**Supplementary material**



**Figure S1. SEM images of the three types of asbestos.** (A) chrysotile of serpentine group features bundled fibrils; (B) amosite and (C) crocidolite of the amphiboles group are needle-like shapes.



**Figure S2. Effect of asbestos on the distribution of mitochondria and actin in human lung fibroblasts.** Cells were treated with chrysotile, amosite, or crocidolite (25 mg/L) for the indicated times and stained to visualize mitochondria (red), filamentous actin (green), and nuclei (blue). Scale bar, 20μm.

**Table S1. Classification of fibrosis-related genes upregulated and downregulated by asbestos.** Data (n = 3) are presented as the mean ± SD. \*, \*\*, \*\*\* represent P < 0.05, 0.01, 0.001, respectively, vs the control (not exposed to asbestos) group.

|  |  |  |
| --- | --- | --- |
| ***Functional groups*** | **Official full name** | **Fold regulation compared to control** |
| **Gene symbol** | **Chrysotile** | **P** | **Amosite** | **P** | **Crocidolite** | **P** |
| ***Pro-Fibrotic*** |  |  |  |  |  |  |
| ACTA2 | Actin, alpha 2, smooth muscle, aorta | -4.15±0.69 | \*\*\* | -1.77±0.12 | \*\*\* | -1.53±0.18 | \*\* |
| AGT | Angiotensinogen | 2.23±0.66 | \* | 3.20±0.32 | \*\*\* | 3.49±1.04 | \*\* |
| CCL11 | Chemokine (C-C motif) ligand 11 | 1.10±0.26 |  | 1.10±0.06 |  | -1.06±1.82 | 　 |
| CCL2 | Chemokine (C-C motif) ligand 2 | 2.86±0.35 | \*\*\* | 1.40±0.25 | \*\* | 1.10±0.28 | 　 |
| CCL3 | Chemokine (C-C motif) ligand 3 | -1.14±0.07 |  | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| AKT1 | V-akt murine thymoma viral oncogene homolog 1 | -1.30±0.12 | \*\* | -1.40±0.16 | \*\* | -1.43±0.08 | \*\* |
| CTGF | Connective tissue growth factor | -1.49±0.08 | \*\*\* | -1.32±0.08 | \*\*\* | -1.23±0.17 | \*\* |
| GREM1 | Gremlin 1 | -1.74±0.19 | \*\* | -1.27±0.05 |  | -1.27±0.16 | 　 |
| IL13 | Interleukin 13 | -1.08±0.11 |  | 1.19±1.91 |  | -1.13±0.02 | 　 |
| IL13RA2 | Interleukin 13 receptor, alpha 2 | 7.60±3.59 | \*\* | 3.12±0.41 | \*\*\* | 2.10±0.12 | \*\*\* |
| IL4 | Interleukin 4 | -1.14±0.07 |  | -1.01±1.58 |  | 1.09±1.68 | 　 |
| IL5 | Interleukin 5 | -1.14±0.07 |  | -1.01±1.58 |  | 1.09±1.68 | 　 |
| SNAI1 | Snail homolog 1 | -1.14±0.07 |  | -1.01±1.58 |  | 1.09±1.68 | 　 |
| ***Anti-Fibrotic*** |  |  |  |  |  |  |
| BMP7 | Bone morphogenetic protein 7 | -1.14±0.07 | 　 | -1.01±1.58 | 　 | 1.09±1.68 | 　 |
| HGF | Hepatocyte growth factor | 1.66±0.13 | \*\* | 1.28±0.08 | \* | -1.06±1.46 | 　 |
| IFNG | Interferon, gamma | -1.14±0.07 | 　 | -1.01±1.58 | 　 | 1.09±1.68 | 　 |
| IL10 | Interleukin 10 | -1.14±0.07 | 　 | -1.01±1.58 | 　 | 1.09±1.68 | 　 |
