0.7736  | 0.9732 |
| Collagen Type II 281-298 (IgG)  | 0.963 | 0.645        | 1.438        | 0.8533  | 0.9906 |
| Collagen Type II 281-298 (IgA2) | 0.944 | 0.487        | 1.829        | 0.8649  | 0.9906 |
| FibrinogenB 62-81 (IgG)         | 1.030 | 0.714        | 1.485        | 0.8752  | 0.9906 |
| FibrinogenB 285-305 (IgA2)      | 0.959 | 0.441        | 2.084        | 0.9160  | 0.9906 |
| tenascin C 5 (IgA2)             | 0.977 | 0.370        | 2.578        | 0.9621  | 0.9906 |
| Filaggrin 48-65 cyclic (IgA1)   | 0.990 | 0.519        | 1.888        | 0.9764  | 0.9906 |
| Vimentin 58-77 cyclic (IgA1)    | 1.003 | 0.695        | 1.446        | 0.9885  | 0.9906 |
| Vimentin 1-16 (IgG)             | 0.997 | 0.655        | 1.518        | 0.9906  | 0.9906 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S16.** All adjusted\* associations between autoantibodies to citrullinated proteins and incident RA-ILD among **anti-CCP-negative RA**

| Targeted antigen                       | OR       | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|--|----------|--------------|--------------|---------|--------|
| H4 33-48 cit 39 (IgA2)                 | <0.001   | <0.001       | 0.063        | 0.0023  | 0.1775 |
| H2A/a-2 1-20 cit (IgA2)                | 283.081  | 5.108        | >999.999     | 0.0059  | 0.1856 |
| H4 33-48 cit 39 40 (IgA2)              | <0.001   | <0.001       | 0.115        | 0.0071  | 0.1856 |
| Filaggrin 48-65 cit2 cyclic (IgG)      | >999.999 | 6.601        | >999.999     | 0.0152  | 0.2483 |
| FibrinogenA 616-635 cit3 cyclic (IgG)  | 0.148    | 0.031        | 0.705        | 0.0165  | 0.2483 |
| Filaggrin 48-65 cit2 cyclic (IgA1)     | >999.999 | 3.939        | >999.999     | 0.0209  | 0.2483 |
| Clusterin 231-250 cit cyclic (IgA1)    | 3.862    | 1.211        | 12.320       | 0.0224  | 0.2483 |
| H2A/a 1-20 cit cyclic (IgA2)           | 19.233   | 1.393        | 265.577      | 0.0273  | 0.2483 |
| Vimentin 58-77 cit3 cyclic (IgA2)      | 143.770  | 1.679        | >999.999     | 0.0286  | 0.2483 |
| FibrinogenA 27-43 cit (IgA2)           | 74.794   | 1.448        | >999.999     | 0.0321  | 0.2500 |
| Fibronectin cit 1035 1036 (IgG)        | 0.270    | 0.069        | 1.056        | 0.0599  | 0.4116 |
| FibrinogenA 27-43 cit (IgA1)           | 3.734    | 0.880        | 15.855       | 0.0741  | 0.4116 |
| Collagen Type II 281-298 cit 290 (IgG) | 0.373    | 0.125        | 1.109        | 0.0760  | 0.4116 |
| FibrinogenA 211-230 cit cyclic (IgA1)  | 3.031    | 0.888        | 10.342       | 0.0767  | 0.4116 |
