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报告正文

# 基本信息

|  |  |  |
| --- | --- | --- |
| 姓名：{{sample.patient\_name}} | 病理号：{{sample.pathological\_id}} | 住院号： |
| 性别：{{sample.gender}} | 样本类型：{{sample.sample\_type}} | |
| 年龄：{{sample.age}} | | |
| 病理诊断：{{sample.pathol\_diagn}} | | |
| 肿瘤细胞评估：{%if sample.tumor\_content%}{{sample.tumor\_content}}{%else%}{%endif%} | | |

# 检测小结

**基于二代测序技术，在DNA水平检测571个基因，在RNA水平检测2660个基因RNA，对检测范围内的点突变、小片段插入缺失、基因融合、拷贝数变异和基因表达进行分析。**

|  |  |
| --- | --- |
| **检测范围/基因组指标** | **检测结果及意义** |
| **1. 体细胞变异：**254个基因的全部外显子区，247个基因的部分外显子区，30个基因的内含子、启动子或融合断点区域，以及2660个基因的RNA序列 | {%if var.special.Master\_level\_I + var.special.Master\_level\_II + var.special.Master\_level\_onco\_nodrug + var.special.Master\_level\_III%}检出{{var.special.Master\_level\_I + var.special.Master\_level\_II + var.special.Master\_level\_onco\_nodrug + var.special.Master\_level\_III}}个体细胞变异，检出{{(var.var\_germline.level\_4 + var.var\_germline.level\_5)|count}}个致病/疑似致病变异。其中，{{var.special.Master\_level\_I + var.special.Master\_level\_II}}个与靶向药物相关，{{var.special.BJYY\_PD1}}个与PD-1/PD-L1抑制剂相关。{%endif%} |
| **2. 胚系变异：**64个基因的全部外显子区, 21个基因的部分外显子区，3个基因的内含子和启动子区域 |
| **3. 肿瘤突变负荷（TMB）** | 肿瘤突变负荷{%if tmb.var\_id==”TMB-L”%}低（TMB-L）{%else%}高（TMB-H， {{tmb.TMB\_value}} Muts/Mb）{%endif%} |
| **4. 微卫星状态（MSS/MSI）** | {%if msi.var\_id==”MSS”%}微卫星稳定型（MSS）。{%else%}微卫星不稳定型（MSI-H）。{%endif%} |

注：

1. 上表中体细胞变异数目仅统计临床意义明确、有潜在临床意义和临床意义不明确的变异；胚系变异数目仅统计致病性变异和疑似致病性变异。
2. 基于内部实体瘤TMB数据库，采用国际较为公认的四分位法划分TMB-L/H，设定排序在前25％的值为TMB-H，后75％为TMB-L。

|  |  |  |  |
| --- | --- | --- | --- |
| 初审医师： | 何磊 | 复核医师： | 王征 |
| 日期： | {{sample.report\_date}} | 日期： | {{sample.report\_date}} |

# 检测结果及解析

## 基因组变异及靶向用药提示

{%p if var.var\_for\_regimen.level\_I + var.var\_for\_regimen.level\_II or var.knb%}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **基因组变异** | **突变频率/拷贝数/胚系变异** | **提示敏感** | | **提示耐药/慎重选择** |
| FDA/NMPA/其他机构  批准 | 临床试验 | FDA/NMPA/其他机构  批准 |
| {%tr if var.knb%} | | | | |
| {%tr for b in var.knb%} | | | | |
| *KRAS/*  *NRAS/*  *BRAF*  V600E | 野生型 | {{b.regimen\_name}}{{b.evi\_conclusion\_simple}} | - | - |
| {%tr endfor%} | | | | |
| {%tr endif%} | | | | |
| {%tr if var.var\_for\_regimen.level\_I+ var.var\_for\_regimen.level\_II%} | | | | |
| {%tr for a in var.var\_for\_regimen.level\_I+ var.var\_for\_regimen.level\_II%} | | | | |
| {%p if “,” in a.gene\_symbol and (a.bio\_category==”Sv” or a.bio\_category== “PSeqRnaSv”)%}  {%p if a.five\_prime\_gene != a.three\_prime\_gene %}  *{{a.five\_prime\_gene}}*  *{{a.three\_prime\_gene}}*  {%p else%}  *{{a.five\_prime\_gene}}*  {%p endif%}  {%p else%}  *{{a.gene\_symbol}}*  {%p endif%} | {%p if a.bio\_category==”Snvindel”%}  {%p if a.var\_origin==”germline”%}  {%if a.freq\_sc >= 0.85%}纯合{%else%}杂合{%endif%}  {%p else%}  {{a.freq\_str}}  {%p endif%}  {%p elif a.bio\_category==”Cnv”%}  {{a.cn\_mean}}  {%p elif a.bio\_category==”Sv”%}  {{a.freq\_str}}  {%p endif%} | {%p if a.evi\_sum.evi\_split.Predictive%}  {%p for c in a.evi\_sum.evi\_split.Predictive%}  {%p if c.clinical\_significance==”Sensitive” and c.refer\_agency%}  {{c.regimen\_name}}({{c.evi\_conclusion\_simple}})  {%p endif%}  {%p else%}  -  {%p endfor%}  {%p else%}  -  {%p endif%} | {%p if a.evi\_sum.evi\_split.Predictive%}  {%p for c in a.evi\_sum.evi\_split.Predictive%}  {%p if c.clinical\_significance==”Sensitive” and not c.refer\_agency%}  {{c.regimen\_name}}({{c.evi\_conclusion\_simple}})  {%p else%}  -  {%p endif%}  {%p endfor%}  {%p else%}  -  {%p endif%} | {%p if a.evi\_sum.evi\_split.Predictive%}  {%p for c in a.evi\_sum.evi\_split.Predictive%}  {%p if c.clinical\_significance==”Resistence”%}  {{c.regimen\_name}}({{c.evi\_conclusion\_simple}})  {%p else%}  -  {%p endif%}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| {%tr endfor%} | | | | |
| {%tr endif%} | | | | |

{%p endif%}

注：

1. "-"：未有此类变异/药物/其他信息。
2. 参照美国病理协会（Association for Molecular Pathology, AMP）、美国临床肿瘤学会（American Society of Clinical Oncology, ASCO）和美国病理学家协会（College of American Pathologists, CAP）联合发布的肿瘤变异解读及报告指南(PMID: 27993330) 中的变异分类方法，综合变异在治疗、诊断和预后方面相关研究证据，将变异分为4类：I类为强临床意义；II类为潜在临床意义；III类为临床意义不明；IV类为良性/可能良性。上表仅列出I-II类变异。
3. 检测结果与临床意义相关性的证据水平分为A、B、C、D4个等级，A级：对应癌种中FDA/NMPA批准或指南推荐的治疗、诊断和（或）预后的相关标志物; B级：专家共识或III/IV期临床试验研究表明对患者肿瘤治疗有敏感或耐药、或具有诊断、预后意义的生物标志物；C级: FDA/NMPA批准或专业指南推荐的在其他癌种对某个治疗方案敏感或耐药的标志物；或者是作为临床试验入组标准的标志物；或者是多个小型研究结果证实具有诊断或预后意义的标志物；D级: 临床前研究表明具有潜在的治疗意义，或基于小型研究或多个案例报告可能作为辅助疾病诊断或预后的标志物（结论未形成共识）。具有明确临床意义的I类变异，对应药物敏感性证据级别为A级和B级；具有潜在临床意义的II类变异，对应药物敏感性证据级别为C级和D级；临床意义尚不明确的III类变异不做药物敏感性分析。
4. 报告所列举的药物或基因变异并未按照基因或者药物的重要性排序，具体决策需参照临床实际。

## 体细胞变异检测结果

### 点突变，小片段的插入缺失检测结果

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **基因** | **转录本** | **碱基改变** | **氨基酸改变** | **功能区域** | **突变频率** | **变异等级** |
| {%tr if var.special.BJYY\_SNV %} | | | | | | |
| {%tr for a in var.special.BJYY\_SNV%} | | | | | | |
| {{a.gene\_symbol}} | {{a.transcript\_primary}} | {{a.hgvs\_c}} | {%p if a.hgvs\_p!=”p.?”%}  {{a.hgvs\_p}}  {%p else%}  -  {%p endif%} | {{a.gene\_region}} | {{a.freq\_str}} | {%p if a.clinic\_num\_s==5%}  I类  {%p elif a in var.var\_somatic.level\_onco\_nodrug%}  III类  {%p elif a.clinic\_num\_s==4%}  II类  {%p else%}  III类  {%p endif%} |
| {%tr endfor%} | | | | | | |
| {%tr else%} | | | | | | |
| *-* | - | - | - | - | - | - |
| {%tr endif%} | | | | | | |

### 拷贝数变异检测结果

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **基因** | **变异类型** | **功能区域** | **拷贝数** | **变异等级** |
| {%tr if var.special.BJYY\_CNV%} | | | | |
| {%tr for a in var.special.BJYY\_CNV%} | | | | |
| *{{a.gene\_symbol}}* | 扩增 | all exons | {{a.cn\_mean}} | {%p if a.clinic\_num\_s==5%}  I类  {%p elif a in var.var\_somatic.level\_onco\_nodrug%}  III类  {%p elif a.clinic\_num\_s==4%}  II类  {%p else%}  III类  {%p endif%} |
| {%tr endfor%} | | | | |
| {%tr else%} | | | | |
| *-* | - | - | - | - |
| {%tr endif%} | | | | |

### 融合基因检测结果

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **基因** | | **转录本** | | **变异类型** | | **功能区域** | | **突变频率** | | **变异等级** |
| {%tr if var.special.BJYY\_Sv or var.special.BJYY\_RnaSv%} | | | | | | | | | | |
| {%tr for a in var.special.BJYY\_RnaSv%} | | | | | | | | | | |
| {%p if a.five\_prime\_gene != a.three\_prime\_gene %}  {{a.five\_prime\_gene}}  {{a.three\_prime\_gene}}  {%p else%}  {{a.five\_prime\_gene}}  {%p endif%} | | {%p if a.five\_prime\_gene!=a.three\_prime\_gene%}  {{a.five\_prime\_transcript}}  {{a.three\_prime\_transcript}}  {%p else%}  {{a.five\_prime\_transcript}}  {%p endif%} | | 融合 | | {{a.five\_prime\_cds}}  {{a.three\_prime\_cds}} | | {{a.reads|replace(“.0”,””)}}copies | | {%p if a.clinic\_num\_s==5%}  I类  {%p elif a in var.var\_somatic.level\_onco\_nodrug%}  III类  {%p elif a.clinic\_num\_s==4%}  II类  {%p else%}  III类  {%p endif%} |
| {%tr endfor%} | | | | | | | | | | |
| {%tr for b in var.special.BJYY\_Sv%} | | | | | | | | | | |
| {%p if b.five\_prime\_gene != b.three\_prime\_gene %}  {{b.five\_prime\_gene}}  {{b.three\_prime\_gene}}  {%p else%}  {{b.five\_prime\_gene}}  {%p endif%} | {%p if b.five\_prime\_gene!=b.three\_prime\_gene%}  {{b.five\_prime\_transcript}}  {{b.three\_prime\_transcript}}  {%p else%}  {{b.five\_prime\_transcript}}  {%p endif%} | | 融合 | | {{b.five\_prime\_cds}}  {{b.three\_prime\_cds}} | | {{b.reads|replace(“.0”,””)}}copies | | {%p if b.clinic\_num\_s==5%}  I类  {%p elif b in var.var\_somatic.level\_onco\_nodrug%}  III类  {%p elif b.clinic\_num\_s==4%}  II类  {%p else%}  III类  {%p endif%} | |
| {%tr endfor%} | | | | | | | | | | |
| {%tr else%} | | | | | | | | | | |
| - | | - | | - | | - | | - | | - |
| {%tr endif%} | | | | | | | | | | |

注：

1. "-"：未有此类变异/其他信息。
2. 上表仅列出临床意义相关、肿瘤发生发展相关和临床意义不明确的检出变异。
3. 检出变异为点突变或小片段插入缺失突变时提示丰度，指突变型占野生型和突变型之和的比例。
4. 检出变异为基因扩增时提示DNA拷贝数，正常细胞中基因拷贝数为2。
5. 在RNA样本中检出变异为基因融合时无突变丰度数值；在DNA样本中检出变异为基因融合时提示丰度，指突变型占野生型和突变型之和的比例；在RNA和DNA样本中同时检出融合仅提示RNA检测结果。

## 体细胞变异及靶向药物解析

{%p if var.knb%}

|  |
| --- |
| ***KRAS/NRAS/BRAF* V600E 野生型** |
| **基因解析：**  KRAS基因是人体内最为常见的原癌基因，其负责编码的RAS蛋白在细胞内的信号通路中起着信号转导作用，KRAS突变在多种肿瘤中均有发生，比如在肺癌中约占15–25%（PMID: 18794081），在结直肠癌中高达40%（PMID: 19679400）。NRAS基因同KRAS、HRAS基因一样隶属于RAS基因家族，其负责编码的RAS蛋白在多种细胞信号通路中起着信号转导作用，在细胞的生存与增殖等活动中处于重要位置。NRAS在结直肠癌患者中的突变率相对较高，约为1～6%，主要发生位置为2～4号外显子，同时NRAS也是结直肠癌中重要的分子标志之一。BRAF，又名丝氨酸/苏氨酸激酶，其在丝裂原活化蛋白激酶（MAPK）级联（PMID: 15520807）的调节中起关键作用。BRAF基因突变在多种肿瘤中均有报道，包括黑色素瘤（PMID: 12068308）、肺癌、结直肠癌（PMID:19537845）等，是一种常见的原癌基因。  **变异解析：**  -  **靶向药物解析：**  {%p if var.knb.evi\_sum.evi\_split%}  {%p if var.knb.evi\_sum.evi\_split.Predictive\_merge%}  {%p for b in var.knb.evi\_sum.evi\_split.Predictive\_merge%}  **{{b.regimen\_name}}:**  {{b.evi\_interpretation|e}}  {%p endfor%}  {%p endif%}  {%p endif%} |

{%p endif%}

{%p if var.var\_somatic.level\_I+var.var\_somatic.level\_II+var.var\_somatic.level\_onco\_nodrug%}

|  |
| --- |
| {%tr for a in var.var\_somatic.level\_I+var.var\_somatic.level\_II+var.var\_somatic.level\_onco\_nodrug%} |
| {%p if a.bio\_category==”Snvindel”%}  ***{{a.gene\_symbol}}* {{a.hgvs\_c}} {%if a.hgvs\_p != “p.?”%}{{a.hgvs\_p}}{%endif%}**  **{%**p elifa.bio\_category==”Cnv”**%}**  ***{{a.gene\_symbol}}* 扩增**  **{%**p elifa.bio\_category==”Sv”or a.bio\_category==”PSeqRnaSv”**%}**  ***{{a.five\_prime\_gene}}*:{{a.five\_prime\_cds}}-*{{a.three\_prime\_gene}}*:{{a.three\_prime\_cds}}融合**  {%p endif%} |
| **基因解析：**  {%p if “,” in a.gene\_symbol and (a.bio\_category==”Sv” or a.bio\_category==“PSeqRnaSv”)%}  {%p if a.five\_prime\_gene != a.three\_prime\_gene %}  {{a.five\_prime\_gene\_function|e}}  {{a.three\_prime\_gene\_function|e}}  {%p else%}  {{a.five\_prime\_gene\_function|e}}  {%p endif%}  {%p else%}  {{a.gene\_function|e}}  {%p endif%}  **变异解析：**  {{a.variant\_desc\_cn|e}}{{a.variant\_interpret\_cn|e}}  **靶向药物解析：**  {%p if a.evi\_sum.evi\_split%}  {%p if a.evi\_sum.evi\_split.Predictive\_merge%}  {%p for b in a.evi\_sum.evi\_split.Predictive\_merge%}  **{{b.regimen\_name}}：**  {{b.evi\_interpretation|e}}  {%p endfor%}  {%p endif%}  {%p if a.evi\_sum.evi\_split.Prognostic%}  {%p for b in a.evi\_sum.evi\_split.Prognostic %}  **预后相关：**  {{b.evi\_interpretation|e}}  {%p endfor%}  {%p endif%}  {%p if a.evi\_sum.evi\_split.Diagnostic%}  {%p for b in a.evi\_sum.evi\_split.Diagnostic %}  **辅助诊断相关：**  {{b.evi\_interpretation|e}}  {%p endfor%}  {%p endif%}  {%p else%}  目前关于该变异的临床治疗实践尚不明确。  {%p endif%} |
| **{%tr endfor%}** |