| IL13RA2 | Interleukin 13 receptor, alpha 2 | 7.60±3.59 | \*\* | 3.12±0.41 | \*\*\* | 2.10±0.12 | \*\*\* |
| ***Extracellular matrix structural constituents*** |  |  |  |  |  |  |
| COL1A2 | Collagen, type I, alpha 2 | -2.29±0.47 | \*\* | -1.41±0.14 | \*\* | -1.36±0.20 | \*\* |
| COL3A1 | Collagen, type III, alpha 1 | -2.46±0.48 | \*\* | -1.62±0.13 | \*\* | -1.47±0.13 | \*\* |
| ***Extracellular matrix remodeling enzymes*** |  |  |  |  |  |  |
| LOX | Lysyl oxidase | -1.36±0.16 | 　 | -1.40±0.07 | 　 | -1.20±0.22 | 　 |
| MMP1 | Matrix metallopeptidase 1 | 3.99±1.36 | \*\* | 1.61±0.30 | \*\* | 1.20±1.64 | 　 |
| MMP13 | Matrix metallopeptidase 13 | -1.13±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| MMP14 | Matrix metallopeptidase 14 | 1.08±1.23 | 　 | 1.17±0.05 | 　 | 1.42±0.18 | \* |
| MMP2 | Matrix metallopeptidase 2 | -1.42±0.04 | \*\* | -1.39±0.22 | \*\* | -1.48±0.15 | \*\* |
| MMP3 | Matrix metallopeptidase 3 | 5.11±4.43 | 　 | 2.10±1.11 | \*\* | 1.83±0.38 | 　 |
| MMP8 | Matrix metallopeptidase 8 | -1.67±0.35 | 　 | 1.03±2.64 | 　 | -1.16±0.03 | 　 |
| MMP9 | Matrix metallopeptidase 9 | -1.10±0.06 | 　 | -1.01±1.60 | 　 | 1.16±1.70 | 　 |
| PLAT | Plasminogen activator, tissue | 3.10±0.50 | \*\* | 1.16±1.76 | 　 | 1.14±0.29 | 　 |
| PLAU | Plasminogen activator, urokinase | 2.40±0.39 | \*\*\* | 1.53±0.26 | \*\* | 1.25±0.11 | \* |
| PLG | Plasminogen | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| SERPINA1 | Serpin peptidase inhibitor, clade A, member 1 | -1.19±0.07 | \*\* | 1.07±1.74 | 　 | 1.20±0.05 | \* |
| SERPINE1 | Serpin peptidase inhibitor, clade E, member 1 | -1.23±0.20 |  | -1.36±0.27 |  | -1.31±0.19 |  |
| SERPINH1 | Serpin peptidase inhibitor, clade H, member 1 | -2.11±0.01 | \*\*\* | -1.45±0.18 | \* | -1.25±0.16 | \* |
| TIMP1 | TIMP metallopeptidase inhibitor 1 | 1.28±0.11 | 　 | 1.10±0.03 | 　 | -1.01±1.56 | 　 |
| TIMP2 | TIMP metallopeptidase inhibitor 2 | -1.26±0.06 | 　 | -1.15±0.04 | 　 | -1.25±0.08 | 　 |
| TIMP3 | TIMP metallopeptidase inhibitor 3 | -1.54±0.20 | \*\* | -1.31±0.16 | \* | -1.23±0.19 | \* |
| TIMP4 | TIMP metallopeptidase inhibitor 4 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| ***Cell adhesion molecules*** |  |  |  |  |  |  |
| ITGA1 | Integrin, alpha 1 | -2.41±0.10 | \*\*\* | -1.64±0.10 | \*\* | -1.69±0.21 | \*\* |
| ITGA2 | Integrin, alpha 2 | 2.69±0.43 | \*\*\* | 1.61±0.33 | \*\* | 1.14±0.06 | 　 |
| ITGA3 | Integrin, alpha 3 | -1.33±0.13 | \* | -1.62±0.09 | \*\* | -1.58±0.24 | \*\* |
| ITGAV | Integrin, alpha V | -1.79±0.25 | \*\* | -1.62±0.18 | \* | -1.62±0.12 | \*\* |
| ITGB1 | Integrin, beta 1 | -1.43±0.14 | \* | -1.39±0.00 | \* | -1.46±0.16 | \* |
| ITGB3 | Integrin, beta 3 | -1.99±0.22 | \*\* | -1.28±0.03 | \* | -1.34±0.09 | \* |