| Clusterin 221-240 cit cyclic (IgG)     | 0.383    | 0.131        | 1.118        | 0.0792  | 0.4116 |
| Vimentin 58-77 cit3 cyclic (IgG)       | 0.392    | 0.130        | 1.184        | 0.0970  | 0.4250 |
| Enolase-1A 5-21 cit (IgA1)             | 3.212    | 0.793        | 13.019       | 0.1022  | 0.4250 |
| Filaggrin 48-65 cit2 cyclic (IgA2)     | 79.199   | 0.415        | >999.999     | 0.1028  | 0.4250 |
| Vimentin 1-16 cit (IgG)                | 0.405    | 0.134        | 1.220        | 0.1082  | 0.4250 |
| H2B/a 62-81 cit cyclic (IgG)           | 0.421    | 0.146        | 1.213        | 0.1090  | 0.4250 |
| Biglycan 247-266 cit cyclic (IgA1)     | 2.570    | 0.795        | 8.312        | 0.1150  | 0.4271 |
| FibrinogenB 285-305 cit (IgA2)         | 0.244    | 0.040        | 1.478        | 0.1248  | 0.4305 |
| FibrinogenA 41-60 cit3 cyclic (IgA1)   | 1.968    | 0.825        | 4.693        | 0.1270  | 0.4305 |
| FibrinogenB 54-74 cit 60 72 74 (IgA1)  | 2.139    | 0.752        | 6.083        | 0.1539  | 0.5002 |
| Vimentin 1-16 cit (IgA1)               | 2.603    | 0.619        | 10.949       | 0.1918  | 0.5928 |
| FibrinogenB 36-52 cit (IgA1)           | 1.744    | 0.748        | 4.066        | 0.1977  | 0.5928 |
| Clusterin 231-250 cit cyclic (IgA2)    | 4.853    | 0.421        | 55.880       | 0.2052  | 0.5928 |
| FibrinogenA 211-230 cit cyclic (IgG)   | 0.480    | 0.149        | 1.549        | 0.2196  | 0.6118 |
| FibrinogenA 563-583 cit 573 (IgA1)     | 1.569    | 0.739        | 3.332        | 0.2410  | 0.6483 |
| H4 33-48 cit 39 (IgA1)                 | 1.728    | 0.671        | 4.448        | 0.2569  | 0.6655 |
| Biglycan 247-266 cit cyclic (IgG)      | 0.506    | 0.153        | 1.675        | 0.2645  | 0.6655 |
| H2A/a 1-20 cit cyclic (IgA1)           | 1.738    | 0.613        | 4.931        | 0.2988  | 0.7145 |
| Clusterin 221-240 cit cyclic (IgA1)    | 1.749    | 0.588        | 5.199        | 0.3148  | 0.7145 |
| FibrinogenB 36-52 cit (IgG)            | 0.531    | 0.152        | 1.855        | 0.3214  | 0.7145 |
| Vimentin 58-77 cit3 cyclic (IgA1)      | 1.756    | 0.557        | 5.533        | 0.3362  | 0.7145 |
| FibrinogenB 246-267 cit (IgA2)         | 0.365    | 0.047        | 2.868        | 0.3381  | 0.7145 |
| H4 33-48 cit 39 (IgG)                  | 1.694    | 0.575        | 4.990        | 0.3389  | 0.7145 |
| FibrinogenB 54-74 cit 60 72 74 (IgA2)  | 3.126    | 0.272        | 35.959       | 0.3604  | 0.7280 |
| Biglycan 247-266 cit cyclic (IgA2)     | 4.424    | 0.175        | 111.857      | 0.3669  | 0.7280 |



Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S17.** All adjusted\* associations between autoantibodies to native proteins and incident RA-ILD among **anti-CCP-negative RA**

| Targeted antigen                | OR      | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---------------------------------|---------|--------------|--------------|---------|--------|
| Filaggrin 48-65 cyclic (IgG)    | 107.801 | 2.307        | >999.999     | 0.0170  | 0.2989 |
| H2A/a 1-20 cyclic (IgA2)        | 127.142 | 2.088        | >999.999     | 0.0208  | 0.2989 |
| H2A/a-2 1-20 (IgA2)             | 35.509  | 1.636        | 770.571      | 0.0230  | 0.2989 |
| tenascin C 1 (IgG)              | 0.297   | 0.098        | 0.904        | 0.0325  | 0.3010 |
| Vimentin 58-77 cyclic (IgA1)    | 2.265   | 1.016        | 5.048        | 0.0456  | 0.3010 |
| Filaggrin 48-65 cyclic (IgA1)   | 4.221   | 1.024        | 17.403       | 0.0463  | 0.3010 |
| H2B/a 62-81 cyclic (IgG)        | 0.352   | 0.117        | 1.061        | 0.0636  | 0.3542 |
| tenascin C 5 (IgG)              | 0.418   | 0.155        | 1.128        | 0.0851  | 0.4146 |
| Collagen Type II 281-298 (IgG)  | 0.359   | 0.108        | 1.201        | 0.0963  | 0.4174 |
| Vimentin 58-77 cyclic (IgA2)    | 5.509   | 0.614        | 49.442       | 0.1275  | 0.4939 |
| H2A/a 1-20 cyclic (IgG)         | 3.795   | 0.636        | 22.653       | 0.1435  | 0.4939 |
| Vimentin 58-77 cyclic (IgG)     | 2.584   | 0.705        | 9.466        | 0.1520  | 0.4939 |
| H2A/a-2 1-20 (IgG)              | 3.642   | 0.574        | 23.108       | 0.1704  | 0.5112 |
| tenascin C 5 (IgA2)             | 0.103   | 0.002        | 4.813        | 0.2468  | 0.6875 |
| tenascin C 1 (IgA2)             | 0.194   | 0.006        | 6.364        | 0.3574  | 0.8279 |
| Vimentin 1-16 (IgA2)            | 0.268   | 0.014        | 5.145        | 0.3822  | 0.8279 |
| Vimentin 265-278 (IgG)          | 0.648   | 0.226        | 1.858        | 0.4191  | 0.8279 |
| FibrinogenB 62-81 (IgA2)        | 0.457   | 0.067        | 3.107        | 0.4233  | 0.8279 |
| FibrinogenB 54-74 (IgA1)        | 1.439   | 0.578        | 3.582        | 0.4336  | 0.8279 |
| FibrinogenB 285-305 (IgA1)      | 1.408   | 0.577        | 3.440        | 0.4523  | 0.8279 |
| FibrinogenB 285-305 (IgA2)      | 0.349   | 0.020        | 5.995        | 0.4683  | 0.8279 |
| Vimentin 265-278 (IgA1)         | 1.342   | 0.575        | 3.129        | 0.4962  | 0.8279 |
| Collagen Type II 281-298 (IgA2) | 0.483   | 0.047        | 4.991        | 0.5417  | 0.8279 |
| H2B/a 62-81 cyclic (IgA2)       | 0.534   | 0.057        | 5.034        | 0.5840  | 0.8279 |
| Filaggrin 48-65 cyclic (IgA2)   | 3.126   | 0.043        | 228.682      | 0.6028  | 0.8279 |
| FibrinogenB 54-74 (IgA2)        | 0.572   | 0.068        | 4.803        | 0.6065  | 0.8279 |
| Collagen Type II 281-298 (IgA1) | 1.235   | 0.519        | 2.939        | 0.6339  | 0.8279 |
| FibrinogenB 285-305 (IgG)       | 0.799   | 0.290        | 2.197        | 0.6634  | 0.8279 |
| FibrinogenB 62-81 (IgA1)        | 1.179   | 0.557        | 2.496        | 0.6667  | 0.8279 |
| H2B/a 62-81 cyclic (IgA1)       | 1.183   | 0.527        | 2.654        | 0.6836  | 0.8279 |
| Vimentin 265-278 (IgA2)         | 0.625   | 0.063        | 6.173        | 0.6874  | 0.8279 |
| FibrinogenB 54-74 (IgG)         | 0.797   | 0.253        | 2.507        | 0.6975  | 0.8279 |
| Vimentin 1-16 (IgA1)            | 1.189   | 0.492        | 2.871        | 0.7006  | 0.8279 |
| Vimentin 1-16 (IgG)             | 0.797   | 0.223        | 2.841        | 0.7260  | 0.8328 |
| H2A/a-2 1-20 (IgA1)             | 0.867   | 0.293        | 2.566        | 0.7971  | 0.8881 |
| H2A/a 1-20 cyclic (IgA1)        | 1.127   | 0.372        | 3.415        | 0.8319  | 0.9013 |
| tenascin C 1 (IgA1)             | 0.944   | 0.351        | 2.537        | 0.9085  | 0.9576 |
| tenascin C 5 (IgA1)             | 1.022   | 0.363        | 2.873        | 0.9678  | 0.9869 |
| FibrinogenB 62-81 (IgG)         | 1.009   | 0.365        | 2.786        | 0.9869  | 0.9869 |

Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

**Table S18.** All adjusted\* associations between autoantibodies after subtraction of results of native from citrullinated proteins and incident RA-ILD

| Targeted antigen                        | OR    | Lower 95% CL | Upper 95% CL | p-value | FDR-p  |
|---|-------|--------------|--------------|---------|--------|
| H4 33-48 cit 39 (IgA2)                  | 0.078 | 0.028        | 0.219        | <0.0001 | 0.0001 |
| Filaggrin 48-65 cit2 cyclic (IgA2)      | 2.011 | 1.359        | 2.978        | 0.0005  | 0.0187 |
| FibrinogenB 285-305 cit (IgG)           | 1.302 | 1.070        | 1.585        | 0.0085  | 0.2217 |
| Filaggrin 48-65 cit2 cyclic (IgA1)      | 1.257 | 1.051        | 1.503        | 0.0121  | 0.2292 |
| H2A/a-2 1-20 cit (IgA1)                 | 0.775 | 0.632        | 0.951        | 0.0147  | 0.2292 |
| FibrinogenB 36-52 cit (IgA2)            | 0.371 | 0.161        | 0.857        | 0.0203  | 0.2315 |
| Filaggrin 48-65 cit2 cyclic (IgG)       | 1.180 | 1.026        | 1.358        | 0.0208  | 0.2315 |
| Clusterin 231-250 cit cyclic (IgG)      | 1.266 | 1.029        | 1.558        | 0.0258  | 0.2519 |
| H4 33-48 cit 39 40 (IgG)                | 1.251 | 1.021        | 1.533        | 0.0306  | 0.2649 |
| Fibronectin cit 1035 1036 (IgG)         | 1.219 | 0.993        | 1.497        | 0.0584  | 0.4414 |
| FibrinogenB 62-81 cit 74 (IgA1)         | 0.797 | 0.619        | 1.027        | 0.0792  | 0.4414 |
| H4 33-48 cit 39 (IgG)                   | 1.293 | 0.968        | 1.728        | 0.0818  | 0.4414 |
| H2A/a 1-20 cit cyclic (IgG)             | 0.905 | 0.809        | 1.013        | 0.0833  | 0.4414 |
| H2A/a 1-20 cit cyclic (IgA1)            | 0.880 | 0.762        | 1.017        | 0.0838  | 0.4414 |
| H2B/a 62-81 cit cyclic (IgG)            | 0.857 | 0.719        | 1.021        | 0.0849  | 0.4414 |
| Biglycan 247-266 cit cyclic (IgA1)      | 0.798 | 0.584        | 1.090        | 0.1556  | 0.6527 |
| H2A/a 1-20 cit cyclic (IgA2)            | 0.798 | 0.580        | 1.097        | 0.1640  | 0.6527 |
| FibrinogenA 41-60 cit3 cyclic (IgA2)    | 1.836 | 0.767        | 4.393        | 0.1723  | 0.6527 |
| Collagen Type II 281-298 cit 290 (IgA1) | 0.835 | 0.644        | 1.083        | 0.1746  | 0.6527 |
| FibrinogenB 62-81 cit 72 (IgA1)         | 0.831 | 0.636        | 1.086        | 0.1758  | 0.6527 |
| H2A/a-2 1-20 cit (IgA2)                 | 0.806 | 0.588        | 1.105        | 0.1805  | 0.6527 |
| Vimentin 1-16 cit (IgG)                 | 0.883 | 0.734        | 1.063        | 0.1889  | 0.6527 |
| FibrinogenB 285-305 cit (IgA2)          | 0.754 | 0.493        | 1.153        | 0.1925  | 0.6527 |
| FibrinogenA 27-43 cit (IgA2)            | 0.765 | 0.501        | 1.167        | 0.2137  | 0.6946 |
| Biglycan 247-266 cit cyclic (IgA2)      | 0.626 | 0.282        | 1.386        | 0.2477  | 0.7107 |
| B-actin 191-216 cit 196.206.210 (IgG)   | 1.181 | 0.878        | 1.589        | 0.2706  | 0.7107 |
| FibrinogenB 54-74 cit 60 72 74 (IgA1)   | 0.834 | 0.602        | 1.156        | 0.2761  | 0.7107 |
| Clusterin 221-240 cit cyclic (IgA1)     | 0.852 | 0.638        | 1.139        | 0.2808  | 0.7107 |
| FibrinogenA 616-635 cit3 cyclic (IgA1)  | 0.868 | 0.671        | 1.123        | 0.2819  | 0.7107 |
| FibrinogenA 563-583 cit 573 (IgA2)      | 1.255 | 0.828        | 1.902        | 0.2853  | 0.7107 |
| Collagen Type II 281-298 cit 290 (IgG)  | 0.915 | 0.776        | 1.079        | 0.2901  | 0.7107 |
| Enolase-1A 5-21 cit (IgA2)              | 1.269 | 0.815        | 1.975        | 0.2916  | 0.7107 |
| Fibronectin cit 1035 1036 (IgA2)        | 1.152 | 0.871        | 1.522        | 0.3219  | 0.7510 |
| H2B/a 62-81 cit cyclic (IgA1)           | 0.891 | 0.706        | 1.124        | 0.3306  | 0.7510 |
| FibrinogenA 27-43 cit (IgA1)            | 0.877 | 0.672        | 1.146        | 0.3370  | 0.7510 |
| FibrinogenB 54-74 cit 60 72 74 (IgG)    | 1.180 | 0.829        | 1.679        | 0.3577  | 0.7728 |
| FibrinogenB 246-267 cit (IgG)           | 1.162 | 0.838        | 1.612        | 0.3666  | 0.7728 |
| H4 33-48 cit 39 40 (IgA1)               | 1.090 | 0.896        | 1.325        | 0.3879  | 0.7800 |
| Enolase-1A 5-21 cit (IgA1)              | 0.900 | 0.707        | 1.145        | 0.3920  | 0.7800 |