**{%p endif%}**

## 胚系变异检测结果

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **基因** | **转录本** | **基因区域** | **碱基改变** | **氨基酸改变** | **纯合/杂合** | **变异意义** |
| {%tr if var.var\_germline.level\_5+var.var\_germline.level\_4%} | | | | | | |
| {%tr for a in var.var\_germline.level\_5+var.var\_germline.level\_4%} | | | | | | |
| *{{a.gene\_symbol}}* | {{a.transcript\_primary}} | {{a.gene\_region}} | {{a.hgvs\_c}} | {%p if a.hgvs\_p !=”p.?”%}  {{a.hgvs\_p}}  {%p else%}  -  {%p endif%} | {%if a.freq\_sc >= 0.85%}纯合{%else%}杂合{%endif%} | {%p if a.clinic\_num\_g==5%}  致病性变异  {%p else%}  疑似致病性变异  {%p endif%} |
| {%tr endfor%} | | | | | | |
| {%tr else%} | | | | | | |
| - | - | - | - | - | - | - |
| {%tr endif%} | | | | | | |

注：

1. "-"：未有此类变异/其他信息。
2. 上表仅列出致病突变和疑似致病突变，不列出临床意义未明变异、可能良性变异和良性变异。
3. 胚系变异解读遵循美国医学遗传学和基因组学学会（American College of Medical Genetics, ACMG）发布的《遗传变异注释标准与指南》（2015年版），遗传变异分为致病性变异、可能致病性变异、临床意义不明变异、可能良性变异和良性变异五个等级。本产品共检测88个与遗传性肿瘤/综合征相关基因。
   1. **免疫检查点抑制剂分子标志物检测结果**

### 疗效预测指标

|  |  |  |
| --- | --- | --- |
| **检测内容** | **检测意义** | **检测结果** |
| 肿瘤突变负荷（TMB） | 对于肿瘤突变负荷（TMB）较高的患者，FDA已批准帕博丽珠单抗用于既往治疗后疾病进展且没有令人满意替代治疗方案的不可手术或转移性的成人和儿童实体瘤患者。 | {{tmb.TMB\_value}} Muts/Mb,  {%if tmb.var\_id==”TMB-L”%}TMB-L{%else%}TMB-H{%endif%} |
| 微卫星状态 | FDA已批准纳武利尤单抗、纳武利尤单抗+伊匹单抗、帕博丽珠单抗用于MSI-H的结直肠癌、子宫内膜癌、肾细胞癌等的治疗。 | {%if msi.var\_id==”MSS”%}微卫星稳定型  （MSS）{%else%}微卫星不稳定型  （MSI-H）{%endif%} |

注：

1. 肿瘤突变负荷（Tumor Mutation Burden, TMB）：本样本检测到的TMB值与既往检测样本TMB数值由高到低进行排序，并根据四分位法，设定排序在前25％的值为TMB-H，后75％为TMB-L。
2. 微卫星状态：本产品共检测307个MSI位点，在胃癌和肠癌样本中进行了充分验证。微卫星不稳定位点占到总数的15%以下提示为微卫星稳定型（MSS），15%及以上则为微卫星不稳定型（MSI）。本检测结果仅供参考。

### 疗效影响因素-治疗正相关

|  |  |  |
| --- | --- | --- |
| **基因** | **检测结果** | **检测意义** |
| ***POLE*** | {%p if var.io.result.POLE %}  {%p for a in var.io.result.POLE %}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *POLE和POLD1*编码产物为DNA聚合酶的催化亚基，其突变可导致肿瘤超突变特性。结直肠癌、非小细胞肺癌、子宫内膜癌和胃腺癌的临床研究提示，与野生型患者相比，*POLE/POLD1*突变型患者在接受免疫治疗之后其客观缓解率更高，中位无进展生存期和总生存期更长（PMID: 35261896, 27362548, 27612425, 35308232）。 |
| ***POLD1*** | {%p if var.io.result.POLD1%}  {%p for a in var.io.result.POLD1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***CDK12*** | {%p if var.io.result.CDK12%}  {%p for a in var.io.result.CDK12%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *CDK12*双拷贝缺失的前列腺癌组织具有更多浸润T细胞和更高新抗原负荷，是一类特殊的前列腺癌亚型，可能从免疫检查点抑制剂治疗中获益(PMID: 29906450)。 |
| ***TP53*** | {%p if var.io.result.TP53%}  {%p for a in var.io.result.TP53%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 多项非小细胞肺癌临床研究表明，*TP53*失活突变、*KEAP1/TP53*共突变和*ZFHX3/TP53*共突变的患者接受PD-1/PD-L1抑制剂治疗后的无进展生存期或总生存期较长（PMID: 33330629, 34450259, 35226388）。*TP53*突变型膀胱癌患者较*TP53*野生型患者更易从免疫检查点抑制剂治疗中获益（PMID: 33356494）。 |
| ***KRAS*** | {%p if var.io.result.KRAS%}  {%p for a in var.io.result.KRAS%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 回顾性研究提示*TP53*或*KRAS*突变的肿瘤患者，尤其是TP53/KRAS共突变患者，PD-1/PD-L1抑制剂治疗的临床获益更显著（PMID: 28039262）。非小细胞肺癌临床研究提示，*KRAS*突变且PD-L1表达≥1％患者接受免疫检查点抑制剂治疗时的疗效高于*KRAS*野生型患者，且这一差异在PD-L1表达≥50％时更显著（PMID:30738221）。 |
| ***ATM*** | {%p if var.io.result.ATM%}  {%p for a in var.io.result.ATM%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | DNA损伤修复（DDR）通路基因的失活突变会导致DNA修复异常，与淋巴细胞浸润、基因组不稳定性增加和肿瘤突变负荷升高有关。非小细胞肺癌、尿路上皮癌、去势抵抗性转移性前列腺癌等多种癌症的临床研究发现，与无DDR通路基因缺失突变的患者相比，携带DDR通路基因缺失突变患者接受PD-1/PD-L1抑制剂治疗后的客观缓解率更高，中位无进展生存期和总生存期更长（PMID: 32332016, 29489427, 32916128, 30514390, 29983880）。DDR通路基因包括错配修复（MMR）基因和POLE等基因，有更多的临床研究可供参考，在下方单独列出。 |
| ***ATR*** | {%p if var.io.result.ATR%}  {%p for a in var.io.result.ATR%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***BRCA1*** | {%p if var.io.result.BRCA1%}  {%p for a in var.io.result.BRCA1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***BRCA2*** | {%p if var.io.result.BRCA2%}  {%p for a in var.io.result.BRCA2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***BRIP1*** | {%p if var.io.result.BRIP1%}  {%p for a in var.io.result.BRIP1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***CHEK1*** | {%p if var.io.result.CHEK1%}  {%p for a in var.io.result.CHEK1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***CHEK2*** | {%p if var.io.result.CHEK2%}  {%p for a in var.io.result.CHEK2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***ERCC1*** | {%p if var.io.result.ERCC1%}  {%p for a in var.io.result.ERCC1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***FANCA*** | {%p if var.io.result.FANCA %}  {%p for a in var.io.result.FANCA %}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***MRE11*** | {%p if var.io.result.MRE11%}  {%p for a in var.io.result.MRE11%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***PALB2*** | {%p if var.io.result.PALB2%}  {%p for a in var.io.result.PALB2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***RAD50*** | {%p if var.io.result.RAD50%}  {%p for a in var.io.result.RAD50%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***XRCC1*** | {%p if var.io.result.XRCC1%}  {%p for a in var.io.result.XRCC1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***SERPINB3*** | {%p if var.io.result.SERPINB3%}  {%p for a in var.io.result.SERPINB3%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *SERPINB3*和*SERPINB4*属于serpin家族，编码产物是一种丝氨酸蛋白酶抑制剂在细胞凋亡和自身免疫中发挥作用。黑色素瘤临床研究提示，在抗CTLA4免疫治疗换这种，相关基因突变与较长的总生存期相关（PMID: 27668655）。 |
| ***SERPINB4*** | {%p if var.io.result.SERPINB4%}  {%p for a in var.io.result.SERPINB4%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***CD274*** | {%p if var.io.result.CD274%}  {%p for a in var.io.result.CD274%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *CD274*编码产物为PD-L1。一项实体瘤回顾性分析提示，携带*CD274*扩增的实体瘤患者对免疫检查点抑制剂照料的总体客观缓解率约为66.7％（PMID: 29902298）。尿路上皮癌和软组织肉瘤临床研究提示*CD274*扩增的患者在PD-L1抑制剂治疗后有更好的临床获益（PMID: 35071713, 28405504）。 |
| ***MLH1*** | {%p if var.io.result.MLH1%}  {%p for a in var.io.result.MLH1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 错配修复（MMR）通路是重要的DNA损伤修复机制，相关基因包括MLH1、MSH2、MSH6和PMS2等，MMR通路缺陷（dMMR）会导致DNA复制错误无法被正常修复。MSI-H实体瘤临床研究提示，MMR基因突变的肿瘤一般具有较高的肿瘤突变负荷，同时PD-L1过表达概率更高。多项临床研究提示dMMR的乳腺癌、结直肠癌和实体瘤患者对免疫检查点抑制剂更敏感，较MMR通路正常的患者拥有更长的无进展生存期或总生存期（PMID: 34530255, 34966607, 35185898）。  检测dMMR的方法包括免疫组化、微卫星状态检测和基因测序。检出MMR通路基因突变时，请结合免疫组化和微卫星状态检测结果制定临床用药方案。 |
| ***MSH6*** | {%p if var.io.result.MSH2%}  {%p for a in var.io.result.MSH2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***MSH2*** | {%p if var.io.result.MSH6%}  {%p for a in var.io.result.MSH6%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***PMS2*** | {%p if var.io.result.PMS2%}  {%p for a in var.io.result.PMS2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***TERT*** | {%p if var.io.result.TERT%}  {%p for a in var.io.result.TERT%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 临床研究提示在免疫检查点抑制剂治疗的非小细胞肺癌患者人群中，*TERT*突变与更高的治疗有效率、更长的中位无进展生存期有关（PMID: 32241817），在尿路上皮癌人群中，*TERT*启动子突变与较长的无进展生存期和总生存期有关（PMID: 33980590）。 |
| ***KMT2D*** |  | 肿瘤细胞中的*KMT2D*突变会引起DNA损伤和转录异常，积累更高的突变负荷和异常转录本，易产生更多的肿瘤新抗原，进而可能对PD-1/PD-L1抑制剂治疗更加敏感(PMID: 32887696)。 |
| ***LRP1B*** | {%p if var.io.result.LRP1B%}  {%p for a in var.io.result.LRP1B%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *LRP1B*基因编码一种肿瘤抑制因子。回顾性研究提示在接受免疫检查点抑制剂治疗的肺癌、前列腺癌、黑色素瘤、肉瘤和乳腺癌患者中，*LRP1B*致病/致癌性突变与较高的客观缓解率、无进展生存期和总生存期相关（PMID: 31164891, 33653800）。 |
| ***ARID1A*** | {%p if var.io.result.ARID1A%}  {%p for a in var.io.result.ARID1A%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *ARID1A*编码产物在DNA错配修复通路中发挥功能，TCGA数据提示*ARID1A*失活与MSI、高肿瘤突变负荷存在相关性。回顾性研究提示带有*ARID1A*失活突变的非小细胞肺癌、结直肠癌、胃癌和子宫内膜癌患者对免疫检查点抑制剂治疗响应较好（PMID: 31949479, 32111729, 34512623）。 |
| ***PRKDC*** | {%p if var.io.result.PRKDC%}  {%p for a in var.io.result.PRKDC%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *PRKDC*基因突变常与其他DNA损伤修复缺陷共存，与高肿瘤突变负荷存在一定的相关性。回顾性分析提示在免疫检查点抑制剂治疗的实体瘤患者人群中，*PRKDC*基因突变与较长无进展生存期和总生存期存在相关性(PMID: 32502294)。 |
| ***SETD2*** | {%p if var.io.result.SETD2%}  {%p for a in var.io.result.SETD2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *SETD2*编码一种组蛋白甲基转移酶，在维持基因组完整性和稳定性方面起关键作用。回顾性分析提示，*SETD2*基因突变与高肿瘤突变负荷和微卫星不稳定有一定相关性，在PD-1/PD-L1抑制剂类药物治疗人群中与较高的客观缓解率和较长的总生存期存在相关性（PMID: 34127768）。 |
| ***FAT1*** | {%p if var.io.result.FAT1%}  {%p for a in var.io.result.FAT1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 非小细胞肺癌临床研究提示，携带*FAT1*失活突变的患者在抗PD-1/PD-L1治疗后具有更高的客观缓解率、更长的无进展生存期和总生存期（PMID: 31085721; 35212236）。 |

注：

1. “-”表示本次检测未检出临床意义明确或潜在临床意义的变异。
2. 免疫检查点抑制剂疗效相关基因的临床研究目前处于探索性研究阶段，结果仅供参考。

### 疗效影响因素-治疗负相关

|  |  |  |
| --- | --- | --- |
| **基因** | **检测结果** | **检测意义** |
| ***APC*** | {%p if var.io.result.APC%}  {%p for a in var.io.result.APC%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 研究发现WNT/β-catenin通路的*APC*和*CTNNB1*基因突变在无T细胞浸润的肿瘤中的发生概率较高（PMID: 25970248）。肿瘤免疫微环境分析结果显示*CTNNB1*突变可导致肝癌患者活化的免疫细胞显著减少，显著降低免疫刺激分子的表达(PMID:34777372)。 |
| ***CTNNB1*** | {%p if var.io.result.CTNNB1%}  {%p for a in var.io.result.CTNNB1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***B2M*** | {%p if var.io.result.B2M%}  {%p for a in var.io.result.B2M%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | *B2M*基因缺失或失活会导致肿瘤细胞的HLA-I类抗原表达缺失，进而引起免疫检查点抑制剂的抗性（PMID: 22833104, 29025772）。 |
| ***MDM2*** | {%p if var.io.result.MDM2%}  {%p for a in var.io.result.MDM2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 实体瘤临床研究提示，在免疫检查点抑制剂治疗后的超进展人群中，更易出现*MDM2/4*基因的扩增，提示其可能与较差的治疗效果相关(PMID: 28351930, 34290608)。 |
| ***MDM4*** | {%p if var.io.result.MDM4%}  {%p for a in var.io.result.MDM4%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***EGFR*** | {%p if var.io.result.EGFR%}  {%p for a in var.io.result.EGFR%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 非小细胞肺癌的临床研究提示，与*EGFR*野生型和*ALK*阴性/未知患者相比，携带*EGFR*突变或*ALK*重排的患者更难从PD-1/PD-L1抑制剂治疗中获益（PMID: 26412456, 26712084, 27225694, 31125062）。在检出相关突变后，请结合临床实际情况确定靶向抑制剂类药物的使用。 |
| ***ALK*** | {%p if var.io.result.ALK%}  {%p for a in var.io.result.ALK%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***PTEN*** | {%p if var.io.result.PTEN%}  {%p for a in var.io.result.PTEN%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 研究提示*PTEN*缺失的肿瘤组织中，效应T细胞渗透较少且肿瘤杀伤作用较弱，提示PD-1/PD-L1抑制剂治疗效果可能较差（PMID: 26645196, 29977240）。 |
| ***IFNGR1*** | {%p if var.io.result.IFNGR1%}  {%p for a in var.io.result.IFNGR1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | IFN信号通路相关基因编码产物在抗原呈递过程中发挥重要作用，包括*JAK1*、*JAK2*、 *IFNGR1*和*IRF1*等，临床研究显示此类基因突变更易在PD-1/PD-L1抑制剂治疗失败人群中出现，提示其可能与较差的治疗效果相关（PMID: 27433843, 27667683, 27903500, 29070816, 31570880）。 |
| ***IRF1*** | {%p if var.io.result.IRF1%}  {%p for a in var.io.result.IRF1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***JAK1*** | {%p if var.io.result.JAK1%}  {%p for a in var.io.result.JAK1%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***JAK2*** | {%p if var.io.result.JAK2%}  {%p for a in var.io.result.JAK2%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***STK11*** | {%p if var.io.result.STK11%}  {%p for a in var.io.result.STK11%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 非小细胞肺癌临床研究提示，*STK11*基因缺失的肿瘤组织中效应T细胞浸润程度低，与较低的客观缓解率、较短的无进展生存期相关（PMID: 29773717）。但同时有研究提示，*STK11*基因突变更偏向于肿瘤治疗的一种预后指标（PMID: 32312757）。 |
| ***CDKN2A*** | {%p if var.io.result.CDKN2A%}  {%p for a in var.io.result.CDKN2A%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 非小细胞肺癌和尿路上皮癌临床研究提示*CDKN2A*/*CDKN2B*基因缺失与免疫检查点抑制剂治疗后的肿瘤超进展、较短的总生存期相关（PMID: 33334611, 34074656, 34625620）。 |
| ***CDKN2B*** | {%p if var.io.result.CDKN2B%}  {%p for a in var.io.result.CDKN2B%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} |
| ***DNMT3A*** | {%p if var.io.result.DNMT3A%}  {%p for a in var.io.result.DNMT3A%}  {{a}}  {%p endfor%}  {%p else%}  -  {%p endif%} | 实体瘤临床研究提示在免疫检查点抑制剂治疗过程中，*DNMT3A*基因突变更易出现在治疗失败时间短的人群中，提示其可能与较差的治疗效果相关（PMID: 28351930）。 |
| ***CCND1/FGF3/***  ***FGF4/FGF19*** | {%p if var.io.result.CCND1 and var.io.result.FGF3 and var.io.result.FGF4 and var.io.result.FGF19%}  共扩增  {%p else%}  -  {%p endif%} | 研究提示在免疫检查点抑制剂治疗人群中，*CCND1*基因扩增与更短的生存期、更差的治疗结果相关（PMID: 32903763）。*CCND1*、*FGF3、FGF4和FGF19*基因位于染色体11q13，易发生共扩增。 |