| ITGB5 | Integrin, beta 5 | 1.57±0.12 | \*\* | 1.20±0.01 | 　 | 1.21±0.17 | 　 |
| ITGB6 | Integrin, beta 6 | 1.19±1.37 | 　 | 1.58±2.21 | 　 | 1.09±0.01 | 　 |
| ITGB8 | Integrin, beta 8 | 1.09±0.15 | 　 | -1.05±1.57 | 　 | -1.39±0.02 | \*\* |
| ***Inflammatory cytokines & chemokines*** |  |  |  |  |  |  |
| CCL11 | Chemokine (C-C motif) ligand 11 | 1.10±0.26 | 　 | 1.10±0.06 | 　 | -1.06±1.82 | 　 |
| CCL2 | Chemokine (C-C motif) ligand 2 | 2.86±0.35 | \*\*\* | 1.40±0.25 | \*\* | 1.10±0.28 | 　 |
| CCL3 | Chemokine (C-C motif) ligand 3 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| CCR2 | Chemokine (C-C motif) receptor 2 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| CXCR4 | Chemokine (C-X-C motif) receptor 4 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| IFNG | Interferon, gamma | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| IL10 | Interleukin 10 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| IL13 | Interleukin 13 | -1.08±0.11 | 　 | 1.19±1.91 | 　 | -1.13±0.02 | 　 |
| IL13RA2 | Interleukin 13 receptor, alpha 2 | 7.60±3.59 | \*\* | 3.12±0.41 | \*\*\* | 2.10±0.12 | \*\*\* |
| IL1A | Interleukin 1, alpha | 5.72±2.70 | \* | 1.73±0.27 | \*\* | 1.14±0.07 | 　 |
| IL1B | Interleukin 1, beta | 17.39±4.33 | \*\*\* | 2.73±1.10 | \* | 1.73±0.10 | \*\* |
| IL4 | Interleukin 4 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| IL5 | Interleukin 5 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| ILK | Integrin-linked kinase | -1.47±0.05 | \*\* | -1.40±0.08 | \*\* | -1.43±0.06 | \*\* |
| TNF | Tumor necrosis factor | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| ***Growth factors*** |  |  |  |  |  |  |
| AGT | Angiotensinogen | 2.23±0.66 | \* | 3.20±0.32 | \*\*\* | 3.49±1.04 | \*\* |
| CTGF | Connective tissue growth factor | -1.49±0.08 | \*\*\* | -1.32±0.08 | \*\*\* | -1.23±0.17 | \*\* |
| EDN1 | Endothelin 1 | -1.30±0.03 | 　 | -1.14±0.34 | 　 | -1.43±0.07 | 　 |
| EGF | Epidermal growth factor | -1.38±0.34 | 　 | 1.06±1.48 | 　 | 1.07±1.77 | 　 |
| HGF | Hepatocyte growth factor | 1.66±0.13 | \*\* | 1.28±0.08 | \* | -1.06±1.46 | 　 |
| PDGFA | Platelet-derived growth factor alpha polypeptide | -1.07±1.22 | 　 | -1.08±1.65 | 　 | -1.28±0.04 | \*\* |
| PDGFB | Platelet-derived growth factor beta polypeptide | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| VEGFA | Vascular endothelial growth factor A | 1.06±1.31 | 　 | -1.04±1.68 | 　 | 1.03±1.59 | 　 |
| ***TGFβ superfamily members*** |  |  |  |  |  |  |
| BMP7 | Bone morphogenetic protein 7 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| CAV1 | Caveolin 1, caveolae protein, 22kDa | -1.76±0.16 | \*\* | -1.28±0.03 | \*\* | -1.46±0.12 | \*\* |