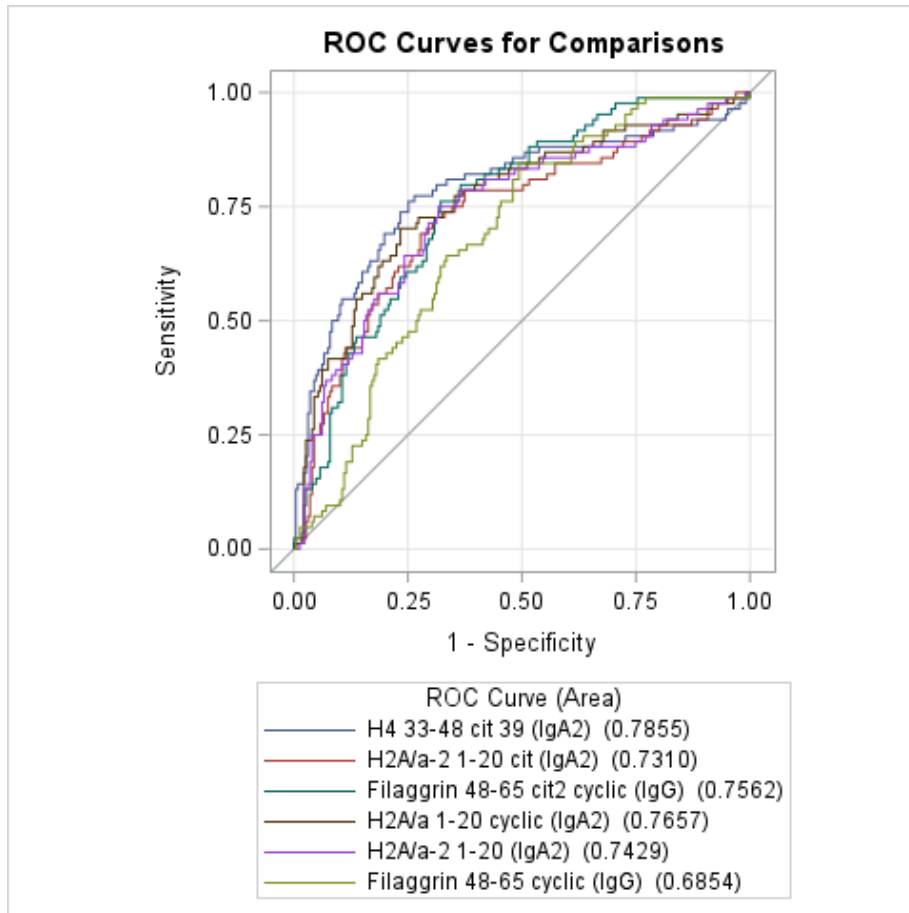
Per log-transformed unit.

