Supplementary Table 1. List of CHOL/COVID-19/VA-associated genes.

| Query  | Entrez | Symbol  | Name                                      | Comment |
|--------|--------|---------|-------------------------------------------|---------|
| BRD2   | 6046   | BRD2    | bromodomain containing 2                  | 1       |
| NOS2   | 4843   | NOS2    | nitric oxide synthase 2                   | 1       |
| GPT    | 2875   | GPT     | glutamic--pyruvic transaminase             | 1       |
| MAPK1  | 5594   | MAPK1   | mitogen-activated protein kinase 1         | 1       |
| CXCR3  | 2833   | CXCR3   | C-X-C motif chemokine receptor 3          | 1       |
| ICAM1  | 3383   | ICAM1   | intercellular adhesion molecule           | 1       |
| CDK4   | 1019   | CDK4    | cyclin dependent kinase 4                 | 1       |
| CAT    | 847    | CAT     | catalase                                  | 1       |
| TMPRSS13 | 84000 | TMPRSS13 | transmembrane serine protease 13         | 1       |
**Supplementary Table 2. Alteration of biological processes.**

| ONTOLOGY | ID       | Description                                               | GeneRatio | BgRatio | pvalue          | p.adjust       | qvalue          | geneID                                | Count | Remark       |
|----------|----------|-----------------------------------------------------------|-----------|---------|-----------------|----------------|----------------|---------------------------------------|-------|--------------|
| BP       | GO:0070482 | response to oxygen levels                                 | 4/9       | 394/18670 | 2.26E-05       | 0.001975       | 0.001018       | NOS2/ICAM1/CDK4/CAT                   | 4     | Inflammatory |
| BP       | GO:0055093 | response to hyperoxia                                     | 2/9       | 21/18670  | 4.32E-05       | 0.003348       | 0.001727       | CDK4/CAT                              | 2     | Inflammatory |
| BP       | GO:0036296 | response to increased oxygen levels                       | 2/9       | 28/18670  | 7.76E-05       | 0.004923       | 0.002539       | CDK4/CAT                              | 2     | Inflammatory |
| BP       | GO:0072593 | reactive oxygen species metabolic process                 | 3/9       | 284/18670 | 0.000273       | 0.013629       | 0.007029       | NOS2/ICAM1/CAT                       | 3     | Inflammatory |
| BP       | GO:1903409 | inflammatory                                              | 2/9       | 122/18670 | 0.001448       | 0.024627       | 0.012702       | NOS2/ICAM1/CAT                       | 2     | Inflammatory |
| BP       | GO:0043574 | protein targeting to peroxisome                           | 2/9       | 69/18670  | 0.000477       | 0.01512        | 0.007798       | NOS2/CAT                              | 2     | Inflammatory |
| BP       | GO:0001666 | response to hypoxia                                       | 3/9       | 359/18670 | 0.000543       | 0.01634        | 0.008427       | NOS2/CAT                              | 3     | Inflammatory |
| BP       | GO:0036293 | response to decreased oxygen levels                       | 3/9       | 370/18670 | 0.000593       | 0.01634        | 0.008427       | NOS2/CAT                              | 3     | Inflammatory |
| BP       | GO:0001910 | regulation of leukocyte mediated cytotoxicity             | 2/9       | 78/18670  | 0.000609       | 0.01634        | 0.008427       | NOS2/ICAM1/CAT                       | 2     | Inflammatory |
| BP       | GO:0007031 | peroxisome organization                                   | 2/9       | 81/18670  | 0.000656       | 0.016763       | 0.008646       | NOS2/CAT                              | 2     | Inflammatory |
| BP       | GO:0051090 | regulation of DNA-binding transcription factor activity    | 3/9       | 432/18670 | 0.000931       | 0.019116       | 0.009859       | MAPK1/ICAM1/CAT                      | 3     | Immunity     |
| BP       | GO:0031341 | regulation of cell killing                                | 2/9       | 98/18670  | 0.000959       | 0.019116       | 0.009859       | NOS2/ICAM1/CAT                       | 2     | Immunity     |
| BP       | GO:0072676 | lymphocyte migration                                      | 2/9       | 111/18670 | 0.001227       | 0.021964       | 0.011328       | CXCR3/ICAM1/CAT                      | 2     | Immunity     |
| BP       | GO:0042133 | neurotransmitter metabolic process                         | 2/9       | 153/18670 | 0.002313       | 0.032948       | 0.016993       | NOS2/ICAM1/CAT                       | 2     | Immunity     |
| BP       | GO:0001906 | cell killing                                              | 2/9       | 168/18670 | 0.00278        | 0.038807       | 0.020015       | NOS2/ICAM1/CAT                       | 2     | Immunity     |
| BP       | GO:0002685 | regulation of leukocyte migration                          | 2/9       | 196/18670 | 0.003761       | 0.046872       | 0.024175       | CXCR3/ICAM1/CAT                      | 2     | Immunity     |
| BP       | GO:0071346 | cellular response to interferon-gamma                     | 2/9       | 180/18670 | 0.003183       | 0.043191       | 0.022276       | NOS2/ICAM1/CAT                       | 2     | Cytokine     |
| BP       | GO:0034341 | response to interferon-gamma                              | 2/9       | 199/18670 | 0.003874       | 0.047438       | 0.024467       | NOS2/ICAM1/CAT                       | 2     | Cytokine     |
Supplementary Table 3. Alteration of KEGG pathways.