| DCN | Decorin | -2.25±0.20 | \*\* | -1.47±0.15 | \* | -1.39±0.11 | \*\* |
| ENG | Endoglin | -1.34±0.06 | \*\* | -1.37±0.14 | \*\* | -1.46±0.12 | \*\* |
| GREM1 | Gremlin 1 | -1.74±0.20 | \*\* | -1.27±0.05 | 　 | -1.27±0.16 | 　 |
| INHBE | inhibin, beta E | -2.41±0.30 | \*\*\* | -2.75±0.16 | \*\*\* | -2.73±0.43 | \*\*\* |
| LTBP1 | Latent transforming growth factor beta binding protein 1 | 1.07±0.07 | 　 | -1.12±0.02 | 　 | -1.19±0.06 | \*\* |
| SMAD2 | SMAD family member 2 | -1.27±0.08 | \* | -1.23±0.04 | \* | -1.39±0.12 | \*\* |
| SMAD3 | SMAD family member 3 | -1.16±1.23 | 　 | -1.25±0.32 | 　 | -1.17±1.50 | 　 |
| SMAD4 | SMAD family member 4 | -1.26±0.07 | 　 | -1.23±0.14 | 　 | -1.37±0.01 | 　 |
| SMAD6 | SMAD family member 6 | -1.94±0.10 | \*\* | -1.45±0.11 | 　 | -1.28±0.03 | 　 |
| SMAD7 | SMAD family member 7 | -1.16±1.33 | 　 | -1.09±0.18 | 　 | -0.14±0.04 | 　 |
| TGFB1 | Transforming growth factor, beta 1 | 1.03±0.06 | 　 | -1.06±1.53 | 　 | -1.14±1.54 | 　 |
| TGFB2 | Transforming growth factor, beta 2 | -1.13±1.37 | 　 | 1.01±0.04 | 　 | -1.09±1.52 | 　 |
| TGFB3 | Transforming growth factor, beta 3 | -2.84±0.19 | \*\*\* | -1.91±0.14 | \*\*\* | -1.86±0.16 | \*\*\* |
| TGFBR1 | Transforming growth factor, beta receptor 1 | -1.51±0.18 | \* | -1.33±0.23 | 　 | -1.42±0.08 | \* |
| TGFBR2 | Transforming growth factor, beta receptor II | -1.23±0.04 | 　 | -1.25±0.06 | 　 | -1.33±0.07 | \* |
| TGIF1 | TGFB-induced factor homeobox 1 | 1.43±0.38 | \* | 1.22±0.20 | 　 | 1.09±0.06 | 　 |
| THBS1 | Thrombospondin 1 | -2.19±0.26 | \*\* | -1.40±0.08 | \* | -1.63±0.08 | \*\* |
| THBS2 | Thrombospondin 2 | 1.89±0.52 | \* | 1.47±0.15 | \* | 1.14±0.04 | 　 |
| ***Transcription factors*** |  |  |  |  |  |  |
| CEBPB | CCAAT/enhancer binding protein, beta | 2.28±0.52 | \*\*\* | 1.48±0.45 | \* | 1.48±0.04 | \* |
| JUN | Jun proto-oncogene | -1.42±0.17 | 　 | -1.22±0.38 | 　 | -1.26±0.02 | 　 |
| MYC | V-myc myelocytomatosis viral oncogene homolog | -1.04±1.32 | 　 | -1.10±0.03 | 　 | -1.14±0.16 | 　 |
| NFKB1 | Nuclear factor of kappa light polypeptide gene enhancer in B-cells 1 | -1.08±0.13 | 　 | -1.18±1.56 | 　 | -1.38±0.01 | 　 |
| SP1 | Sp1 transcription factor | -1.16±1.25 | 　 | -1.16±0.12 | 　 | -1.39±0.04 | \* |
| STAT1 | Signal transducer and activator of transcription 1 | -1.16±0.02 | 　 | -1.10±0.10 | 　 | -1.15±0.06 | 　 |
| STAT6 | Signal transducer and activator of transcription 6 | -1.08±1.20 | 　 | 1.00±0.02 | 　 | -1.12±1.59 | 　 |
| ***Epithelial-to-mesenchymal transition***  |  |  |  |  |  |  |
| AKT1 | V-akt murine thymoma viral oncogene homolog 1 | -1.30±0.12 | \*\* | -1.40±0.16 | \*\* | -1.44±0.08 | \*\* |