BMI = body mass index, CL = confidence limit, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, DMARD = disease-modifying anti-rheumatic drug, FDR = false discovery rate, H = histone, Ig = immunoglobulin, ILD = interstitial lung disease, MDHAQ = multi-dimensional health assessment questionnaire, OR = odds ratio, RA = rheumatoid arthritis, RF = rheumatoid factor

\*Adjusting for matching factors and covariates of BMI, smoking pack-years, DAS28-CRP, MDHAQ, rheumatoid nodules, bDMARD use, methotrexate use, glucocorticoid use, and MUC5B genotype.

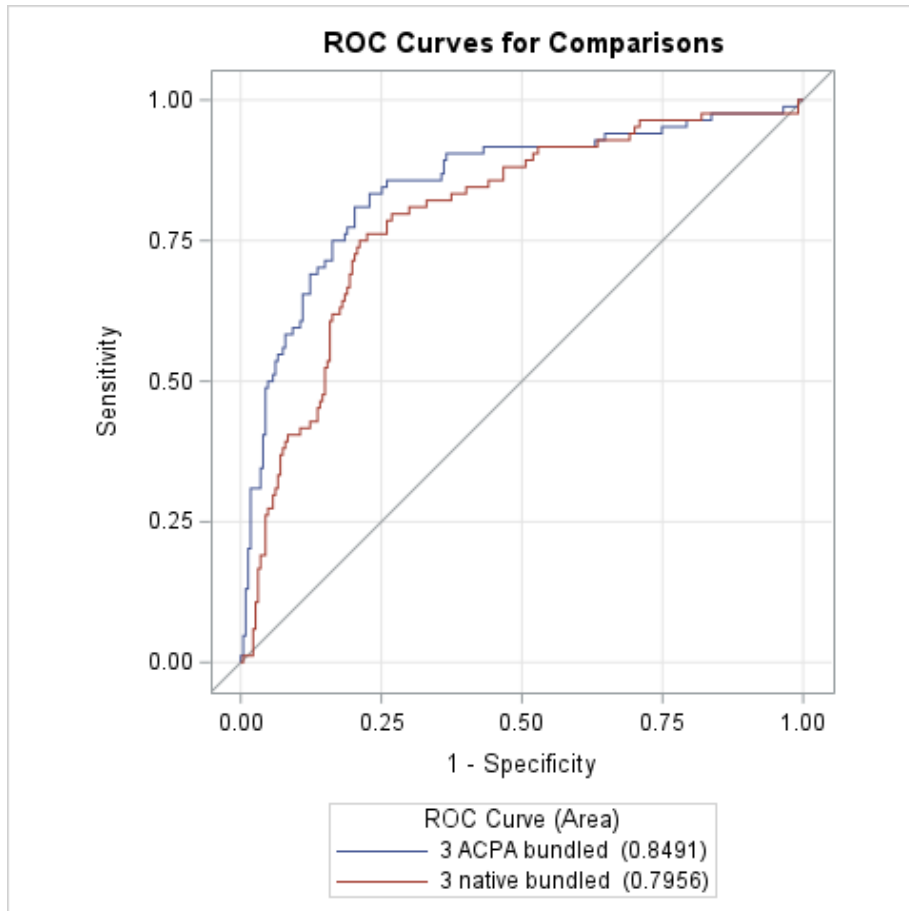
**Figure S1.** Receiver operating characteristic curves for incident RA-ILD risk among 84 cases and 233 RA-noILD controls in BRASS for 6 novel biomarkers

ROC = receiver operating characteristic, Novel biomarkers = H4 33-48 cit 39 (IgA2), H2A/a-2 1-20 cit (IgA2), Filaggrin 48-65 cit2 cyclic (IgG), H2A/a 1-20 cyclic (IgA2), H2A/a-2 1-20 (IgA2), Filaggrin 48-65 cyclic (IgG)