注：

1. “-”表示本次检测未检出临床意义明确或潜在临床意义的变异。
2. 免疫检查点抑制剂疗效相关基因的临床研究目前处于探索性研究阶段，结果仅供参考。
   1. **化疗药物相关基因多态性检测结果及解析**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 基因 | 检测位点 | 检测结果 | 结果提示 | 证据等级 |
| {%tr for a in chemo.reduce\_116%} | | | | |
| ***{{a.gene\_symbol}}*** | {{a.dbsnp}} | {{a.genotype}} | {{a.clin\_anno\_cn}} | {{a.evi\_level}} |
| {{%tr endfor%}} | | | | |

注：

1. 化疗药物证据水平划分依据参考PharmGKB数据库，共分为1A/1B/2A/2B/3/4这6个等级：

1A级：由临床药物基因组学实施联盟（CPIC）或遗传药理学指南认可，或者应用于其他主要卫生系统；

1B级：注释基于多项有统计显著性的研究；

2A级：注释基于多项重复研究，并且该基因为明确的药物代谢基因；

2B级：注释基于多项重复研究，但其中一些研究没有统计学意义或影响较小；

3级：注释仅基于一项有显著性差异的研究，或多项研究但缺乏明显药效关联；

4级：注释仅基于病例报告，非权威性研究或体外分子功能研究。

1. 如果同一个药物不同SNP位点对药物疗效或毒性预测的结论不一致，以证据水平级别高的为准。
2. 不同基因检测位点与药物相关性来自不同的研究，其结果相互独立，因此，同一患者的同一类药物的多个位点检测结果解析可能不一致，最终用药方案需结合临床具体情况。
   1. **FDA/NMPA获批药物简介**

{%p if therapeutic\_regimen%}

{%p for a in therapeutic\_regimen%}

|  |  |  |  |
| --- | --- | --- | --- |
| **药物名称** | **通用名：{%if a.regimen\_cn%}{{a.regimen\_cn}}{%else%}-{%endif%}{%if a.regimen\_en%}({{a.regimen\_en}}){%else%}(-){%endif%}** | **{%if “FDA” in a.approval\_organization%}FDA批准{%else%}FDA未批准{%endif%}** | **{%if “NMPA” in a.approval\_organization%}NMPA批准{%else%}NMPA未批准{%endif%}** |
| **商品名： {%if a.trade\_name\_cn and a.trade\_name\_en%}{{a.trade\_name\_cn}}({{a.trade\_name\_en}}){%elif a.trade\_name\_en%}-({{a.trade\_name\_en}}){%else%}-{%endif%}** |
|  |  |  |  |
| 药理机制 | {%p for b in a.drug\_details%}  {{b.drug\_mechanism\_cn|e}}  {%p endfor%} | | |
| 相关变异 | {%p if a.var%}  {%p for b in a.var%}  {%p if b.hgvs%}  {{b.hgvs}}  {%p elif b.biomarker\_type%}  {{b.biomarker\_type }}  {%p elif b.cnv\_type%}  {{b.gene\_symbol}} 扩增  {%p else%}  {{b.gene\_symbol}} {{b.hgvs\_c}}{%if b.hgvs\_p!=”p.?”%} {{b.hgvs\_p}}{%endif%}  {%p endif%}  {%p endfor%}  {%p else%}  -  {%p endif%} | | |
| 适应症 | {%p if a.adaptation\_disease\_cn %}  {%p for b in a.adaptation\_disease\_cn%}  {{b|e}}  {%p endfor%}  {%p else%}  缺少适应症信息，请补充知识库！  {%p endif%} | | |

{%p endfor%}

{%p else%}

|  |  |  |  |
| --- | --- | --- | --- |
| **药物名称** | **通用名：-** | **-** | **-** |
| **商品名：-** |
|  |  |  |  |
| 药理机制 | - | | |
| 相关变异 | - | | |
| 适应症 | - | | |

{%p endif%}

注：药物批准信息来源于FDA/NMPA官方网站或药物说明书。

* 1. **可能获益的临床试验**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 生物标志物 | 试验编号 | 研究内容 | 治疗方案 | 试验阶段 |
| {%tr if clinic\_trial%} | | | | |
| {%tr for a in clinic\_trial%} | | | | |
| ***{{a.gene\_symbol}}*** | {{a.clinicaltrial\_number}} | {{a.study\_title}} | {%p for b in a.interventions%}  {{b}}  {%p endfor%} | {{a.phase}} |
| {%tr endfor%} | | | | |
| {%tr else%} | | | | |
| ***-*** | - | - | - | - |
| {%tr endif%} | | | | |

注：上述临床试验信息是根据受检者检测结果在ClinicalTrial（https://clinicaltrials.gov/）和药物临床试验登记与信息公示平台（http://www.chinadrugtrials.org.cn/）中检索而来，如需了解详细试验研究信息（入组条件、研究者信息、参加机构信息等）可根据上表中试验编号在上述网站中检索。

# 附录

## 质控信息

|  |  |  |  |
| --- | --- | --- | --- |
| **肿瘤样本 DNA质控内容** | | **质控标准** | **质控数值** |
| 样品质控 | 肿瘤细胞含量 | 合格：≥20%；风险：5％-20％ | {%if sample.tumor\_content%}{%if sample.tumor\_content>=0.2%}合格{%elif sample.tumor\_content>=0.05%}风险{%endif%}{%endif%} |
| DNA量-组织样本 | ≥60ng | {%if lib\_quality\_control and lib\_quality\_control.lib\_dna\_qc and lib\_quality\_control.lib\_dna\_qc.dna\_qty%}{{lib\_quality\_control.lib\_dna\_qc.dna\_qty|replace(“.00”,””)}}{%endif%} |
| 文库质控 | 文库浓度 | ≥30ng/uL | {%if lib\_quality\_control and lib\_quality\_control.lib.dna\_qc and lib\_quality\_control.lib\_dna\_qc.dna\_concn%}{{ib\_quality\_control.lib\_dna\_qc.library\_concn}}{%endif%}ng/uL |
| 插入片段大小 | 140-300bp | {{qc.dna\_data\_qc.inssize\_median}} bp |
| 数据质控 | Q30 | ≥75% | {{qc.dna\_data\_qc.cleandata\_q30}} |
| 比对率 | ≥95% | {{qc.dna\_data\_qc.mapping\_ratio}} |
| 覆盖度 | ≥95% | {{qc.dna\_data\_qc.cover\_ratio}} |
| 均一性（热点区域） | ≥90% | {{qc.dna\_data\_qc.uni20\_uniq\_hot}} |
| 均一性（非热点区域） | ≥90% | {{qc.dna\_data\_qc.uni20\_uniq\_nonhot}} |
| 平均有效深度（热点区域） | ≥1000 | {{qc.dna\_data\_qc.depth\_mean\_uniq\_hot}} |
| 平均有效深度（非热点区域） | ≥500 | {{qc.dna\_data\_qc.depth\_mean\_uniq\_nonhot}} |
| CNV质控 | 基因内部CV分布 | ＜0.40 | {{qc.dna\_data\_qc.cnv\_cv}} |
| 样本与PON一致性 | ＜1.50 | {{qc.dna\_data\_qc.cnv\_uni}} |

注：

1. 仅当送检的样品中含有石蜡玻片时才能进行病理质控，若肿瘤细胞含量低于20%，可能会影响检测结果的准确性，同时本检测不检测CNV；

2. Q30: 测序的准确率高于99.9%的碱基的比例；

3. 比对率: 可以比对至参考序列上的reads的比例；

4. 覆盖度: 检测到的区域占目标区域的比例；

5. 平均有效深度: 目标区域每个碱基被覆盖到的次数的平均值，去除PCR重复后测到的读数（dedup reads）；

6. 对照白细胞几乎100%能满足质控要求，因此不在此详细展示质控内容；

7. 基因内部CV分布：基因内部归一化深度的分布均一性；当其大于0.4时，CNV准确性存疑，报告中不出具CNV部分结果；

8. 样本与PON一致性：样本与Pool of Normal归一化深度的一致性；当其大于1.5时，CNV准确性存疑，报告中不出具CNV部分结果；

9. 样本的CNV质控结果不影响该样本的单核苷酸变异、插入/缺失变异和融合变异的检出；

10. 如果质控数值超出质控标准范围，可能是由于检测样本质量欠佳导致，本检测的灵敏度和特异性可能会受到影响，不能排除存在其它突变的可能。

{%p if qc.rna\_data\_qc%}

|  |  |  |  |
| --- | --- | --- | --- |
| **肿瘤样本 RNA质控内容** | | **质控标准** | **质控数值** |
| 样品质控 | RNA量 | 合格≥50ng；风险≥5ng | {%if lib\_quality\_control and lib\_quality\_control.lib\_dna\_qc and lib\_quality\_control.lib\_dna\_qc.rna\_qty%}{%if lib\_quality\_control.lib\_dna\_qc.rna\_qty >=50%}合格{%elif lib\_quality\_control.lib\_dna\_qc.rna\_qty >=5%}风险{%endif%}{%endif%} |
| RNA片段大小分布（DV200） | 合格≥20%；风险≥5％ | {%if lib\_quality\_control and lib\_quality\_control.lib\_dna\_qc and lib\_quality\_control.lib\_dna\_qc.dv200%}{%if lib\_quality\_control.lib\_dna\_qc.dv200>= 0.2%}合格{%elif lib\_quality\_control.lib\_dna\_qc.dv200>= 0.05%}风险{%endif%}{%endif%} |
| 文库质控 | 文库浓度 | ≥15ng/uL | {%if lib\_quality\_control and lib\_quality\_control.lib\_dna\_qc and lib\_quality\_control.lib\_dna\_qc.library\_concn%}{{lib\_quality\_control.lib\_dna\_qc.library\_concn}}{%endif%} |
| 数据质控 | Q30 | ≥75% | {{qc.rna\_data\_qc.cleandata\_q30}} |
| 链特异性 | 合格≥90%；风险≥80% | {{qc.rna\_data\_qc.end2sense\_ratio}} |
| 下机数据量 | 合格≥1.5G；风险≥1G | {{qc.rna\_data\_qc.cleandata\_size}} |

注：DV200，RNA片段大小分布，即计算大于 200bp的 RNA 片段占总体RNA片段的百分比。

{%p endif%}

## 免疫检查点抑制剂分子标记物检测结果详细解析

### 肿瘤突变负荷结果解析

|  |  |
| --- | --- |
| **肿瘤突变负荷（TMB）** | |
| 检测结果 | {{tmb.TMB\_value}} Muts/Mb, {{tmb.var\_id}}  {%p if tmb.img\_path%}  {{tmb.img\_path}}  {%p endif%} |
| 检测介绍 | 肿瘤突变负荷（Tumor mutation burden，TMB）通常定义为基因组中每百万碱基（Mb）的非同义突变或所有体细胞突变数目。TMB是对基因组不稳定性的一种衡量，它的高低受到多种外源或内源因素的影响，外源因素主要包括吸烟、暴露于紫外线照射等等（PMID:15748635;PMID:12379884），而内源因素则主要是获得性的DNA修复机制的损伤，如BRCA1/2、MLH1, MSH2, MSH6等基因发生突变(PMID:22810696)。 |
| 治疗策略 | {%p if tmb.evi\_sum%}  {%p for a in tmb.evi\_sum.evi\_split.Predictive\_merge%}  **{{a.regimen\_name}}:**  {{a.evi\_interpretation}}  {%p endfor%}  {%p else%}  -  {%p endif%} |

### 肿瘤微卫星状态检测结果解析

|  |  |
| --- | --- |
| **微卫星状态** | |
| 检测结果 | {%if msi.var\_id==”MSS”%}MSS（微卫星稳定）{%else%}MSI-H（微卫星不稳定）{%endif%} |
| 检测介绍 | 微卫星（Microsatellite）又称简单重复序列（SSR），是指遍布于人类基因组中的短串联重复序列，一般由1-6个核苷酸组成。DNA复制时，肿瘤细胞内的微卫星由于重复单位的插入或缺失而造成的微卫星长度的变化，称为微卫星不稳定性（Microsatellite Instability, MSI）。大量研究表明，MSI是由错配修复（mismatch repair，MMR）基因突变或功能缺陷引起的（PMID:25701956）。MSI在多种癌种中被发现，包括子宫内膜癌、结直肠癌和胃腺癌等。据报道，10%-15%的散发性结直肠癌患者存在MSI（PMID:15528785 ），NCCN指南明确推荐所有结直肠癌患者均需考虑做MSI或MMR检测。临床上也已将MSI作为结直肠癌及其他实体瘤预后和制定辅助治疗方案的重要分子标志物。 |
| 治疗策略 | {%p if msi.evi\_sum%}  {%p for a in msi.evi\_sum.evi\_split.Predictive\_merge%}  **{{a.regimen\_name}}:**  {{a.evi\_interpretation}}  {%p endfor%}  {%p else%}  -  {%p endif%} |