| BMP7 | Bone morphogenetic protein 7 | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.68 | 　 |
| COL1A2 | Collagen, type I, alpha 2 | -2.29±0.47 | \*\* | -1.41±0.14 | \*\* | -1.36±0.20 | \*\* |
| COL3A1 | Collagen, type III, alpha 1 | -2.46±0.48 | \*\* | -1.62±0.13 | \*\* | -1.47±0.15 | \*\* |
| ILK | Integrin-linked kinase | -1.47±0.05 | \*\* | -1.40±0.08 | \*\* | -1.44±0.06 | \*\* |
| ITGAV | Integrin, alpha V | -1.79±0.25 | \*\* | -1.62±0.18 | \* | -1.62±0.12 | \*\* |
| ITGB1 | Integrin, beta 1 | -1.43±0.14 | \* | -1.39±0.00 | \* | -1.46±0.16 | \* |
| MMP2 | Matrix metallopeptidase 2 | -1.42±0.04 | \*\* | -1.39±0.22 | \*\* | -1.48±0.15 | \*\* |
| MMP3 | Matrix metallopeptidase 3 | 5.11±4.43 | 　 | 2.20±1.11 | \*\* | 1.84±0.38 | 　 |
| MMP9 | Matrix metallopeptidase 9 | -1.10±0.06 | 　 | -1.02±1.60 | 　 | 1.16±1.70 | 　 |
| SERPINE1 | Serpin peptidase inhibitor, clade E, member 1 | -1.23±0.20 |  | -1.36±0.27 |  | -1.32±0.19 |  |
| SMAD2 | SMAD family member 2 | -1.27±0.08 | \* | -1.23±0.04 | \* | -1.39±0.13 | \*\* |
| SNAI1 | Snail homolog 1 | -1.14±0.07 | 　 | -1.02±1.60 | 　 | 1.09±1.70 | 　 |
| TGFB1 | Transforming growth factor, beta 1 | 1.03±0.06 | 　 | -1.06±1.53 | 　 | -1.14±1.54 | 　 |
| TGFB2 | Transforming growth factor, beta 2 | -1.13±1.37 | 　 | 1.01±0.04 | 　 | -1.09±1.52 | 　 |
| TGFB3 | Transforming growth factor, beta 3 | -2.84±0.19 | \*\*\* | -1.92±0.14 | \*\*\* | -1.86±0.16 | \*\*\* |
| TIMP1 | TIMP metallopeptidase inhibitor 1 | 1.28±0.11 | 　 | 1.108±0.03 | 　 | -1.01±1.56 | 　 |
| BCL2 | B-cell CLL/lymphoma 2 | -1.43±1.42 | 　 | -1.11±0.21 | 　 | 1.20±0.06 | 　 |
| FASLG | Fas ligand (TNF superfamily, member 6) | -1.14±0.07 | 　 | -1.01±1.60 | 　 | 1.09±1.69 | 　 |

**Table S2. Classification of stress- and toxicity-related genes upregulated and downregulated by asbestos.** Data (n = 3) are presented as the mean ± SD. \*, \*\*, \*\*\* represent P < 0.05, 0.01, 0.001, respectively, vs the control (not exposed to asbestos) group.

|  |  |  |
| --- | --- | --- |
| ***Functional groups*** | **Gene name** | **Fold regulation compared to control** |
| **Gene symbol** | **Chrysotile** | **P** | **Amosite** | **P** | **Crocidolite** | **P** |
| ***Oxidative stress*** |  |  |  |  |  |  |
| FTH1 | Ferritin, heavy polypeptide 1 | 1.26±0.06 | \* | 1.08±0.18 |  | 1.08±0.08 |  |
| GCLC | Glutamate-cysteine ligase, catalytic subunit | 1.17±0.08 |  | -1.02±0.12 |  | 1.06±0.14 |  |
| GCLM | Glutamate-cysteine ligase, modifier subunit | 1.22±0.08 | \* | 1.26±0.07 | \*\* | 1.25±0.00 | \*\* |
| GSR | Glutathione reductase | 1.04±0.02 |  | 1.14±0.22 |  | 1.21±0.13 |  |
| GSTP1 | Glutathione S-transferase pi 1 | 1.27±0.11 | \* | 1.15±0.06 |  | 1.19±0.18 |  |
