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| **Supplementary Table 2. Details of the 22 immune-related genes in IGSHCC** |
| **Gene symbol** | **Gene name** | **Associated functions** | **LASSO****coefficient** |
| *BMP6* | Bone morphogenetic protein 6 | ERK signaling, TGF-pathway, growth factor activity | 0.5128 |
| *BRD8* | Bromodomain-containing 8 | Chromatin organization, DNA-binding transcription factor activity, thyroid hormone receptor activity | 0.2639 |
| *C5* | Complement C5 | Signaling by GPCR, immune response, lectin-induced complement pathway | -0.0756 |
| *CAMP* | Cathelicidin antimicrobial peptide | Innate immune system, SREBP signaling | -0.2253 |
| *CCR7* | C-C motif chemokine receptor 7 | Signaling by GPCR, CCR5 pathway in macrophages | -0.0549 |
| *CCR8* | C-C motif chemokine receptor 8 | Signaling by GPCR, CCR5 pathway in macrophages, chemokine receptor activity | -0.5300 |
| *CXCL5* | C-X-C motif chemokine ligand 5 | Signaling by GPCR, CCR5 pathway in macrophages, CXCR chemokine receptor binding | 0.0703 |
| *EPO* | Erythropoietin | EPO-induced JAK/STAT pathway, hormone activity | 0.2628 |
| *GAL* | Galanin and GMAP prepropeptide | Signaling by GPCR, hormone activity, type 2 galanin receptor binding | 0.2169 |
| *GHR* | Growth hormone receptor | JAK/STAT signaling pathway, protein phosphatase binding | -0.2097 |
| *GLP1R* | Glucagon-like peptide 1 receptor | GPCR activity, glucagon receptor activity | 0.5783 |
| *GMFB* | Glia maturation factor beta | Inhibition of Erk, actin binding, growth factor activity | 0.5759 |
| *HDGF* | Heparin-binding growth factor | ERK signaling, TGF-pathway, growth factor activity | 0.0775 |
| *IL20RA* | Interleukin-20 receptor subunit alpha | ERK signaling, JAK/STAT signaling pathway, cytokine receptor activity | 0.4480 |
| *NR0B1* | Nuclear receptor subfamily 0 group B member 1 | Aldosterone synthesis and secretion, DNA-binding transcription factor activity | 0.0338 |
| *PLAUR* | Plasminogen activator, urokinase receptor | Metabolism of proteins, innate immune system | 0.4750 |
| *PSMD14* | Proteasome 26S subunit, non-ATPase 14 | Metabolism of proteins, RET signaling, proteasome binding | 0.0957 |
| *RETN* | Resistin  | Innate immune system, common cytokine receptor, gamma-chain family signaling pathways | -0.7811 |

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| *STC2* | Stanniocalcin 2 | Protein homodimerization activity, heme binding | 0.3873 |
| *TNF* | Tumor necrosis factor | Identical protein binding, cytokine activity | -1.7966 |
| *ULBP2* | UL16-binding protein 2 | Peptide antigen binding, natural killer cell lectin-like receptor binding | 0.0779 |
| *VIPR1* | Vasoactive intestinal peptide receptor 1 | Signaling by GPCR, vasoactive intestinal polypeptide receptor activity | -0.3171 |

ERK, extracellular signal-regulated kinase; GPCR, G-protein-coupled receptor; JAK, Janus kinase; SREBP, sterol regulatory element-binding protein; STAT, signal transducer and activator of transcription; TGF, transforming growth factor.