## 检测基因列表

### 体细胞变异基因检测列表

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **包含全部外显子的254个基因** | | | | | | | | | |
| *ABRAXAS1* | *AKT2* | *AKT3* | *AMER1* | *APC* | *APC2* | *AR* | *ARID1A* | *ARID1B* | *ARID2* |
| *ATM* | *ATR* | *ATRX* | *AURKA* | *AXIN1* | *AXIN2* | *AXL* | *B2M* | *BAP1* | *BARD1* |
| *BCL2L1* | *BCL2L2* | *BCL6* | *BLK* | *BLM* | *BRAF* | *BRCA1* | *BRCA2* | *BRD3* | *BRIP1* |
| *BTG1* | *CCN6* | *CCND1* | *CCND2* | *CCNE1* | *CD274* | *CD34* | *CDH1* | *CDK12* | *CDK4* |
| *CDK6* | *CDKN1A* | *CDKN1B* | *CDKN2A* | *CDKN2B* | *CDKN2C* | *CEBPA* | *CHEK1* | *CHEK2* | *CREBBP* |
| *CRKL* | *CSF1* | *CSF1R* | *CYP2D6* | *DKK3* | *DNMT3A* | *EED* | *EGFR* | *EIF1AX* | *EPAS1* |
| *EPCAM* | *ERBB2* | *ERCC3* | *ESR1* | *EZH2* | *FANCA* | *FANCC* | *FANCD2* | *FANCE* | *FANCF* |
| *FANCG* | *FANCI* | *FANCL* | *FANCM* | *FBXW7* | *FGF10* | *FGF14* | *FGF19* | *FGF23* | *FGF3* |
| *FGF4* | *FGF6* | *FGF7* | *FGFR1* | *FGFR2* | *FGFR3* | *FGFR4* | *FGR* | *FLCN* | *FLT1* |
| *FLT4* | *FOXA1* | *FOXL2* | *FOXO1* | *FRS2* | *FYN* | *GATA2* | *GATA3* | *GATA4* | *GATA6* |
| *GEN1* | *GLI1* | *GNA11* | *GNAQ* | *GREM1* | *GRM3* | *GSTP1* | *H1-2* | *H2BC5* | *H3-5* |
| *H3C2* | *HCK* | *HDAC2* | *HIF1A* | *HLA-A* | *HLA-B* | *HLA-C* | *HNF1A* | *HOXB13* | *HSD3B1* |
| *IFNGR1* | *IFNGR2* | *IGF1R* | *IGF2* | *IL7R* | *INHBA* | *IP6K1* | *IRF1* | *IRF4* | *IRS2* |
| *JUN* | *KDM5C* | *KEAP1* | *KLHL6* | *KMT2D* | *KRAS* | *LATS2* | *LCK* | *LYN* | *MAP2K2* |
| *MAPK1* | *MAPK3* | *MAPK4* | *MCL1* | *MDC1* | *MDM2* | *MDM4* | *MET* | *MGME1* | *MKI67* |
| *MLH1* | *MLH3* | *MPL* | *MRE11* | *MSH2* | *MSH6* | *MTOR* | *MUC16* | *MUTYH* | *MYC* |
| *MYCN* | *MYD88* | *MYOD1* | *NAA11* | *NBN* | *NF1* | *NF2* | *NFKBIA* | *NOTCH1* | *NRAS* |
| *NTRK3* | *PALB2* | *PARP1* | *PBRM1* | *PDCD1* | *PDCD1LG2* | *PDGFRA* | *PEG3* | *PGR* | *PIK3CA* |
| *PIK3CB* | *PIK3CG* | *PIK3R1* | *PIM1* | *PMS1* | *PMS2* | *PNRC1* | *POLD1* | *POLE* | *PPARG* |
| *PPP2R2A* | *PRDM1* | *PRKAA1* | *PSMD4* | *PTCH1* | *PTEN* | *RAD50* | *RAD51* | *RAD51B* | *RAD51C* |
| *RAD51D* | *RAD52* | *RAD54L* | *RASA1* | *RASAL1* | *RB1* | *RHOA* | *RICTOR* | *RIPK4* | *RIT1* |
| *RNF43* | *ROBO2* | *RSF1* | *SDHAF2* | *SDHB* | *SERPINB3* | *SERPINB4* | *SETBP1* | *SETD2* | *SLX4* |
| *SMAD4* | *SMARCA4* | *SMARCB1* | *SMO* | *SOCS1* | *SOX10* | *SOX2* | *SOX9* | *SRC* | *SRSF2* |
| *STAT3* | *STK11* | *SUZ12* | *TBX3* | *TCF7L2* | *TENT5C* | *TET2* | *TMEM127* | *TNFAIP3* | *TNFRSF14* |
| *TOP2A* | *TP53* | *TPMT* | *TSC1* | *TSC2* | *VHL* | *WRN* | *XRCC1* | *XRCC2* | *YES1* |
| *ZBTB2* | *ZFHX4* | *ZNF703* | *ZNRF3* |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **包含部分外显子的247个基因** | | | | | | | | | |
| *ABCB1* | *ABL1* | *ABL2* | *ACVR1B* | *AGO1* | *AKT1* | *ALK* | *ALOX12B* | *ARAF* | *ARFRP1* |
| *ARID5B* | *ASXL1* | *AURKB* | *BCL2* | *BCOR* | *BCORL1* | *BCR* | *BIRC3* | *BMPR1A* | *BRD4* |
| *BTK* | *CALR* | *CARD11* | *CASP8* | *CBFB* | *CBL* | *CCND3* | *CD74* | *CD79A* | *CD79B* |
| *CD80* | *CD86* | *CDC73* | *CDK8* | *CHD2* | *CHD4* | *CIC* | *CRLF2* | *CSF3R* | *CTCF* |
| *CTLA4* | *CTNNA1* | *CTNNB1* | *CUL3* | *CYLD* | *DAXX* | *DCUN1D1* | *DDR1* | *DDR2* | *DICER1* |
| *DIS3* | *DNMT1* | *DOT1L* | *DPYD* | *EIF4A2* | *EMSY* | *EP300* | *EPHA3* | *EPHA5* | *EPHA6* |
| *EPHA7* | *EPHB1* | *ERBB3* | *ERBB4* | *ERCC1* | *ERCC2* | *ERG* | *ERRFI1* | *ETS2* | *ETV1* |
| *ETV4* | *ETV5* | *ETV6* | *EWSR1* | *FAS* | *FAT1* | *FCGR2B* | *FH* | *FLT3* | *FOXP1* |
| *FUBP1* | *FUS* | *GABRA6* | *GATA1* | *GNA13* | *GNAS* | *GRIN2A* | *GSK3B* | *H3-3A* | *HAVCR2* |
| *HEY1* | *HGF* | *HRAS* | *HSP90AA1* | *ICOS* | *ICOSLG* | *IDH1* | *IDH2* | *IGF1* | *IKBKE* |
| *IKZF1* | *INPP4A* | *INPP4B* | *INSR* | *IRF2* | *JAK1* | *JAK2* | *JAK3* | *KDM5A* | *KDM6A* |
| *KDR* | *KEL* | *KIT* | *KLF4* | *KMT2A* | *KMT2B* | *KMT2C* | *LAG3* | *LATS1* | *LMO1* |
| *LRP1B* | *LZTR1* | *MAGI2* | *MAP2K1* | *MAP2K4* | *MAP3K1* | *MAP3K13* | *MAP3K14* | *MAX* | *MED12* |
| *MEF2B* | *MEN1* | *MGA* | *MITF* | *MSH3* | *MST1R* | *MYB* | *MYCL* | *NAB2* | *NCOA2* |
| *NCOA3* | *NCOR1* | *NFE2L2* | *NKX2-1* | *NOTCH2* | *NOTCH3* | *NOTCH4* | *NPM1* | *NR4A3* | *NSD1* |
| *NTRK1* | *NTRK2* | *NUP93* | *OXSR1* | *PAK1* | *PAK3* | *PAK5* | *PAPPA2* | *PAX5* | *PAX7* |
| *PAX8* | *PDGFB* | *PDGFRB* | *PDK1* | *PDPK1* | *PHF6* | *PIK3C2B* | *PIK3C2G* | *PIK3C3* | *PIK3CD* |
| *PIK3R2* | *PLCG2* | *PLK2* | *POLE4* | *PPP2R1A* | *PREX2* | *PRKACA* | *PRKAR1A* | *PRKCI* | *PRKDC* |
| *PRKN* | *PRSS8* | *PTPN11* | *PTPRD* | *PXDNL* | *QKI* | *RAC1* | *RAD21* | *RAF1* | *RANBP2* |
| *RARA* | *RBM10* | *RECQL4* | *REL* | *RET* | *RHEB* | *ROS1* | *RPPH1* | *RPS6KB1* | *RPS6KB2* |
| *RPTOR* | *RUNX1* | *RUNX1T1* | *SCN8A* | *SDHA* | *SDHC* | *SDHD* | *SF3B1* | *SIK1* | *SKP2* |
| *SLIT2* | *SMAD2* | *SMAD3* | *SMARCD1* | *SNCAIP* | *SOX17* | *SPEN* | *SPOP* | *SPTA1* | *SS18* |
| *STAG2* | *STAT4* | *STAT6* | *SUFU* | *SYK* | *TAF1* | *TAOK1* | *TCF7L1* | *TET1* | *TFE3* |
| *TGFBR2* | *TIGIT* | *TMPRSS2* | *TNFRSF18* | *TNFRSF9* | *TOP1* | *TRAF7* | *TRRAP* | *TSHR* | *U2AF1* |
| *VEGFA* | *WT1* | *XPC* | *XPO1* | *YWHAE* | *ZNF217* | *ZRSR2* |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **内含子、启动子或融合区域检测基因列表（46个基因，DNA）** | | | | | | | | | |
| *ALK* | *AR* | *BRAF* | *CD74* | *EGFR* | *ERBB2* | *ERBB4* | *ESR1* | *ETV1* | *ETV4* |
| *ETV5* | *ETV6* | *EWSR1* | *FGFR1* | *FGFR2* | *FGFR3* | *FGFR4* | *FUS* | *HEY1* | *KIT* |
| *MET* | *MYB* | *NAB2* | *NCOA2* | *NOTCH2* | *NR4A3* | *NRG1* | *NTRK1* | *NTRK2* | *NTRK3* |
| *NUTM1* | *PAX3* | *PAX7* | *PAX8* | *PDGFB* | *PDGFRA* | *PDGFRB* | *RAF1* | *RET* | *ROS1* |
| *SS18* | *STAT6* | *TERT* | *TFE3* | *TMPRSS2* | *YWHAE* |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **融合区域检测基因列表（45基因，RNA）** | | | | | | | | | |
| *ALK* | *AR* | *BRAF* | *CD74* | *CLDN18* | *EGFR* | *ERBB2* | *ERBB4* | *ESR1* | *ETV1* |
| *ETV4* | *ETV5* | *ETV6* | *EWSR1* | *FGFR1* | *FGFR2* | *FGFR3* | *FGFR4* | *HEY1* | *KIT* |
| *MET* | *MYB* | *NAB2* | *NCOA2* | *NOTCH2* | *NR4A3* | *NRG1* | *NRG2* | *NRG3* | *NTRK1* |
| *NTRK2* | *NTRK3* | *NUTM1* | *PAX8* | *PDGFB* | *PDGFRA* | *PDGFRB* | *RAF1* | *RET* | *ROS1* |
| *SS18* | *STAT6* | *TFE3* | *TMPRSS2* | *YWHAE* |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **包含SNP位点的64个基因** | | | | | | | | | |
| *TYMS* | *UMPS* | *CDA* | *SLC28A3* | *DYNC2H1* | *MTHFR* | *SOD2* | *SLCO1B1* | *MTRR* | *UGT1A1* |
| *SEMA3C* | *C8orf34* | *CYP19A1* | *APEX1* | *BMP2* | *BMP4* | *PTGS2* | *CBLB* | *ENG* | *HAMP* |
| *HSPB1* | *ITGB2* | *ITGB6* | *IL1A* | *IL13* | *IL6* | *IL4* | *LIG4* | *LIN28B* | *LGALS3* |
| *MUC5B* | *MMP1* | *MIF* | *NEIL1* | *NOS2* | *NOS3* | *SERPINE1* | *TGFB1* | *TNF* | *TRAF3* |
| *XRCC4* | *XRCC5* | *AUTS2* | *CD44* | *CORO2A* | *CYP2C8* | *CXCL8* | *SLC47A1* | *MT2A* | *MMP7* |
| *MGMT* | *MPO* | *NR1I2* | *NQO1* | *NFKB1* | *F2R* | *PRDX1* | *PRDX6* | *PTTG1* | *RECQL* |
| *RNASEL* | *REV3L* | *TXNRD2* | *XRCC3* |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **包含CNV的30个基因** | | | | | | | | | |
| *AKT2* | *AKT3* | *AURKA* | *CCND1* | *CCNE1* | *CD274* | *CDK4* | *CDK6* | *EGFR* | *ERBB2* |
| *FGF19* | *FGF3* | *FGFR1* | *FGFR2* | *FGFR3* | *IGF1R* | *MAPK1* | *MET* | *MYC* | *NTRK3* |
| *PDCD1* | *PDGFRA* | *PGR* | *PIK3CA* | *RET* | *RICTOR* | *SMO* | *TOP2A* | *MDM2* | *MDM4* |

注：当样本肿瘤细胞含量低于20%时，本检测不做CNV检测。

### 胚系变异基因检测列表

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **包含胚系变异的88个基因** | | | | | | | | | |
| *ABRAXAS1* | *ALK\** | *APC* | *ATM* | *ATR* | *AXIN2* | *BAP1* | *BARD1* | *BLM* | *BMPR1A\** |
| *BRAF* | *BRCA1* | *BRCA2* | *BRIP1* | *CDC73\** | *CDH1* | *CDK12* | *CDK4* | *CDKN1B* | *CDKN2A* |
| *CEBPA* | *CHEK2* | *CHEK1* | *EPCAM* | *CTNNA1\** | *DICER1\** | *EGFR* | *ENG* | *FANCA* | *FH\** |
| *FANCI* | *FANCL* | *FLCN* | *GEN1* | *GREM1* | *GATA2* | *MET* | *MLH1* | *MSH2* | *HRAS\** |
| *KIT\** | *MAX\** | *MSH3\** | *MEN1\** | *MSH6* | *MITF\** | *MUTYH* | *MLH3* | *NBN* | *NF1* |
| *PALB2* | *PMS2* | *POLD1* | *POLE* | *PTEN* | *NF2* | *RAD51C* | *RAD51D* | *RNF43* | *PDGFRA* |
| *SDHA\** | *SDHB* | *SDHC\** | *PPP2R2A* | *PRKAR1A\** | *SDHD\** | *PTCH1* | *SMAD4* | *RAD50* | *RAD51B* |
| *STK11* | *TP53* | *RAD54L* | *RB1* | *RECQL* | *RECQL4\** | *RET\** | *TSC1* | *TSC2* | *VHL* |
| *RUNX1\** | *SDHAF2* | *SMARCA4* | *SMARCB1* | *SUFU\** | *TERT* | *TMEM127* | *WT1\** |  |  |