| HMOX1 | Heme oxygenase (decycling) 1 | 2.28±0.27 | \*\* | 1.69±0.24 | \* | 1.77±0.34 |  |
| NQO1 | NAD(P)H dehydrogenase, quinone 1 | 1.69±0.12 |  | 1.52±0.06 |  | 1.37±0.06 |  |
| PRDX1 | Peroxiredoxin 1 | 1.47±0.09 | \* | 1.06±0.04 |  | 2.75±0.54 | \*\*\* |
| SQSTM1 | Sequestosome 1 | 2.54±0.07 | \* | 2.97±0.22 | \* | 3.22±0.29 | \* |
| TXN | Thioredoxin | 1.24±0.08 | \* | 1.18±0.25 |  | 1.15±0.26 |  |
| TXNRD1 | Thioredoxin reductase 1 | 1.12±0.10 |  | 1.16±0.24 |  | 1.23±0.15 |  |
| ***Hypoxia signaling*** |  |  |  |  |  |  |
| ADM | Adrenomedullin | 1.20±0.06 |  | 1.03±0.26 |  | 1.01±0.15 |  |
| ARNT | Aryl hydrocarbon receptor nuclear translocator | 1.09±0.08 |  | -1.10±0.13 |  | -1.02±0.10 |  |
| BNIP3L | BCL2/adenovirus E1B 19kDa interacting protein 3-like | 1.08±0.08 |  | -1.04±0.17 |  | 1.06±0.21 |  |
| CA9 | Carbonic anhydrase IX | 1.01±0.13 |  | -1.21±0.10 |  | -1.16±0.00 |  |
| EPO | Erythropoietin | 1.03±0.09 |  | 1.07±0.09 |  | 1.19±0.00 | \* |
| HMOX1 | Heme oxygenase (decycling) 1 | 2.28±0.27 | \*\* | 1.69±0.24 | \* | 1.77±0.34 |  |
| LDHA | Lactate dehydrogenase A | -1.12±0.11 |  | -1.04±0.30 |  | 1.25±0.26 |  |
| MMP9 | Matrix metallopeptidase 9 | 1.00±0.08 |  | 1.04±0.08 |  | 1.15±0.00 |  |
| SERPINE1 | Serpin peptidase inhibitor, clade E, member 1 | -1.11±0.06 |  | 1.09±0.35 |  | 1.46±0.45 |  |
| SLC2A1 | Solute carrier family 2, member 1 | 1.19±0.05 |  | 1.08±0.49 |  | 1.18±0.24 |  |
| VEGFA | Vascular endothelial growth factor A | -1.05±0.08 |  | 1.02±0.13 |  | 1.10±0.16 |  |
| ***Osmotic stress*** |  |  |  |  |  |  |
| AKR1B1 | Aldo-keto reductase family 1, member B1 | 1.52±0.07 | \* | 1.15±0.09 |  | 1.14±0.22 |  |
| AQP1 | Aquaporin 1 | 1.53±0.19 | \* | 1.26±0.25 |  | 1.34±0.36 |  |
| AQP2 | Aquaporin 2 | 1.03±0.09 |  | 1.07±0.09 |  | 1.19±0.00 |  |
| AQP4 | Aquaporin 4 | 1.50±0.25 |  | 1.07±0.09 |  | 1.19±0.00 |  |
| CFTR | Cystic fibrosis transmembrane conductance regulator | -1.29±0.05 |  | -1.37±0.26 |  | -1.50±0.16 |  |
| EDN1 | Endothelin 1 | -1.45±0.09 |  | -1.02±0.07 |  | 1.09±0.07 |  |
| HSPA4L | Heat shock 70kDa protein 4-like | 1.18±0.10 |  | 1.93±0.27 | \* | 2.08±0.37 | \*\* |
| NFAT5 | Nuclear factor of activated T-cells 5 | 1.97±0.25 |  | 2.07±0.09 |  | 2.13±0.10 |  |
| SLC5A3 | Solute carrier family 5, member 3 | 1.20±0.10 |  | 1.14±0.27 |  | 1.23±0.32 |  |
| ***Apoptosis*** |  |  |  |  |  |  |
| CASP1 | Caspase 1, apoptosis-related cysteine peptidase | 1.17±0.07 |  | 1.25±0.12 |  | 1.06±0.02 |  |
| FAS | Fas (TNF receptor superfamily, member 6) | 1.14±0.11 |  | 1.03±0.04 |  | 1.19±0.05 |  |
| MCL1 | Myeloid cell leukemia sequence 1 | 1.36±0.10 | \* | 1.16±0.03 |  | 3.15±0.23 | \*\*\* |
