

**Supplementary Table 1****TCGA Patient information**

| <b>Variable</b>              | <b>Proportion</b> |
|------------------------------|-------------------|
| <b>AJCC stage</b>            |                   |
| Stage I                      | 16%               |
| Stage II                     | 41%               |
| Stage III                    | 28%               |
| Stage IV                     | 15%               |
| <b>Microsatellite status</b> |                   |
| MSS                          | 64%               |
| MSI-L                        | 17%               |
| MSI-H                        | 19%               |
| <b>Age</b>                   |                   |
| <66                          | 50%               |
| >=66                         | 50%               |
| <b>Gender</b>                |                   |
| Female                       | 45%               |
| Male                         | 55%               |

**Supplementary Table 2****Bioinformatic tools**

| <b>Bulk transcriptome</b>        |                 |
|----------------------------------|-----------------|
| Immune cell abundance            | CIBERSORT       |
| ssGSEA                           | GSVA            |
| GO                               | clusterProfiler |
| DEG                              | Limma           |
| Random forest                    | ranger          |
| LASSO Cox analysis               | glmnet          |
| WGCNA                            | WGCNA           |
| <b>Single-cell transcriptome</b> |                 |

|                               |                            |
|-------------------------------|----------------------------|
| UMAP                          | scanpy                     |
| cell-cell interactions (CCIs) | SingleCellSignalR          |
| <b>NGS</b>                    |                            |
| Quality control               | bcl2fastq                  |
| alignment                     | bwa-mem, Picard, GATK      |
| SNP / Indel calling           | VarScan2                   |
| CNV identification            | FACTERA, ADTE <sub>x</sub> |

**Supplementary Table 3**

| Gene Symbol | ENTREZ ID | Gene Name   |
|-------------|-----------|---|
| ATOH1       | 474       | atonal bHLH transcription factor 1                            |
| B3GNT8      | 374907    | UDP-GlcNAc:betaGal beta-1,3-N-acetylglucosaminyltransferase 8 |
| SULT1B1     | 27284     | sulfotransferase family 1B member 1                           |
| TNFRSF19    | 55504     | TNF receptor superfamily member 19                            |
| HOXC4       | 3221      | homeobox C4   |
| HBA1        | 3039      | hemoglobin subunit alpha 1                                    |
| ENO2        | 2026      | enolase 2   |
| HOXC11      | 3227      | homeobox C11  |
| SYT12       | 91683     | synaptotagmin 12  |
| APOD        | 347       | apolipoprotein D  |
| MTERF       | NA        | NA  |
| PLAG1       | 5324      | PLAG1 zinc finger   |
| TRIM58      | 25893     | tripartite motif containing 58                                |
| TNFAIP2     | 7127      | TNF alpha induced protein 2                                   |
| TMEM195     | NA        | NA  |

|              |      |             |
|--------------|------|-------------|
| HOXC8        | 3224 | homeobox C8 |
| LOC100272228 | NA   | NA          |

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