注：\* 标记基因检测部分外显子，其余基因检测全部外显子。

### RNA基因列表及表达检测结果

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **包含RNA的2660个基因** | | | | | | | | | |
| *A2M* | *ABCB1* | *ABCF1* | *ABL1* | *ABR* | *ABTB2* | *ACAD9* | *ACADM* | *ACAN* | *ACOT12* |
| *ACSF3* | *ACTA2* | *ACTB* | *ACTG1* | *ACTG2* | *ACTL6A* | *ACTL6B* | *ACTR3B* | *ACVR1B* | *ACVR1C* |
| *ACVR2A* | *ACY1* | *ADA* | *ADAM12* | *ADAMTS16* | *ADGRE1* | *ADGRE2* | *ADGRE5* | *ADH1A* | *ADH1B* |
| *ADH1C* | *ADH4* | *ADH6* | *ADM* | *ADORA2A* | *AFAP1* | *AFDN* | *AFF3* | *AGAP3* | *AGBL4* |
| *AGGF1* | *AGK* | *AGR2* | *AGTRAP* | *AHCYL1* | *AHR* | *AICDA* | *AIF1* | *AIRE* | *AKAP1* |
| *AKAP13* | *AKAP9* | *AKR1C3* | *AKR1C4* | *AKT1* | *AKT2* | *AKT3* | *ALAD* | *ALAS1* | *ALCAM* |
| *ALDOA* | *ALDOC* | *ALK* | *ALKBH2* | *ALKBH3* | *ALOX15B* | *AMBP* | *AMBRA1* | *AMER1* | *AMH* |
| *AMMECR1L* | *AMOT* | *AMOTL2* | *ANGPT1* | *ANGPT2* | *ANGPTL4* | *ANKLE2* | *ANKRD28* | *ANKRD46* | *ANLN* |
| *ANO3* | *ANP32B* | *ANXA1* | *AP1M1* | *AP3B1* | *APAF1* | *APBB1* | *APC* | *APC2* | *APH1B* |
| *API5* | *APIP* | *APLNR* | *APOA1* | *APOA2* | *APOA4* | *APOB* | *APOBEC3B* | *APOC2* | *APOC3* |
| *APOD* | *APOE* | *APOL6* | *APOLD1* | *APOM* | *APP* | *APPL1* | *AQP9* | *AR* | *ARAF* |
| *AREG* | *ARF1* | *ARG1* | *ARG2* | *ARHGEF2* | *ARHGEF6* | *ARID1A* | *ARID1B* | *ARID2* | *ARID5A* |
| *ARMC10* | *ARMH3* | *ARNT* | *ARNT2* | *ARNTL* | *ASAP2* | *ASCL1* | *ASL* | *ASNS* | *ASPA* |
| *ASPG* | *ASPN* | *ASPSCR1* | *ASXL1* | *ATF1* | *ATF2* | *ATF3* | *ATF4* | *ATF7IP* | *ATG10* |
| *ATG12* | *ATG16L1* | *ATG5* | *ATG7* | *ATIC* | *ATM* | *ATOX1* | *ATP11C* | *ATP1B1* | *ATP2A2* |
| *ATP5F1D* | *ATP5F1E* | *ATP5ME* | *ATP6V1D* | *ATR* | *ATRX* | *AURKA* | *AURKB* | *AXIN1* | *AXIN2* |
| *AXL* | *AZGP1* | *B2M* | *B3GAT1* | *B4GALT6* | *BACH2* | *BAD* | *BAG1* | *BAG4* | *BAIAP2L1* |
| *BAIAP3* | *BAK1* | *BAMBI* | *BAP1* | *BATF* | *BATF3* | *BAX* | *BBC3* | *BBS1* | *BCAN* |
| *BCAT1* | *BCL10* | *BCL11B* | *BCL2* | *BCL2A1* | *BCL2L1* | *BCL2L11* | *BCL2L14* | *BCL3* | *BCL6* |
| *BCL6B* | *BCOR* | *BCR* | *BDNF* | *BGN* | *BICC1* | *BID* | *BIRC2* | *BIRC3* | *BIRC5* |
| *BIRC7* | *BLK* | *BLM* | *BLNK* | *BLVRA* | *BMI1* | *BMP2* | *BMP4* | *BMP5* | *BMP6* |
| *BMP7* | *BMP8A* | *BMPR1B* | *BNIP3* | *BNIP3L* | *BRAF* | *BRCA1* | *BRCA2* | *BRD2* | *BRD3* |
| *BRD4* | *BRD7* | *BRIP1* | *BRIX1* | *BST1* | *BST2* | *BTBD1* | *BTF3L4* | *BTK* | *BTLA* |
| *BUB1* | *BUB1B* | *BYSL* | *C1QA* | *C1QB* | *C1QBP* | *C1R* | *C1S* | *C2* | *C2CD5* |
| *C3* | *C3AR1* | *C4B* | *C4BPA* | *C5* | *C5AR1* | *C6* | *C7* | *C8A* | *C8B* |
| *C8G* | *C8orf34* | *C9* | *CA12* | *CA2* | *CA4* | *CACNA1C* | *CACNA1D* | *CACNA1E* | *CACNA1G* |
| *CACNA1H* | *CACNA2D1* | *CACNA2D2* | *CACNA2D3* | *CACNA2D4* | *CACNB2* | *CACNB3* | *CACNB4* | *CACNG1* | *CACNG4* |
| *CACNG6* | *CADPS* | *CALM1* | *CALM2* | *CALM3* | *CALML3* | *CALML4* | *CALML5* | *CALML6* | *CAMK1* |
| *CAMK1D* | *CAMK1G* | *CAMK2A* | *CAMK2B* | *CAMK2D* | *CAMK2G* | *CAMK4* | *CAMP* | *CAPN2* | *CAPN6* |
| *CAPZA2* | *CARD11* | *CARD9* | *CASP1* | *CASP10* | *CASP12* | *CASP3* | *CASP7* | *CASP8* | *CASP9* |
| *CAV1* | *CBL* | *CBLB* | *CBLC* | *CBR4* | *CBX5* | *CC2D1B* | *CCAR2* | *CCDC186* | *CCDC198* |
| *CCDC6* | *CCDC91* | *CCL1* | *CCL11* | *CCL13* | *CCL14* | *CCL15* | *CCL16* | *CCL17* | *CCL18* |
| *CCL19* | *CCL2* | *CCL20* | *CCL21* | *CCL22* | *CCL23* | *CCL24* | *CCL25* | *CCL26* | *CCL27* |
| *CCL28* | *CCL3* | *CCL3L1* | *CCL4* | *CCL5* | *CCL7* | *CCL8* | *CCNA1* | *CCNA2* | *CCNB1* |
| *CCNB2* | *CCNB3* | *CCND1* | *CCND2* | *CCND3* | *CCNE1* | *CCNE2* | *CCNO* | *CCR1* | *CCR2* |
| *CCR3* | *CCR4* | *CCR5* | *CCR6* | *CCR7* | *CCR9* | *CCRL2* | *CD101* | *CD14* | *CD160* |
| *CD163* | *CD164* | *CD180* | *CD19* | *CD1A* | *CD1B* | *CD1C* | *CD1D* | *CD1E* | *CD2* |
| *CD200* | *CD207* | *CD209* | *CD22* | *CD226* | *CD24* | *CD244* | *CD247* | *CD27* | *CD274* |
| *CD276* | *CD28* | *CD300A* | *CD33* | *CD34* | *CD36* | *CD37* | *CD38* | *CD3D* | *CD3E* |
| *CD3EAP* | *CD3G* | *CD4* | *CD40* | *CD40LG* | *CD44* | *CD46* | *CD47* | *CD48* | *CD5* |
| *CD52* | *CD53* | *CD55* | *CD58* | *CD59* | *CD6* | *CD63* | *CD68* | *CD69* | *CD7* |
| *CD70* | *CD74* | *CD79A* | *CD79B* | *CD80* | *CD81* | *CD83* | *CD84* | *CD86* | *CD8A* |
| *CD8B* | *CD9* | *CD96* | *CD99* | *CDC14A* | *CDC14B* | *CDC20* | *CDC25A* | *CDC25B* | *CDC25C* |
| *CDC27* | *CDC42* | *CDC42EP1* | *CDC6* | *CDC7* | *CDCA3* | *CDH1* | *CDH11* | *CDH16* | *CDH17* |
| *CDH2* | *CDH3* | *CDH5* | *CDK1* | *CDK12* | *CDK2* | *CDK4* | *CDK6* | *CDKN1A* | *CDKN1B* |
| *CDKN1C* | *CDKN2A* | *CDKN2B* | *CDKN2C* | *CDKN2D* | *CDKN3* | *CDX2* | *CEACAM1* | *CEACAM3* | *CEACAM5* |
| *CEACAM6* | *CEACAM8* | *CEBPA* | *CEBPB* | *CEBPE* | *CELSR2* | *CENPF* | *CEP43* | *CEP55* | *CEP72* |
| *CEP85L* | *CEP89* | *CES3* | *CFB* | *CFD* | *CFI* | *CFL1* | *CFP* | *CGAS* | *CHAD* |
| *CHEK1* | *CHEK2* | *CHGA* | *CHI3L1* | *CHIT1* | *CHRM3* | *CHSY1* | *CHTOP* | *CHUK* | *CIC* |
| *CIDEA* | *CIITA* | *CIT* | *CKLF* | *CKS1B* | *CKS2* | *CLCF1* | *CLCN6* | *CLDN18* | *CLEC10A* |
| *CLEC14A* | *CLEC4A* | *CLEC4C* | *CLEC4E* | *CLEC5A* | *CLEC6A* | *CLEC7A* | *CLECL1* | *CLIP1* | *CLTC* |
| *CLU* | *CMA1* | *CMKLR1* | *CMTM4* | *CMTM6* | *CNIH4* | *CNOT10* | *CNOT2* | *CNOT4* | *CNTFR* |
| *CNTRL* | *COG7* | *COL11A1* | *COL11A2* | *COL14A1* | *COL16A1* | *COL17A1* | *COL1A1* | *COL1A2* | *COL24A1* |
| *COL27A1* | *COL2A1* | *COL3A1* | *COL4A1* | *COL4A2* | *COL4A3* | *COL4A4* | *COL4A5* | *COL4A6* | *COL5A1* |
| *COL5A2* | *COL6A3* | *COL6A6* | *COLEC12* | *COMP* | *CORO1A* | *COX11* | *COX4I1* | *COX5B* | *COX6A1* |
| *COX6B1* | *CPA3* | *CPEB2* | *CPSF7* | *CR1* | *CR2* | *CRABP2* | *CREB1* | *CREB3* | *CREB3L1* |
| *CREB3L2* | *CREB3L3* | *CREB3L4* | *CREB5* | *CREBBP* | *CRK* | *CRKL* | *CRLF2* | *CRP* | *CRTAM* |
| *CSF1* | *CSF1R* | *CSF2* | *CSF2RB* | *CSF3* | *CSF3R* | *CSNK1A1* | *CSNK1A1L* | *CST2* | *CT45A1* |
| *CTAG1B* | *CTAG2* | *CTAGE1* | *CTBP1* | *CTBP2* | *CTCFL* | *CTLA4* | *CTNNA1* | *CTNNA2* | *CTNNA3* |
| *CTNNB1* | *CTRC* | *CTSC* | *CTSG* | *CTSH* | *CTSL* | *CTSS* | *CTSV* | *CTSW* | *CTTN* |
| *CUL1* | *CUL2* | *CUL3* | *CUX1* | *CWH43* | *CX3CL1* | *CX3CR1* | *CXADR* | *CXCL1* | *CXCL10* |
| *CXCL11* | *CXCL12* | *CXCL13* | *CXCL14* | *CXCL16* | *CXCL2* | *CXCL3* | *CXCL5* | *CXCL6* | *CXCL8* |
| *CXCL9* | *CXCR1* | *CXCR2* | *CXCR3* | *CXCR4* | *CXCR5* | *CXCR6* | *CXXC4* | *CXXC5* | *CYB561* |
| *CYBB* | *CYCS* | *CYFIP2* | *CYLD* | *CYP17A1* | *CYP19A1* | *CYP1B1* | *CYP2D6* | *CYP4A11* | *CYP4A22* |
| *CYP8B1* | *CYSTM1* | *DAB2* | *DACH2* | *DAPK1* | *DAPK2* | *DAPK3* | *DAXX* | *DCC* | *DCSTAMP* |
| *DCTN1* | *DDB1* | *DDB2* | *DDIT3* | *DDIT4* | *DDX21* | *DDX43* | *DDX50* | *DDX58* | *DEFB1* |
| *DEFB134* | *DEPTOR* | *DGAT2* | *DGCR2* | *DGLUCY* | *DHX15* | *DHX16* | *DIAPH1* | *DIO1* | *DIO2* |
| *DIPK2B* | *DKK1* | *DKK2* | *DKK4* | *DLK1* | *DLL1* | *DLL3* | *DLL4* | *DLX2* | *DMBT1* |
| *DNAJC14* | *DNMT1* | *DNMT3A* | *DOCK9* | *DPF1* | *DPF3* | *DPP4* | *DSC3* | *DSP* | *DST* |
| *DTX1* | *DTX3* | *DTX3L* | *DTX4* | *DUOX1* | *DUOX2* | *DUSP1* | *DUSP10* | *DUSP2* | *DUSP4* |
| *DUSP5* | *DUSP6* | *DUSP8* | *DVL1* | *DVL2* | *DVL3* | *DYNC1I2* | *DZANK1* | *E2F1* | *E2F2* |
| *E2F3* | *E2F4* | *E2F5* | *EBI3* | *ECSIT* | *EDC3* | *EDN1* | *EEF1G* | *EFNA1* | *EFNA2* |
| *EFNA3* | *EFNA4* | *EFNA5* | *EGF* | *EGFR* | *EGLN1* | *EGLN2* | *EGLN3* | *EGR1* | *EGR2* |
| *EGR3* | *EHHADH* | *EIF1* | *EIF2AK2* | *EIF2AK3* | *EIF2B4* | *EIF3L* | *EIF4A2* | *EIF4EBP1* | *EIF5AL1* |
| *ELANE* | *ELAVL3* | *ELAVL4* | *ELK1* | *ELMO1* | *ELOB* | *ELOC* | *ELOVL6* | *EML4* | *EMX2* |
| *ENDOG* | *ENG* | *ENO1* | *ENTPD1* | *EOMES* | *EP300* | *EPAS1* | *EPCAM* | *EPHA2* | *EPM2AIP1* |
| *EPO* | *EPOR* | *EPS15* | *EPS8L3* | *ERBB2* | *ERBB4* | *ERC1* | *ERCC1* | *ERCC2* | *ERCC3* |
| *ERCC4* | *ERCC5* | *ERCC6* | *EREG* | *ERG* | *ERLIN2* | *ERN2* | *ERO1A* | *ERP44* | *ESR1* |
| *ESR2* | *ETHE1* | *ETS1* | *ETS2* | *ETV1* | *ETV4* | *ETV5* | *ETV6* | *ETV7* | *EVA1A* |
| *EWSR1* | *EXO1* | *EYA1* | *EZH2* | *EZR* | *F11* | *F11R* | *F12* | *F13A1* | *F2RL1* |
| *FAAP24* | *FABP1* | *FABP4* | *FADD* | *FAM114A2* | *FAM124B* | *FAM131B* | *FAM13C* | *FAM167A* | *FAM30A* |
| *FANCA* | *FANCB* | *FANCC* | *FANCD2* | *FANCE* | *FANCF* | *FANCG* | *FANCL* | *FAP* | *FAS* |
| *FASLG* | *FAU* | *FBP1* | *FBXO28* | *FBXW7* | *FCAR* | *FCER1A* | *FCER1G* | *FCER2* | *FCF1* |
| *FCGR1A* | *FCGR2A* | *FCGR2B* | *FCGR3A* | *FCGR3B* | *FCGRT* | *FCHO1* | *FCHSD1* | *FCN1* | *FCRL2* |
| *FCRLA* | *FEN1* | *FEZ1* | *FGF1* | *FGF10* | *FGF11* | *FGF12* | *FGF13* | *FGF14* | *FGF16* |
| *FGF17* | *FGF18* | *FGF19* | *FGF2* | *FGF20* | *FGF21* | *FGF22* | *FGF23* | *FGF3* | *FGF4* |
| *FGF5* | *FGF6* | *FGF7* | *FGF8* | *FGF9* | *FGFR1* | *FGFR1OP2* | *FGFR2* | *FGFR3* | *FGFR4* |
| *FH* | *FHIT* | *FILIP1* | *FIP1L1* | *FKBP15* | *FLCN* | *FLG* | *FLI1* | *FLNA* | *FLNB* |
| *FLNC* | *FLT1* | *FLT3* | *FLT3LG* | *FLT4* | *FN1* | *FOLH1* | *FOS* | *FOSL1* | *FOXA1* |
| *FOXA2* | *FOXC1* | *FOXE1* | *FOXG1* | *FOXJ1* | *FOXL2* | *FOXM1* | *FOXO1* | *FOXO3* | *FOXO4* |
| *FOXP3* | *FPR1* | *FPR2* | *FPR3* | *FRAT1* | *FRAT2* | *FST* | *FSTL3* | *FUBP1* | *FUT4* |
| *FUT5* | *FUT7* | *FUT8* | *FYB1* | *FYN* | *FZD1* | *FZD10* | *FZD2* | *FZD3* | *FZD4* |
| *FZD5* | *FZD6* | *FZD7* | *FZD8* | *FZD9* | *G6PD* | *GAB1* | *GAB2* | *GABPA* | *GABRB2* |