| TNFRSF10A | Tumor necrosis factor receptor superfamily, member 10a | 1.45±0.17 |  | 1.98±0.39 | \* | 1.37±0.09 |  |
| TNFRSF10B | Tumor necrosis factor receptor superfamily, member 10b | 1.34±0.07 |  | 2.21±0.31 |  | 2.44±0.71 | \* |
| TNFRSF1A | Tumor necrosis factor receptor superfamily, member 1A | 1.41±0.01 |  | 1.02±0.14 |  | 1.11±0.02 |  |
| ***Autophagy*** |  |  |  |  |  |  |
| ATG5 | ATG5 autophagy related 5 homolog | 1.16±0.06 |  | 1.85±0.22 | \*\* | 1.91±0.21 | \*\* |
| ATG7 | ATG7 autophagy related 7 homolog | 1.18±0.11 |  | 1.29±0.19 |  | 1.35±0.00 | \* |
| ATG12 | ATG12 autophagy related 12 homolog | 1.14±0.08 |  | 1.03±0.12 |  | 1.14±0.14 |  |
| BECN1 | Beclin 1, autophagy related | 1.10±0.04 |  | 1.27±0.09 | \* | 1.14±0.04 |  |
| FAS | Fas (TNF receptor superfamily, member 6) | 1.14±0.10 |  | 1.03±0.04 |  | 1.10±0.05 |  |
| ULK1 | Unc-51-like kinase 1 | 1.31±0.11 |  | -1.02±0.16 |  | 1.12±0.05 |  |
| ***Necrosis*** |  |  |  |  |  |  |
| FAS | Fas (TNF receptor superfamily, member 6) | 1.14±0.10 |  | 1.03±0.04 |  | 1.10±0.05 |  |
| GRB2 | Growth factor receptor-bound protein 2 | 1.26±0.13 |  | 1.01±0.22 |  | 1.13±0.14 |  |
| PARP1 | Poly (ADP-ribose) polymerase 1 | 1.03±0.01 |  | -1.08±0.14 |  | 1.08±0.02 |  |
| PVR | Poliovirus receptor | -1.12±0.08 |  | -1.16±0.45 |  | 1.01±0.26 |  |
| RIPK1 | Receptor (TNFRSF)-interacting serine-threonine kinase 1 | 1.04±0.15 |  | 1.27±0.16 |  | 1.11±0.03 |  |
| TNFRSF10A | Tumor necrosis factor receptor superfamily, member 10a | 1.45±0.17 |  | 2.00±0.55 | \* | 1.37±0.09 |  |
| TNFRSF1A | Tumor necrosis factor receptor superfamily, member 1A | 1.02±0.14 |  | 1.41±0.01 |  | 1.11±0.02 |  |
| TXNL4B | Thioredoxin-like 4B | 1.22±0.12 |  | 1.53±0.20 |  | 1.67±0.37 | \* |
| ***Inflammatory response*** |  |  |  |  |  |  |
| CCL2 | Chemokine (C-C motif) ligand 2 | -1.09±0.05 |  | 1.12±0.12 |  | 1.06±0.07 |  |
| CD40LG | CD40 ligand | 1.03±0.09 |  | 1.07±0.09 |  | 1.19±0.00 | \*\*\* |
| CRP | C-reactive protein | 1.04±0.10 |  | 1.07±0.09 |  | 1.19±0.00 | \*\* |
| IFNG | Interferon, gamma | 1.03±0.09 |  | 1.07±0.09 |  | 1.19±0.00 |  |
| IL1A | Interleukin 1, alpha | 7.43±2.26 | \*\* | 1.08±0.01 |  | 1.60±0.04 | \*\* |
| IL1B | Interleukin 1, beta | 5.15±0.34 | \*\*\* | 2.01±0.41 | \* | 1.22±0.10 | \* |
| IL6 | Interleukin 6 | -1.50±0.01 |  | -1.11±0.29 |  | 1.14±0.14 |  |
| CXCL8 | Interleukin 8 | 2.06±0.14 | \* | 1.56±0.19 |  | 2.29±0.88 |  |
| TLR4 | Toll-like receptor 4 | 1.24±0.67 |  | -1.17±0.17 |  | -1.01±0.26 |  |
| TNF | Tumor necrosis factor | 1.03±0.09 |  | 1.07±0.09 |  | 1.19±0.00 | \* |
| ***Cell cycle arrest & checkpoint*** |  |  |  |  |  |  |