| ID     | Description                                      | GeneRatio | BgRatio  | pvalue  | p.adjust | qvalue  | geneID          | Count | Remark     |
|--------|--------------------------------------------------|-----------|----------|---------|----------|---------|-----------------|-------|------------|
| hsa05164     | Influenza A                                      | 3/7       | 171/8047 | 0.00031 | 0.014567 | 0.009679 | MAPK1/ICAM1/CDK4 | 3     | Viral      |
| hsa05167     | Kaposi sarcoma-associated herpesvirus infection | 3/7       | 189/8047 | 0.000416 | 0.014676 | 0.009751 | MAPK1/ICAM1/CDK4 | 3     | Viral      |
| hsa05166     | Human T-cell leukemia virus 1 infection          | 3/7       | 219/8047 | 0.000642 | 0.015083 | 0.010021 | MAPK1/ICAM1/CDK4 | 3     | Viral      |
| hsa05145     | Toxoplasmosis                                    | 2/7       | 112/8047 | 0.003852 | 0.025864 | 0.017185 | NOS2/MAPK1      | 2     | Viral      |
| hsa05160     | Hepatitis C                                      | 2/7       | 156/8047 | 0.007356 | 0.034574 | 0.022972 | MAPK1/CDK4      | 2     | Viral      |
| hsa05169     | Epstein-Barr virus infection                     | 2/7       | 202/8047 | 0.012117 | 0.049748 | 0.033054 | ICAM1/CDK4      | 2     | Viral      |
| hsa05203     | Viral carcinogenesis                             | 2/7       | 204/8047 | 0.012349 | 0.049748 | 0.033054 | MAPK1/CDK4      | 2     | Viral      |
| hsa04146     | Peroxisome                                       | 2/7       | 83/8047  | 0.002134 | 0.021497 | 0.014283 | NOS2/CAT        | 2     | Immunity   |
| hsa04660     | T cell receptor signaling pathway                | 2/7       | 104/8047 | 0.00333  | 0.025864 | 0.017185 | MAPK1/CDK4      | 2     | Immunity   |
| hsa04650     | Natural killer cell mediated cytoxicity          | 2/7       | 131/8047 | 0.005235 | 0.029527 | 0.019619 | MAPK1/ICAM1     | 2     | Immunity   |
| hsa04066     | HIF-1 signaling pathway                          | 2/7       | 109/8047 | 0.003652 | 0.025864 | 0.017185 | NOS2/MAPK1      | 2     | Signaling  |
| hsa04668     | TNF signaling pathway                            | 2/7       | 112/8047 | 0.003852 | 0.025864 | 0.017185 | MAPK1/ICAM1     | 2     | Signaling  |
| hsa04926     | Relaxin signaling pathway                        | 2/7       | 129/8047 | 0.00508  | 0.029527 | 0.019619 | NOS2/MAPK1      | 2     | Signaling  |
| hsa04068     | FoxO signaling pathway                           | 2/7       | 131/8047 | 0.005235 | 0.029527 | 0.019619 | MAPK1/CAT       | 2     | Signaling  |
| hsa04371     | Apelin signaling pathway                         | 2/7       | 137/8047 | 0.005713 | 0.030985 | 0.020587 | NOS2/MAPK1      | 2     | Signaling  |
| hsa04062     | Chemokine signaling pathway                      | 2/7       | 189/8047 | 0.010662 | 0.045556 | 0.030269 | MAPK1/CXCR3     | 2     | Signaling  |