| *GADD45A* | *GADD45B* | *GADD45G* | *GADD45GIP1* | *GADL1* | *GAGE1* | *GAGE10* | *GAGE12F* | *GAGE12I* | *GAGE12J* |
| *GAGE13* | *GAGE2A* | *GAGE2C* | *GAGE2E* | *GAPDH* | *GAS1* | *GATA1* | *GATA2* | *GATA3* | *GBP1* |
| *GBP2* | *GBP4* | *GCG* | *GCGR* | *GDF15* | *GDF6* | *GEMIN4* | *GFAP* | *GHITM* | *GHR* |
| *GIMAP4* | *GIMAP6* | *GIT2* | *GJA1* | *GJB6* | *GKAP1* | *GLI1* | *GLI2* | *GLI3* | *GLIS3* |
| *GLOD4* | *GLS* | *GLUD1* | *GLUL* | *GMIP* | *GNA11* | *GNA14* | *GNAQ* | *GNAS* | *GNG12* |
| *GNG4* | *GNG7* | *GNGT1* | *GNL3* | *GNLY* | *GOLGA5* | *GOPC* | *GOT1* | *GOT2* | *GPATCH3* |
| *GPC4* | *GPI* | *GPM6B* | *GPR160* | *GPR18* | *GPR3* | *GPS1* | *GPSM3* | *GPT* | *GPX1* |
| *GPX3* | *GPX4* | *GRAP2* | *GRB10* | *GRB2* | *GRB7* | *GREM1* | *GRIA3* | *GRIN1* | *GRIN2A* |
| *GRIN2B* | *GRIPAP1* | *GSK3B* | *GSN* | *GSTA1* | *GSTA2* | *GSTA3* | *GSTA4* | *GSTA5* | *GSTM1* |
| *GSTM2* | *GSTM3* | *GSTM4* | *GSTM5* | *GSTO1* | *GSTO2* | *GSTP1* | *GSTT1* | *GSTT2* | *GSTT2B* |
| *GTF2H3* | *GTF2I* | *GTF2IRD1* | *GTF3C1* | *GTPBP4* | *GUSB* | *GYG1* | *GZMA* | *GZMB* | *GZMH* |
| *GZMK* | *GZMM* | *H2AX* | *H3-3A* | *H3-5* | *H3C10* | *H3C2* | *H3C8* | *HACD2* | *HAMP* |
| *HAVCR2* | *HBB* | *HBEGF* | *HCK* | *HDAC1* | *HDAC10* | *HDAC11* | *HDAC2* | *HDAC3* | *HDAC4* |
| *HDAC5* | *HDAC6* | *HDC* | *HELLS* | *HERC6* | *HES1* | *HES5* | *HEY1* | *HEY2* | *HEYL* |
| *HFM1* | *HGD* | *HGF* | *HHEX* | *HHIP* | *HIF1A* | *HIP1* | *HK1* | *HK2* | *HLA-A* |
| *HLA-B* | *HLA-C* | *HLA-DMA* | *HLA-DMB* | *HLA-DOA* | *HLA-DOB* | *HLA-DPA1* | *HLA-DPB1* | *HLA-DQA1* | *HLA-DQA2* |
| *HLA-DQB1* | *HLA-DQB2* | *HLA-DRA* | *HLA-DRB1* | *HLA-DRB3* | *HLA-DRB4* | *HLA-DRB5* | *HLA-E* | *HLA-F* | *HLA-F-AS1* |
| *HLA-G* | *HLF* | *HMBS* | *HMGA1* | *HMGA2* | *HMGB1* | *HMGN5* | *HMOX1* | *HNF1A* | *HNRNPA2B1* |
| *HNRNPL* | *HOXA10* | *HOXA11* | *HOXA9* | *HOXC10* | *HOXD11* | *HPGD* | *HPRT1* | *HRAS* | *HSD11B1* |
| *HSD17B8* | *HSDL2* | *HSF2BP* | *HSP90AA1* | *HSP90AB1* | *HSP90B1* | *HSPA1A* | *HSPA2* | *HSPA6* | *HSPB1* |
| *HTR3A* | *HYDIN* | *IBSP* | *ICAM1* | *ICAM2* | *ICAM3* | *ICAM4* | *ICAM5* | *ICOS* | *ICOSLG* |
| *ID1* | *ID2* | *ID3* | *ID4* | *IDH1* | *IDH2* | *IDO1* | *IDO2* | *IER3* | *IFI16* |
| *IFI27* | *IFI35* | *IFI44L* | *IFI6* | *IFIH1* | *IFIT1* | *IFIT2* | *IFIT3* | *IFITM1* | *IFITM2* |
| *IFNA1* | *IFNA17* | *IFNA2* | *IFNA7* | *IFNA8* | *IFNAR1* | *IFNAR2* | *IFNB1* | *IFNG* | *IFNGR1* |
| *IFNGR2* | *IFNL1* | *IFNL2* | *IGF1* | *IGF1R* | *IGF2* | *IGF2R* | *IGFBP2* | *IGFBP3* | *IGFBP7* |
| *IGLL1* | *IGSF6* | *IHH* | *IKBKB* | *IKBKE* | *IKBKG* | *IKZF1* | *IKZF2* | *IKZF3* | *IKZF4* |
| *IL10* | *IL10RA* | *IL11* | *IL11RA* | *IL12A* | *IL12B* | *IL12RB1* | *IL12RB2* | *IL13* | *IL13RA1* |
| *IL13RA2* | *IL15* | *IL15RA* | *IL16* | *IL17A* | *IL17B* | *IL17F* | *IL17RA* | *IL17RB* | *IL18* |
| *IL18R1* | *IL18RAP* | *IL19* | *IL1A* | *IL1B* | *IL1R1* | *IL1R2* | *IL1RAP* | *IL1RAPL2* | *IL1RL1* |
| *IL1RL2* | *IL1RN* | *IL2* | *IL20RA* | *IL20RB* | *IL21* | *IL21R* | *IL22* | *IL22RA1* | *IL22RA2* |
| *IL23A* | *IL23R* | *IL24* | *IL25* | *IL26* | *IL27* | *IL2RA* | *IL2RB* | *IL2RG* | *IL3* |
| *IL32* | *IL33* | *IL34* | *IL3RA* | *IL4* | *IL4R* | *IL5* | *IL5RA* | *IL6* | *IL6R* |
| *IL6ST* | *IL7* | *IL7R* | *IL9* | *ILF3* | *ILK* | *ING4* | *INHBA* | *INHBB* | *INPP5D* |
| *INS* | *INSL4* | *INSRR* | *IRAK1* | *IRAK2* | *IRAK3* | *IRAK4* | *IRF1* | *IRF2* | *IRF2BP2* |
| *IRF3* | *IRF4* | *IRF5* | *IRF7* | *IRF8* | *IRF9* | *IRGM* | *IRS1* | *ISG15* | *ISG20* |
| *ISL1* | *ITCH* | *ITGA1* | *ITGA2* | *ITGA2B* | *ITGA3* | *ITGA4* | *ITGA5* | *ITGA6* | *ITGA7* |
| *ITGA8* | *ITGA9* | *ITGAE* | *ITGAL* | *ITGAM* | *ITGAV* | *ITGAX* | *ITGB1* | *ITGB2* | *ITGB3* |
| *ITGB4* | *ITGB6* | *ITGB7* | *ITGB8* | *ITK* | *ITPK1* | *JADE1* | *JAG1* | *JAG2* | *JAK1* |
| *JAK2* | *JAK3* | *JAKMIP1* | *JAM3* | *JAML* | *JCHAIN* | *JUN* | *JUNB* | *JUP* | *KAT2B* |
| *KATNAL2* | *KBTBD8* | *KCNAB1* | *KCNIP3* | *KCNJ11* | *KCNN4* | *KCTD8* | *KDELR2* | *KDM5C* | *KDM6A* |
| *KDM7A* | *KDR* | *KEAP1* | *KIAA1217* | *KIAA1549* | *KIAA1598* | *KIF12* | *KIF2C* | *KIF5B* | *KIF7* |
| *KIR2DL1* | *KIR2DL2* | *KIR2DL3* | *KIR2DS4* | *KIR3DL1* | *KIR3DL2* | *KIR3DL3* | *KIR3DS1* | *KIT* | *KITLG* |
| *KLC1* | *KLF2* | *KLF4* | *KLHL7* | *KLK2* | *KLK3* | *KLRB1* | *KLRC1* | *KLRC2* | *KLRD1* |
| *KLRF1* | *KLRG1* | *KLRK1* | *KMT2C* | *KMT2D* | *KRAS* | *KREMEN1* | *KRT1* | *KRT10* | *KRT13* |
| *KRT14* | *KRT15* | *KRT17* | *KRT18* | *KRT19* | *KRT20* | *KRT5* | *KRT6A* | *KRT6B* | *KRT6C* |
| *KRT7* | *KYAT1* | *L1CAM* | *LAG3* | *LAIR1* | *LAIR2* | *LAMA1* | *LAMA2* | *LAMA3* | *LAMA4* |
| *LAMA5* | *LAMB1* | *LAMB2* | *LAMB3* | *LAMB4* | *LAMC1* | *LAMC2* | *LAMC3* | *LAMP1* | *LAMP2* |
| *LAMP3* | *LAPTM5* | *LAT* | *LBP* | *LCK* | *LCN2* | *LCOR* | *LCP1* | *LDHA* | *LDHB* |
| *LEF1* | *LEFTY1* | *LEFTY2* | *LEP* | *LEPR* | *LEXM* | *LFNG* | *LGALS3* | *LGALS4* | *LGALS9* |
| *LGR5* | *LHX3* | *LIF* | *LIFR* | *LIG1* | *LIG3* | *LIG4* | *LILRA1* | *LILRA4* | *LILRA5* |
| *LILRB1* | *LILRB2* | *LILRB3* | *LILRB4* | *LIMA1* | *LLGL1* | *LMNA* | *LOH12CR1* | *LOXL2* | *LRG1* |
| *LRP1* | *LRP2* | *LRP5* | *LRP6* | *LRRC32* | *LRRC71* | *LRRN3* | *LSM12* | *LSM14A* | *LST1* |
| *LTA* | *LTB* | *LTBP1* | *LTBR* | *LTF* | *LTK* | *LUC7L2* | *LUM* | *LY6E* | *LY6K* |
| *LY86* | *LY9* | *LY96* | *LYN* | *LYZ* | *LZTFL1* | *M6PR* | *MAD1L1* | *MAD2L1* | *MAD2L2* |
| *MADCAM1* | *MAF* | *MAFF* | *MAGEA1* | *MAGEA10* | *MAGEA12* | *MAGEA3* | *MAGEA4* | *MAGEA6* | *MAGEB2* |
| *MAGEC1* | *MAGEC2* | *MAGI3* | *MALT1* | *MAML2* | *MAP2K1* | *MAP2K2* | *MAP2K3* | *MAP2K4* | *MAP2K6* |
| *MAP3K1* | *MAP3K12* | *MAP3K13* | *MAP3K14* | *MAP3K20* | *MAP3K5* | *MAP3K7* | *MAP3K8* | *MAP4K2* | *MAPK1* |
| *MAPK10* | *MAPK11* | *MAPK12* | *MAPK14* | *MAPK3* | *MAPK8* | *MAPK8IP1* | *MAPK8IP2* | *MAPK9* | *MAPKAPK2* |
| *MAPT* | *MARCKS* | *MARCO* | *MASP1* | *MASP2* | *MAVS* | *MAX* | *MBL2* | *MBNL1* | *MBNL3* |
| *MCAM* | *MCAT* | *MCL1* | *MCM2* | *MCM4* | *MCM5* | *MCM7* | *MDC1* | *MDFIC* | *MDM2* |
| *MDM4* | *ME2* | *MECOM* | *MED12* | *MEF2C* | *MEF2D* | *MEFV* | *MEIS1* | *MELK* | *MEN1* |
| *MERTK* | *MET* | *MFGE8* | *MFNG* | *MGEA5* | *MGMT* | *MGP* | *MGST1* | *MGST2* | *MGST3* |
| *MIA* | *MIB1* | *MICA* | *MICB* | *MIF* | *MITF* | *MKI67* | *MKRN1* | *MLANA* | *MLEC* |
| *MLF1* | *MLH1* | *MLLT10* | *MLLT3* | *MLPH* | *MME* | *MMP1* | *MMP11* | *MMP12* | *MMP2* |
| *MMP3* | *MMP7* | *MMP9* | *MMRN2* | *MNAT1* | *MNX1* | *MORC3* | *MPL* | *MPO* | *MPPED1* |
| *MPRIP* | *MR1* | *MRC1* | *MRE11* | *MRM2* | *MRPL19* | *MRPS5* | *MS4A1* | *MS4A2* | *MS4A4A* |
| *MS4A6A* | *MSH2* | *MSH3* | *MSH6* | *MSMB* | *MSN* | *MSR1* | *MSRB2* | *MST1R* | *MTF1* |
| *MTF2* | *MTMR14* | *MTOR* | *MTRR* | *MUC1* | *MUC2* | *MUC4* | *MUTYH* | *MX1* | *MXI1* |
| *MYB* | *MYBL2* | *MYC* | *MYCN* | *MYCT1* | *MYD88* | *MYH9* | *MYO18A* | *MYO5A* | *MYRIP* |
| *MZT1* | *NAALAD2* | *NAB2* | *NACC2* | *NANOG* | *NASP* | *NAT1* | *NAT8L* | *NBN* | *NCAM1* |
| *NCF1* | *NCF4* | *NCL* | *NCOA1* | *NCOA2* | *NCOA3* | *NCOA4* | *NCOR1* | *NCOR2* | *NCR1* |
| *NCR3* | *NDC1* | *NDC80* | *NDUFA1* | *NDUFA11* | *NDUFA12* | *NDUFA13* | *NDUFA2* | *NDUFA3* | *NDUFA4L2* |
| *NDUFA6* | *NDUFA7* | *NDUFB1* | *NDUFB10* | *NDUFB11* | *NDUFB4* | *NDUFB7* | *NDUFB8* | *NDUFS7* | *NDUFS8* |
| *NECTIN1* | *NECTIN2* | *NECTIN4* | *NEFL* | *NEIL1* | *NEIL3* | *NF1* | *NF2* | *NFAM1* | *NFASC* |
| *NFATC1* | *NFATC2* | *NFATC3* | *NFATC4* | *NFE2L2* | *NFIB* | *NFIL3* | *NFKB1* | *NFKB2* | *NFKBIA* |
| *NFKBIE* | *NFKBIZ* | *NGF* | *NGFR* | *NID2* | *NKD1* | *NKG7* | *NKX2-1* | *NKX3-1* | *NLRC5* |
| *NLRP3* | *NOD1* | *NOD2* | *NODAL* | *NOG* | *NOL4* | *NOL7* | *NOP16* | *NOS1* | *NOS1AP* |
| *NOS2* | *NOS3* | *NOTCH1* | *NOTCH2* | *NOTCH3* | *NOTCH4* | *NOX1* | *NPM1* | *NPM2* | *NPTX2* |
| *NPY1R* | *NQO1* | *NR3C1* | *NR4A1* | *NR4A3* | *NRAP* | *NRAS* | *NRBF2* | *NRDE2* | *NRG1* |
| *NRG2* | *NRG3* | *NRP1* | *NSD1* | *NSD2* | *NSD3* | *NT5E* | *NTF3* | *NTHL1* | *NTN3* |
| *NTRK1* | *NTRK2* | *NTRK3* | *NUB1* | *NUBP1* | *NUF2* | *NUMB* | *NUMBL* | *NUP107* | *NUP214* |
| *NUPR1* | *OAS1* | *OAS2* | *OAS3* | *OASL* | *OAT* | *OAZ1* | *OCIAD1* | *OFD1* | *OLFML2B* |
| *OLR1* | *OPN3* | *ORC6* | *OSM* | *OTC* | *OTOA* | *OXR1* | *P2RY13* | *P4HA1* | *P4HA2* |
| *PAK1* | *PAK2* | *PAK3* | *PAK4* | *PAK5* | *PAK6* | *PALMD* | *PAN3* | *PANX3* | *PAPD7* |
| *PAPSS1* | *PARG* | *PARP12* | *PARP2* | *PARP4* | *PARP9* | *PASD1* | *PAWR* | *PAX3* | *PAX5* |
| *PAX8* | *PBK* | *PBRM1* | *PBX1* | *PBX3* | *PC* | *PCBP1* | *PCDH7* | *PCK1* | *PCK2* |
| *PCLAF* | *PCM1* | *PCNA* | *PCP4* | *PDCD1* | *PDCD1LG2* | *PDE5A* | *PDE7A* | *PDE9A* | *PDGFA* |
| *PDGFB* | *PDGFC* | *PDGFD* | *PDGFRA* | *PDGFRB* | *PDK1* | *PDLIM4* | *PDPK1* | *PDPN* | *PDZK1IP1* |
| *PEAR1* | *PEBP1* | *PECAM1* | *PEG3* | *PER2* | *PF4* | *PFKFB3* | *PFKM* | *PGAP3* | *PGF* |
| *PGK1* | *PGM2* | *PGPEP1* | *PGR* | *PHC3* | *PHF10* | *PHF12* | *PHF6* | *PHGDH* | *PHLDA2* |
| *PHLDB3* | *PI15* | *PIAS1* | *PIAS2* | *PIAS3* | *PIAS4* | *PIGR* | *PIK3CA* | *PIK3CB* | *PIK3CD* |
| *PIK3CG* | *PIK3R1* | *PIK3R2* | *PIK3R3* | *PIK3R4* | *PIK3R5* | *PIM1* | *PIM2* | *PIN1* | *PITX2* |
| *PKM* | *PKMYT1* | *PKP3* | *PLA1A* | *PLA2G10* | *PLA2G1B* | *PLA2G2A* | *PLA2G3* | *PLA2G4A* | *PLA2G4C* |
| *PLA2G4E* | *PLA2G4F* | *PLA2G5* | *PLA2G6* | *PLAT* | *PLAU* | *PLAUR* | *PLCB1* | *PLCB4* | *PLCD3* |
| *PLCE1* | *PLCG1* | *PLCG2* | *PLD1* | *PLD2* | *PLEKHA5* | *PLEKHG6* | *PLK1* | *PLK3* | *PLOD2* |