| CDKN1A | Cyclin-dependent kinase inhibitor 1A | 1.35±0.10 |  | 1.24±0.10 |  | 1.31±0.20 |  |
| CHEK1 | CHK1 checkpoint homolog | 1.03±0.18 |  | -1.00±0.10 |  | 1.34±0.04 | \* |
| CHEK2 | CHK2 checkpoint homolog | 1.21±0.14 |  | 1.69±0.18 |  | 1.86±0.24 | \* |
| DDIT3 | DNA-damage-inducible transcript 3 | 1.38±0.12 | \* | 1.08±0.02 |  | 1.39±0.00 | \* |
| HUS1 | HUS1 checkpoint homolog | 1.24±0.09 |  | -1.00±0.12 |  | 1.10±0.14 |  |
| MRE11A | MRE11 meiotic recombination 11 homolog A | 1.13±0.10 |  | 1.89±0.24 | \* | 1.90±0.49 | \* |
| NBN | Nibrin | 1.13±0.09 |  | 1.68±0.22 | \* | 1.54±0.37 |  |
| RAD17 | RAD17 homolog | 1.08±0.07 |  | -1.02±0.06 |  | 1.09±0.03 | \* |
| RAD9A | RAD9 homolog A | 1.33±0.06 | \* | 1.02±0.10 |  | 2.42±0.58 | \*\* |
| ***DNA damage responses*** |  |  |  |  |  |  |
| ATM | Ataxia telangiectasia mutated | 1.10±0.06 |  | 1.07±0.03 |  | 1.03±0.12 |  |
| ATR | Ataxia telangiectasia and Rad3 related | 1.04±0.09 |  | 1.30±0.12 | \* | 4.28±0.34 | \*\*\* |
| DDB2 | Damage-specific DNA binding protein 2 | 1.26±0.04 | \* | 1.06±0.10 |  | 1.07±0.10 |  |
| GADD45A | Growth arrest and DNA-damage-inducible, alpha | 2.28±0.19 |  | 2.12±0.16 |  | 2.78±0.16 | \* |
| GADD45G | Growth arrest and DNA-damage-inducible, gamma | 1.34±0.24 |  | 2.07±0.02 | \*\* | 1.58±0.40 |  |
| RAD51 | RAD51 homolog | -1.16±0.13 |  | -1.04±0.19 |  | 1.29±0.21 |  |
| TP53 | Tumor protein p53 | 1.34±0.06 |  | -1.01±0.18 |  | 1.08±0.10 |  |
| XPC | Xeroderma pigmentosum, complementation group C | 1.82±0.01 |  | 1.62±0.14 |  | 1.64±0.26 |  |
| ***Unfolded protein response*** |  |  |  |  |  |  |
| ATF4 | Activating transcription factor 4 | 1.18±0.11 |  | 1.07±0.22 |  | 1.20±0.14 |  |
| ATF6 | Activating transcription factor 6 | 1.31±0.20 |  | 2.81±0.49 | \*\*\* | 3.12±0.60 | \*\*\* |
| ATF6B | Activating transcription factor 6 beta | 1.13±0.21 |  | 1.44±0.12 | \* | 1.25±0.05 |  |
| BBC3 | BCL2 binding component 3 | 1.10±0.16 |  | 1.09±0.16 |  | 1.31±0.29 |  |
| BID | BH3 interacting domain death agonist | 1.09±0.05 |  | 1.18±0.10 |  | 1.80±0.39 | \* |
| CALR | Calreticulin | 1.04±0.09 |  | -1.04±0.54 |  | 1.15±0.31 |  |
| DDIT3 | DNA-damage-inducible transcript 3 | 1.38±0.12 | \* | 1.08±0.02 |  | 1.39±0.00 | \* |
| DNAJC3 | DnaJ homolog, subfamily C, member 3 | 1.09±0.18 |  | 1.02±0.21 |  | 1.15±0.14 |  |
| HSP90AA1 | Heat shock protein 90kDa alpha, class A member 1 | 1.11±0.09 |  | 2.18±0.43 | \* | 2.45±0.65 | \* |
| HSP90B1 | Heat shock protein 90kDa beta, member 1 | -1.25±0.05 |  | -1.19±0.13 |  | -1.08±0.06 |  |
| HSPA4 | Heat shock 70kDa protein 4 | 1.13±0.04 |  | 1.25±0.12 |  | 1.20±0.04 | \* |
| HSPA5 | Heat shock 70kDa protein 5 | 1.31±0.05 |  | 1.44±0.33 |  | 1.47±0.19 |  |