**Figure S2.** Receiver operating characteristic curves for incident RA-ILD risk among 84 cases and 233 RA-noILD controls in BRASS for novel biomarkers grouped as autoantibodies to citrullinated or native proteins

ROC = receiver operating characteristic, Novel autoantibodies to citrullinated protein biomarkers: H4 33-48 cit 39 (IgA2), H2A/a-2 1-20 cit (IgA2), Filaggrin 48-65 cit2 cyclic (IgG). Novel autoantibodies to native protein biomarkers: H2A/a 1-20 cyclic (IgA2), H2A/a-2 1-20 (IgA2), Filaggrin 48-65 cyclic (IgG)



**Table S19.** Pairwise comparisons of AUCs between different models for incident RA-ILD risk

| <b>Models being compared</b>                      | <b>p-value</b> |
|---|----------------|
| Demographics - MUC5B                              | 0.6779         |
| Demographics - Lifestyle                          | 0.053          |
| Demographics - RA factors                         | 0.0006         |
| Demographics - Demo, life and RA factors combined | <0.0001        |
| Demographics - 6 biomarkers                       | <0.0001        |
| Demographics - All combined                       | <0.0001        |
| MUC5B - Lifestyle                                 | 0.0783         |
| MUC5B - RA factors                                | 0.0016         |
| MUC5B - Demo, life and RA factors combined        | <0.0001        |
| MUC5B - 6 biomarkers                              | <0.0001        |
| MUC5B - All combined                              | <0.0001        |
| Lifestyle - RA factors                            | 0.1344         |
| Lifestyle - Demo, life and RA factors combined    | 0.0004         |
| Lifestyle - 6 biomarkers                          | <0.0001        |
| Lifestyle - All combined                          | <0.0001        |
| RA factors - Demo, life and RA factors combined   | 0.0248         |
| RA factors - 6 biomarkers                         | 0.0043         |
| RA factors - All combined                         | <0.0001        |
| Demo, life and RA factors combined - 6 biomarkers | 0.0735         |
| Demo, life and RA factors combined - All combined | 0.0002         |
| 6 biomarkers - All combined                       | 0.0215         |



**Table S20. Model coefficients and odds ratios used for RA-ILD risk score development**

| <b>Risk score</b>                                   | <b>Coefficient</b> | <b>OR</b> | <b>95% LCL</b> | <b>95% UCL</b> |
|---|--------------------|-----------|----------------|----------------|
| <i>Without biomarkers</i>                           |                    |           |                |                |
| Smoking pack-years $\geq 30$                        | 1.92               | 6.83      | 2.99           | 15.60          |
| DAS28-CRP $\geq 3.2$                                | 1.17               | 3.21      | 1.65           | 6.23           |
| Current glucocorticoid use                          | 0.96               | 2.62      | 1.39           | 4.92           |
| BMI $\geq 30$ kg/m <sup>2</sup>                     | 0.41               | 1.51      | 0.78           | 2.92           |
| <i>With biomarkers</i>                              |                    |           |                |                |
| Smoking pack-years $\geq 30$                        | 2.29               | 9.90      | 2.48           | 39.51          |
| DAS28-CRP $\geq 3.2$                                | 1.23               | 3.41      | 1.33           | 8.75           |
| Current glucocorticoid use                          | 1.24               | 3.46      | 1.27           | 9.41           |
| BMI $\geq 30$ kg/m <sup>2</sup>                     | 0.76               | 2.13      | 0.78           | 5.81           |
| Filaggrin 48-65 cit 2 cyclic (IgG), highest tertile | 2.02               | 7.51      | 2.49           | 22.62          |
| H4 33-48 cit 39 (IgA2), lowest tertile              | 1.92               | 6.80      | 2.54           | 18.24          |
| H2A/a-2 1-20 (IgA2), highest tertile                | 1.80               | 6.03      | 2.46           | 14.79          |
| <i>MUC5B</i> promoter variant present               | 0.06               | 1.07      | 0.30           | 3.82           |

BMI = body mass index, cit = citrullinated, CRP = C-reactive protein, DAS = disease activity score, h = histone, Ig = immunoglobulin, OR = odds ratio, LCL = lower confidence limit, RA-ILD = rheumatoid arthritis interstitial lung disease, UCL = upper confidence limit