| *PMAIP1* | *PMCH* | *PMEL* | *PMEPA1* | *PML* | *PMS2* | *PNKP* | *PNMA1* | *PNOC* | *PNPLA5* |
| *POC1B* | *POF1B* | *POLB* | *POLD1* | *POLD2* | *POLD4* | *POLE2* | *POLK* | *POLR1B* | *POLR1C* |
| *POLR2A* | *POLR2D* | *POLR2H* | *POLR2J* | *POLR3G* | *POSTN* | *POU2AF1* | *POU2F2* | *POU5F1* | *PPA1* |
| *PPAN* | *PPARD* | *PPARG* | *PPARGC1A* | *PPARGC1B* | *PPAT* | *PPBP* | *PPFIBP1* | *PPHLN1* | *PPIA* |
| *PPL* | *PPP1R1B* | *PPP1R21* | *PPP2CB* | *PPP2R1A* | *PPP2R2B* | *PPP2R2C* | *PPP2R3A* | *PPP3CA* | *PPP3CB* |
| *PPP3CC* | *PPP3R1* | *PPP3R2* | *PPP4R3B* | *PRAME* | *PRC1* | *PRCC* | *PRDM1* | *PRDM6* | *PRDX1* |
| *PRDX5* | *PRF1* | *PRG2* | *PRICKLE1* | *PRKAA2* | *PRKACA* | *PRKACB* | *PRKACG* | *PRKAR1A* | *PRKAR1B* |
| *PRKAR2A* | *PRKAR2B* | *PRKCA* | *PRKCB* | *PRKCD* | *PRKCE* | *PRKCG* | *PRKCQ* | *PRKDC* | *PRKX* |
| *PRL* | *PRLR* | *PRM1* | *PRMT8* | *PROM1* | *PROS1* | *PRPF38A* | *PRR5* | *PRRX1* | *PRSS1* |
| *PRUNE1* | *PSAT1* | *PSEN1* | *PSEN2* | *PSMB10* | *PSMB2* | *PSMB3* | *PSMB5* | *PSMB7* | *PSMB8* |
| *PSMB9* | *PSMC4* | *PSMD7* | *PSPH* | *PTCD2* | *PTCH1* | *PTCH2* | *PTCRA* | *PTEN* | *PTGDR2* |
| *PTGDS* | *PTGER4* | *PTGFRN* | *PTGS2* | *PTK2* | *PTK7* | *PTN* | *PTPN11* | *PTPN5* | *PTPN6* |
| *PTPN7* | *PTPRC* | *PTPRCAP* | *PTPRD* | *PTPRE* | *PTPRN2* | *PTPRR* | *PTPRZ1* | *PTTG1* | *PTTG2* |
| *PUM1* | *PURA* | *PVR* | *PVRIG* | *PWWP2A* | *PYCARD* | *PYCR1* | *PYCR2* | *PYCR3* | *PYGL* |
| *QKI* | *RAB3IL1* | *RAB7A* | *RABGAP1L* | *RAC1* | *RAC2* | *RAC3* | *RAD18* | *RAD21* | *RAD23B* |
| *RAD50* | *RAD51* | *RAD51C* | *RAD52* | *RAD54L* | *RAF1* | *RAG1* | *RALA* | *RALB* | *RALBP1* |
| *RALGDS* | *RANBP2* | *RAP1A* | *RAP1B* | *RAPGEF1* | *RARA* | *RARB* | *RASA4* | *RASAL1* | *RASGEF1B* |
| *RASGRF1* | *RASGRF2* | *RASGRP1* | *RASGRP2* | *RASSF1* | *RASSF5* | *RB1* | *RBL2* | *RBM45* | *RBMS3* |
| *RBP4* | *RBPMS* | *RBX1* | *RCC1* | *REG4* | *REL* | *RELA* | *RELB* | *RELN* | *REN* |
| *REPS1* | *RET* | *REV1* | *REV3L* | *RFC3* | *RFC4* | *RGMB* | *RGS17* | *RHOA* | *RHOB* |
| *RICTOR* | *RIMKLA* | *RIMKLB* | *RIN1* | *RIPK1* | *RIPK2* | *RIPK3* | *RNF130* | *RNF213* | *RNF43* |
| *RNF8* | *RNLS* | *ROBO4* | *ROCK1* | *ROPN1* | *ROR2* | *RORA* | *RORC* | *ROS1* | *RPA3* |
| *RPL23* | *RPL3* | *RPL4* | *RPL7A* | *RPLP0* | *RPS11* | *RPS14* | *RPS27A* | *RPS4Y1* | *RPS6* |
| *RPS6KA5* | *RPS6KA6* | *RPS6KB1* | *RPS6KB2* | *RPS9* | *RPTOR* | *RRAD* | *RRAS2* | *RRM2* | *RRS1* |
| *RSAD2* | *RSPH14* | *RTN4RL1* | *RUNX1* | *RUNX1T1* | *RUNX2* | *RUNX3* | *RXRA* | *RXRB* | *RXRG* |
| *RYBP* | *S100A12* | *S100A2* | *S100A4* | *S100A7* | *S100A8* | *S100A9* | *S100B* | *S100P* | *SAA1* |
| *SAMD9* | *SAMHD1* | *SAMSN1* | *SAP130* | *SARS* | *SBNO2* | *SCGB2A2* | *SCP2* | *SCUBE2* | *SCYL3* |
| *SDC1* | *SDC4* | *SDHA* | *SEC22B* | *SEC31A* | *SEC61G* | *SEL1L3* | *SELE* | *SELENBP1* | *SELENOK* |
| *SELL* | *SELP* | *SELPLG* | *SEMA6A* | *SEMG1* | *SENP1* | *SEPT10* | *SEPT14* | *SEPTIN3* | *SERINC1* |
| *SERINC2* | *SERINC3* | *SERINC5* | *SERPINA1* | *SERPINA3* | *SERPINB2* | *SERPINB3* | *SERPINB5* | *SERPINE1* | *SERPING1* |
| *SERPINH1* | *SETBP1* | *SETD2* | *SF3A1* | *SF3A3* | *SF3B1* | *SFN* | *SFRP1* | *SFRP2* | *SFRP4* |
| *SFTPB* | *SFTPC* | *SFXN1* | *SGK1* | *SGK2* | *SH2B2* | *SH2B3* | *SH2D1A* | *SH2D1B* | *SHC1* |
| *SHC2* | *SHC3* | *SHC4* | *SHH* | *SHROOM3* | *SHTN1* | *SIGIRR* | *SIGLEC1* | *SIGLEC5* | *SIGLEC8* |
| *SIL1* | *SIN3A* | *SIRPA* | *SIRPB2* | *SIRT4* | *SIT1* | *SIX1* | *SKAP2* | *SKP1* | *SKP2* |
| *SLAMF1* | *SLAMF6* | *SLAMF7* | *SLAMF8* | *SLC11A1* | *SLC12A7* | *SLC16A1* | *SLC16A2* | *SLC1A5* | *SLC23A2* |
| *SLC25A1* | *SLC26A4* | *SLC2A1* | *SLC34A2* | *SLC35F2* | *SLC35F3* | *SLC39A6* | *SLC3A1* | *SLC3A2* | *SLC43A1* |
| *SLC43A2* | *SLC45A3* | *SLC4A1AP* | *SLC4A4* | *SLC4A7* | *SLC5A5* | *SLC5A8* | *SLC6A13* | *SLC7A5* | *SLMAP* |
| *SMAD2* | *SMAD3* | *SMAD4* | *SMAD5* | *SMAD9* | *SMAP1* | *SMARCA2* | *SMARCA4* | *SMARCB1* | *SMARCC1* |
| *SMARCC2* | *SMARCD1* | *SMARCD2* | *SMARCD3* | *SMARCE1* | *SMC1A* | *SMC1B* | *SMC3* | *SMO* | *SMPD3* |
| *SNAI1* | *SNAI2* | *SNCA* | *SND1* | *SOCS1* | *SOCS2* | *SOCS3* | *SOD1* | *SOD2* | *SORBS1* |
| *SORBS2* | *SOS1* | *SOS2* | *SOST* | *SOX10* | *SOX11* | *SOX17* | *SOX2* | *SOX4* | *SOX9* |
| *SP1* | *SPA17* | *SPACA3* | *SPAG17* | *SPANXB1* | *SPECC1L* | *SPI1* | *SPIB* | *SPINK1* | *SPINK5* |
| *SPINT1* | *SPN* | *SPO11* | *SPOCK2* | *SPOP* | *SPP1* | *SPRED1* | *SPRED2* | *SPRY1* | *SPRY2* |
| *SPRY4* | *SQSTM1* | *SRC* | *SRD5A2* | *SREBF1* | *SRGN* | *SRP54* | *SRR* | *SRSF2* | *SS18* |
| *SSBP1* | *SSBP2* | *SST* | *SSX1* | *SSX2* | *SSX4* | *ST6GAL1* | *ST7* | *STAG2* | *STARD3* |
| *STAT1* | *STAT2* | *STAT3* | *STAT4* | *STAT5A* | *STAT5B* | *STAT6* | *STC1* | *STING1* | *STK11* |
| *STK11IP* | *STK17B* | *STK26* | *STK4* | *STMN1* | *STMN2* | *STON1-GTF2A1L* | *STRN* | *STRN3* | *SUFU* |
| *SULF1* | *SULT2A1* | *SUMO1* | *SUV39H2* | *SYCP1* | *SYK* | *SYT12* | *SYT17* | *TAB1* | *TACC1* |
| *TACC2* | *TACC3* | *TACSTD2* | *TAF3* | *TAGAP* | *TAL1* | *TANK* | *TAP1* | *TAP2* | *TAPBP* |
| *TAPBPL* | *TARP* | *TATDN1* | *TAX1BP1* | *TBC1D1* | *TBC1D10B* | *TBC1D2* | *TBK1* | *TBL1XR1* | *TBP* |
| *TBX21* | *TBXAS1* | *TCF3* | *TCF7* | *TCF7L1* | *TCF7L2* | *TCIM* | *TCL1A* | *TCL1B* | *TDO2* |
| *TEAD2* | *TECR* | *TERC* | *TERF2* | *TERT* | *TET2* | *TFDP1* | *TFE3* | *TFEB* | *TFG* |
| *TFRC* | *TG* | *TGFA* | *TGFB1* | *TGFB2* | *TGFB3* | *TGFBR1* | *TGFBR2* | *TH* | *THBD* |
| *THBS1* | *THBS4* | *THEM4* | *THRA* | *THRB* | *THY1* | *TIAM1* | *TICAM1* | *TICAM2* | *TIE1* |
| *TIGIT* | *TIRAP* | *TLCD2* | *TLE4* | *TLE5* | *TLK2* | *TLR1* | *TLR10* | *TLR2* | *TLR3* |
| *TLR4* | *TLR5* | *TLR6* | *TLR7* | *TLR8* | *TLR9* | *TLX1* | *TM4SF4* | *TMEFF2* | *TMEM106B* |
| *TMEM140* | *TMEM163* | *TMEM165* | *TMEM43* | *TMEM45B* | *TMPRSS2* | *TMPRSS3* | *TMPRSS4* | *TMUB2* | *TNC* |
| *TNF* | *TNFAIP3* | *TNFAIP6* | *TNFAIP8* | *TNFRSF10A* | *TNFRSF10B* | *TNFRSF10C* | *TNFRSF10D* | *TNFRSF11A* | *TNFRSF11B* |
| *TNFRSF12A* | *TNFRSF13B* | *TNFRSF13C* | *TNFRSF14* | *TNFRSF17* | *TNFRSF18* | *TNFRSF19* | *TNFRSF1A* | *TNFRSF1B* | *TNFRSF25* |
| *TNFRSF4* | *TNFRSF6B* | *TNFRSF8* | *TNFRSF9* | *TNFSF10* | *TNFSF11* | *TNFSF12* | *TNFSF13* | *TNFSF13B* | *TNFSF14* |
| *TNFSF15* | *TNFSF18* | *TNFSF4* | *TNFSF8* | *TNFSF9* | *TNKS* | *TNN* | *TNR* | *TOLLIP* | *TOP2A* |
| *TOX* | *TP53* | *TP63* | *TP73* | *TPD52L1* | *TPI1* | *TPM1* | *TPM2* | *TPM3* | *TPM4* |
| *TPO* | *TPR* | *TPSAB1* | *TPSB2* | *TPTE* | *TPX2* | *TRAF1* | *TRAF2* | *TRAF3* | *TRAF4* |
| *TRAF5* | *TRAF6* | *TRAF7* | *TRAK1* | *TRAT1* | *TREM1* | *TREM2* | *TRIM15* | *TRIM21* | *TRIM24* |
| *TRIM27* | *TRIM29* | *TRIM33* | *TRIM39* | *TRIM63* | *TSC1* | *TSC2* | *TSHR* | *TSLP* | *TSPAN7* |
| *TSPAN8* | *TTC30A* | *TTC31* | *TTK* | *TTPA* | *TTR* | *TUBB* | *TUSC3* | *TWF1* | *TWIST1* |
| *TWIST2* | *TXK* | *TXLNA* | *TXLNGY* | *TXN2* | *TXNIP* | *TXNRD1* | *TXNRD2* | *TXNRD3* | *TYK2* |
| *TYMP* | *TYMS* | *TYROBP* | *TYRP1* | *U2AF1* | *UBA7* | *UBB* | *UBC* | *UBE2C* | *UBE2T* |
| *ULBP2* | *UNC5D* | *UNG* | *UPK1B* | *UPK3A* | *UQCR10* | *UQCR11* | *UQCRQ* | *USP10* | *USP39* |
| *USP8* | *USP9Y* | *UST* | *UTY* | *VCAM1* | *VCAN* | *VCL* | *VEGFA* | *VEGFB* | *VEGFC* |
| *VEGFD* | *VHL* | *VIM* | *VOPP1* | *VPS33B* | *VSIR* | *VSTM2A* | *VTCN1* | *WAC* | *WDCP* |
| *WDR3* | *WDR76* | *WEE1* | *WIF1* | *WIPF1* | *WIPF2* | *WNK2* | *WNT1* | *WNT10A* | *WNT10B* |
| *WNT11* | *WNT16* | *WNT2* | *WNT2B* | *WNT3* | *WNT3A* | *WNT4* | *WNT5A* | *WNT5B* | *WNT6* |
| *WNT7A* | *WNT7B* | *WNT8A* | *WNT8B* | *WNT9A* | *WNT9B* | *WRN* | *WT1* | *WWC1* | *XAGE1B* |
| *XCL1* | *XCL2* | *XCR1* | *XIAP* | *XIST* | *XPA* | *XRCC2* | *XRCC4* | *XRCC5* | *XRCC6* |
| *XXYLT1* | *YRDC* | *YTHDF2* | *YWHAE* | *ZAN* | *ZAP70* | *ZBTB16* | *ZBTB17* | *ZBTB20* | *ZBTB32* |
| *ZBTB46* | *ZC3H12A* | *ZC3H14* | *ZC3HAV1* | *ZCCHC8* | *ZEB1* | *ZEB2* | *ZIC2* | *ZKSCAN5* | *ZMYM2* |
| *ZMYM4* | *ZNF143* | *ZNF205* | *ZNF34* | *ZNF346* | *ZNF365* | *ZNF384* | *ZNF485* | *ZNF703* | *ZSCAN30* |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **RNA的表达检测结果** | | | | | | | | | |
| **gene** | **TPM** | **gene** | **TPM** | **gene** | **TPM** | **gene** | **TPM** | **gene** | **TPM** |
| *A2M* | 2611.49 | *ABCB1* | 20.17 | *ABCF1* | 151.24 | *ABL1* | 526.33 | *ABTB2* | 108.9 |
| *ACAD9* | 106.88 | *ACAN* | 50.41 | *ACOT12* | 4.03 | *ACSF3* | 76.63 | *ACTA2* | 5656.54 |
| *ACTB* | 25759.87 | *ACTG1* | 10879.6 | *ACTG2* | 4333.66 | *ACTL6A* | 264.17 | *ACTL6B* | 16.13 |
| *ACTR3B* | 80.66 | *ACVR1B* | 185.53 | *ACVR1C* | 30.25 | *ACVR2A* | 44.37 | *ACY1* | 153.26 |
| *ADA* | 56.46 | *ADAM12* | 16.13 | *ADGRE1* | 10.08 | *ADGRE2* | 60.5 | *ADGRE5* | 419.45 |
| *ADH1A* | 8.17 | *ADH1B* | 324.67 | *ADH1C* | 471.78 | *ADH4* | 32.27 | *ADH6* | 18.15 |
| *ADM* | 151.24 | *ADORA2A* | 86.71 | *AFDN* | 248.04 | *AGK* | 137.13 | *AGR2* | 2343.28 |
| *AHR* | 379.12 | *AICDA* | 18.13 | *AIF1* | 270.22 | *AIRE* | 4.03 | *AKAP1* | 362.99 |
| *AKR1C3* | 428.12 | *AKR1C4* | 80.06 | *AKT1* | 615.06 | *AKT2* | 326.69 | *AKT3* | 330.72 |
| *ALAS1* | 227.87 | *ALCAM* | 108.9 | *ALDOA* | 6505.43 | *ALDOC* | 100.83 | *ALK* | 92.76 |
| *ALKBH2* | 80.66 | *ALKBH3* | 108.9 | *ALOX15B* | 68.56 | *AMBP* | 58.48 | *AMER1* | 60.5 |
| *AMH* | 14.12 | *AMMECR1L* | 98.81 | *ANGPT1* | 14.12 | *ANGPT2* | 56.46 | *ANGPTL4* | 100.83 |
| *ANKLE2* | 270.22 | *ANKRD28* | 296.44 | *ANKRD46* | 86.71 | *ANLN* | 96.8 | *ANP32B* | 1847.2 |
| *ANXA1* | 3484.67 | *APAF1* | 164.27 | *APBB1* | 48.4 | *APC* | 52.43 | *APC2* | 30.25 |
| *APH1B* | 26.22 | *API5* | 362.99 | *APLNR* | 596.91 | *APOA1* | 70.58 | *APOA2* | 24.2 |
| *APOA4* | 86.71 | *APOB* | 6.05 | *APOBEC3B* | 94.78 | *APOC2* | 135.11 | *APOC3* | 26.22 |
| *APOD* | 403.32 | *APOE* | 764.29 | *APOL6* | 313.94 | *APOM* | 24.2 | *APP* | 1972.23 |
| *APPL1* | 169.53 | *AQP9* | 42.35 | *AR* | 147.21 | *ARAF* | 352.9 | *AREG* | 165.36 |
| *ARF1* | 1609.24 | *ARG1* | 22.18 | *ARG2* | 12.1 | *ARHGEF6* | 110.91 | *ARID1A* | 373.07 |
| *ARID1B* | 330.72 | *ARID2* | 159.31 | *ARID5A* | 82.68 | *ARMH3* | 116.96 | *ARNT* | 167.38 |
| *ARNT2* | 48.4 | *ARNTL* | 96.8 | *ASAP2* | 121.0 | *ASCL1* | 229.89 | *ASL* | 290.39 |
| *ASNS* | 173.43 | *ASPA* | 48.4 | *ASPG* | 38.32 | *ASPN* | 129.06 | *ASXL1* | 169.39 |
| *ATF1* | 96.8 | *ATF2* | 225.86 | *ATF3* | 145.19 | *ATF4* | 1552.78 | *ATG10* | 24.2 |
| *ATG12* | 211.74 | *ATG16L1* | 44.37 | *ATG5* | 169.39 | *ATG7* | 96.8 | *ATM* | 109.84 |
| *ATOX1* | 377.1 | *ATP11C* | 32.27 | *ATP1B1* | 2813.15 | *ATP2A2* | 1944.0 | *ATP5F1D* | 627.16 |
| *ATP5F1E* | 3942.44 | *ATP5ME* | 1318.85 | *ATR* | 84.7 | *ATRX* | 131.08 | *AURKA* | 180.32 |
| *AURKB* | 84.7 | *AXIN1* | 88.73 | *AXIN2* | 90.75 | *AXL* | 118.98 | *AZGP1* | 121.0 |
| *B2M* | 8171.23 | *B3GAT1* | 118.98 | *B4GALT6* | 64.53 | *BACH2* | 36.3 | *BAD* | 199.64 |
| *BAG1* | 278.29 | *BAIAP3* | 60.5 | *BAK1* | 578.76 | *BAMBI* | 54.45 | *BAP1* | 151.24 |
| *BATF* | 145.19 | *BATF3* | 60.5 | *BAX* | 268.21 | *BBC3* | 86.71 | *BBS1* | 76.63 |
| *BCAT1* | 46.38 | *BCL10* | 239.97 | *BCL11B* | 165.36 | *BCL2* | 96.8 | *BCL2A1* | 179.48 |
| *BCL2L1* | 358.95 | *BCL2L11* | 201.66 | *BCL3* | 457.77 | *BCL6* | 131.08 | *BCL6B* | 88.73 |
| *BCOR* | 86.71 | *BCR* | 213.76 | *BDNF* | 215.78 | *BGN* | 1445.9 | *BID* | 145.19 |
| *BIRC2* | 330.72 | *BIRC3* | 502.13 | *BIRC5* | 157.29 | *BIRC7* | 68.56 | *BLK* | 32.27 |
| *BLM* | 64.53 | *BLNK* | 123.01 | *BLVRA* | 187.54 | *BMI1* | 415.42 | *BMP2* | 239.97 |
| *BMP4* | 70.58 | *BMP5* | 28.23 | *BMP6* | 64.53 | *BMP7* | 118.98 | *BMP8A* | 90.75 |
| *BMPR1B* | 72.6 | *BNIP3* | 177.46 | *BNIP3L* | 709.84 | *BRAF* | 1763.97 | *BRCA1* | 16.17 |
| *BRCA2* | 62.51 | *BRD2* | 1520.51 | *BRD3* | 189.56 | *BRD4* | 590.86 | *BRD7* | 929.65 |
| *BRIP1* | 81.45 | *BRIX1* | 215.78 | *BST1* | 97.44 | *BST2* | 897.38 | *BTK* | 14.12 |
| *BTLA* | 38.32 | *BUB1* | 183.51 | *BUB1B-PAK6* | 102.85 | *BYSL* | 54.45 | *C1QA* | 268.21 |
| *C1QB* | 705.81 | *C1QBP* | 371.05 | *C1R* | 272.24 | *C1S* | 538.43 | *C2* | 135.11 |
| *C2CD5* | 84.7 | *C3* | 2210.19 | *C3AR1* | 219.81 | *C4B* | 405.34 | *C4BPA* | 18.15 |
| *C5* | 6.05 | *C5AR1* | 69.9 | *C6* | 24.2 | *C7* | 548.51 | *C8A* | 56.46 |
| *C8B* | 14.12 | *C8G* | 14.12 | *C9* | 22.18 | *CA12* | 116.96 | *CA2* | 951.83 |
| *CA4* | 14.12 | *CACNA1C* | 86.71 | *CACNA1D* | 137.13 | *CACNA1E* | 56.46 | *CACNA1G* | 74.61 |
| *CACNA1H* | 121.0 | *CACNA2D1* | 129.06 | *CACNA2D2* | 4.03 | *CACNA2D3* | 16.13 | *CACNA2D4* | 10.08 |
| *CACNB2* | 80.68 | *CACNB3* | 72.6 | *CACNB4* | 36.3 | *CACNG1* | 66.55 | *CACNG4* | 66.55 |
| *CACNG6* | 102.85 | *CADPS* | 52.43 | *CALM1* | 2478.39 | *CALM2* | 1667.72 | *CALM3* | 1496.31 |
| *CALML3* | 693.71 | *CALML4* | 193.59 | *CALML5* | 683.62 | *CALML6* | 14.12 | *CAMK1* | 104.86 |
| *CAMK1D* | 28.29 | *CAMK1G* | 32.27 | *CAMK2A* | 4.03 | *CAMK2B* | 14.12 | *CAMK2D* | 292.41 |
| *CAMK2G* | 294.42 | *CAMK4* | 32.27 | *CAMP* | 18.15 | *CAPN2* | 1020.4 | *CAPN6* | 42.35 |
| *CARD11* | 54.45 | *CARD9* | 18.15 | *CASP1* | 165.36 | *CASP10* | 108.9 | *CASP12* | 20.17 |
| *CASP3* | 72.6 | *CASP7* | 229.89 | *CASP8* | 45.35 | *CASP9* | 104.3 | *CBL* | 262.64 |
| *CBLB* | 252.07 | *CBLC* | 123.01 | *CC2D1B* | 82.76 | *CCDC198* | 10.08 | *CCDC6* | 1625.37 |
| *CCL1* | 18.15 | *CCL11* | 118.98 | *CCL13* | 34.28 | *CCL14* | 528.35 | *CCL15* | 28.23 |
| *CCL16* | 6.05 | *CCL17* | 8.07 | *CCL18* | 290.39 | *CCL19* | 278.29 | *CCL2* | 296.44 |
| *CCL20* | 62.51 | *CCL21* | 223.84 | *CCL22* | 42.91 | *CCL23* | 24.2 | *CCL24* | 96.8 |
| *CCL25* | 20.17 | *CCL26* | 8.07 | *CCL27* | 8.07 | *CCL28* | 95.22 | *CCL3* | 139.14 |
| *CCL3L1* | 84.7 | *CCL4* | 112.93 | *CCL5* | 593.34 | *CCL7* | 10.08 | *CCL8* | 40.33 |
| *CCNA1* | 12.1 | *CCNA2* | 131.08 | *CCNB1* | 135.11 | *CCNB2* | 104.86 | *CCNB3* | 8.07 |
| *CCND1* | 403.32 | *CCND2* | 106.88 | *CCND3* | 189.56 | *CCNE1* | 237.96 | *CCNE2* | 20.17 |
| *CCNO* | 153.26 | *CCR1* | 231.91 | *CCR2* | 246.02 | *CCR3* | 92.76 | *CCR4* | 82.8 |
| *CCR5* | 48.4 | *CCR6* | 68.56 | *CCR7* | 8.07 | *CCR9* | 6.05 | *CCRL2* | 110.91 |
| *CD101* | 38.32 | *CD14* | 598.93 | *CD160* | 14.12 | *CD163* | 391.22 | *CD164* | 1179.71 |
| *CD180* | 64.97 | *CD19* | 24.2 | *CD1A* | 74.61 | *CD1B* | 84.7 | *CD1C* | 88.73 |
| *CD1D* | 90.75 | *CD1E* | 82.68 | *CD2* | 110.91 | *CD200* | 114.95 | *CD207* | 14.12 |
| *CD209* | 22.18 | *CD22* | 38.32 | *CD226* | 30.25 | *CD24* | 1776.58 | *CD244* | 80.66 |
| *CD247* | 22.18 | *CD27* | 64.53 | *CD274* | 10.08 | *CD276* | 171.41 | *CD28* | 66.55 |
| *CD300A* | 38.32 | *CD33* | 50.41 | *CD34* | 332.74 | *CD36* | 213.76 | *CD37* | 110.91 |
| *CD38* | 44.37 | *CD3D* | 68.56 | *CD3E* | 181.49 | *CD3EAP* | 109.24 | *CD3G* | 68.56 |
| *CD4* | 187.54 | *CD40* | 100.83 | *CD40LG* | 0.0 | *CD44* | 919.57 | *CD46* | 274.26 |
| *CD47* | 352.9 | *CD48* | 123.01 | *CD5* | 58.48 | *CD52* | 381.14 | *CD53* | 239.97 |
| *CD55* | 385.17 | *CD58* | 139.14 | *CD59* | 467.85 | *CD6* | 114.95 | *CD63* | 2075.07 |
| *CD68* | 1226.09 | *CD69* | 48.4 | *CD7* | 112.93 | *CD70* | 28.23 | *CD74* | 19806.97 |
| *CD79A* | 137.13 | *CD79B* | 16.13 | *CD80* | 56.46 | *CD81* | 2056.92 | *CD83* | 50.41 |
| *CD84* | 106.7 | *CD86* | 94.78 | *CD8A* | 78.65 | *CD8B* | 70.58 | *CD9* | 1343.05 |
| *CD96* | 55.54 | *CD99* | 903.43 | *CDC14A* | 32.27 | *CDC14B* | 48.4 | *CDC20* | 391.22 |
| *CDC25A* | 12.1 | *CDC25B* | 342.82 | *CDC25C* | 42.35 | *CDC42* | 1279.04 | *CDC42EP1* | 873.18 |
| *CDC6* | 40.33 | *CDC7* | 42.35 | *CDCA3* | 131.08 | *CDH1* | 832.85 | *CDH11* | 207.71 |
| *CDH16* | 20.17 | *CDH17* | 90.75 | *CDH2* | 40.33 | *CDH3* | 185.53 | *CDH5* | 102.85 |
| *CDK1* | 118.98 | *CDK2* | 193.59 | *CDK4* | 274.26 | *CDK6* | 108.9 | *CDKN1A* | 316.61 |
| *CDKN1B* | 504.15 | *CDKN1C* | 100.83 | *CDKN2A* | 332.74 | *CDKN2B* | 143.18 | *CDKN2C* | 141.16 |
| *CDKN2D* | 278.29 | *CDKN3* | 114.95 | *CDX2* | 139.14 | *CEACAM1* | 154.09 | *CEACAM3* | 34.28 |
| *CEACAM5* | 1376.63 | *CEACAM6* | 972.56 | *CEACAM8* | 64.53 | *CEBPA* | 336.77 | *CEBPB* | 276.27 |
| *CEBPE* | 552.55 | *CELSR2* | 94.78 | *CENPF* | 149.23 | *CEP55* | 104.86 | *CES3* | 70.58 |
| *CFB* | 385.17 | *CFD* | 790.5 | *CFI* | 121.0 | *CFL1* | 3089.42 | *CFP* | 70.58 |
| *CGAS* | 207.71 | *CHAD* | 38.32 | *CHEK1* | 70.58 | *CHEK2* | 76.63 | *CHGA* | 104.86 |
| *CHI3L1* | 30.25 | *CHIT1* | 2.02 | *CHRM3* | 48.4 | *CHSY1* | 217.79 | *CHUK* | 143.18 |
| *CIC* | 199.64 | *CIITA* | 106.88 | *CKLF* | 193.59 | *CKS1B* | 980.06 | *CKS2* | 274.26 |
| *CLCF1* | 46.38 | *CLDN18* | 901.42 | *CLEC10A* | 118.98 | *CLEC14A* | 976.03 | *CLEC4A* | 38.32 |
| *CLEC4C* | 12.1 | *CLEC4E* | 18.15 | *CLEC5A* | 16.13 | *CLEC6A* | 24.2 | *CLEC7A* | 52.43 |
| *CLECL1* | 127.05 | *CLTC* | 1518.49 | *CLU* | 613.04 | *CMA1* | 42.35 | *CMKLR1* | 62.51 |
| *CMTM4* | 106.88 | *CMTM6* | 270.22 | *CNOT10* | 110.91 | *CNOT2* | 217.79 | *CNOT4* | 213.76 |
| *CNTFR* | 48.4 | *COG7* | 185.53 | *COL11A1* | 34.28 | *COL11A2* | 64.53 | *COL17A1* | 141.16 |
| *COL1A1* | 5218.94 | *COL1A2* | 4134.01 | *COL24A1* | 52.43 | *COL27A1* | 133.1 | *COL2A1* | 64.53 |
| *COL3A1* | 4432.47 | *COL4A1* | 594.89 | *COL4A2* | 810.67 | *COL4A3* | 36.3 | *COL4A4* | 48.4 |
| *COL4A5* | 96.8 | *COL4A6* | 104.86 | *COL5A1* | 461.8 | *COL5A2* | 550.53 | *COL6A3* | 1139.37 |
| *COL6A6* | 40.33 | *COLEC12* | 134.41 | *COMP* | 42.35 | *CORO1A* | 157.29 | *COX11* | 225.86 |
| *COX4I1* | 1669.74 | *COX5B* | 2218.25 | *COX6A1* | 2720.38 | *COX6B1* | 1405.56 | *CPA3* | 304.51 |
| *CPEB2* | 181.49 | *CPSF7* | 381.14 | *CR1* | 20.17 | *CR2* | 12.1 | *CRABP2* | 818.74 |
| *CREB1* | 82.88 | *CREB3* | 159.31 | *CREB3L1* | 318.62 | *CREB3L2* | 173.43 | *CREB3L3* | 38.32 |
| *CREB3L4* | 90.75 | *CREB5* | 159.31 | *CREBBP* | 760.26 | *CRK* | 243.91 | *CRKL* | 381.14 |
| *CRLF2* | 14.12 | *CRP* | 88.73 | *CRTAM* | 16.13 | *CSF1* | 50.41 | *CSF1R* | 320.64 |
| *CSF2* | 54.45 | *CSF2RB* | 76.63 | *CSF3* | 64.53 | *CSF3R* | 78.65 | *CSNK1A1* | 653.38 |
| *CSNK1A1L* | 445.67 | *CST2* | 72.6 | *CT45A1* | 280.31 | *CTAG1B* | 18.11 | *CTAG2* | 405.38 |
| *CTAGE1* | 215.78 | *CTBP1* | 433.57 | *CTBP2* | 244.01 | *CTCFL* | 131.08 | *CTLA4* | 18.15 |
| *CTNNA1* | 433.57 | *CTNNA2* | 64.53 | *CTNNA3* | 78.65 | *CTNNB1* | 526.33 | *CTSC* | 356.94 |
| *CTSG* | 32.27 | *CTSH* | 568.68 | *CTSL* | 425.5 | *CTSS* | 357.06 | *CTSV* | 38.32 |
| *CTSW* | 72.6 | *CUL1* | 133.1 | *CUL2* | 237.96 | *CUL3* | 161.33 | *CX3CL1* | 74.61 |
| *CX3CR1* | 157.29 | *CXADR* | 331.75 | *CXCL1* | 81.03 | *CXCL10* | 90.75 | *CXCL11* | 16.13 |
| *CXCL12* | 147.21 | *CXCL13* | 82.68 | *CXCL14* | 356.94 | *CXCL16* | 383.15 | *CXCL2* | 348.51 |
| *CXCL3* | 441.63 | *CXCL5* | 2488.48 | *CXCL6* | 34.28 | *CXCL8* | 179.48 | *CXCL9* | 96.8 |
| *CXCR1* | 227.87 | *CXCR2* | 58.48 | *CXCR3* | 227.87 | *CXCR4* | 871.17 | *CXCR5* | 465.83 |
| *CXCR6* | 143.18 | *CXXC4* | 62.51 | *CXXC5* | 211.74 | *CYB561* | 178.61 | *CYBB* | 237.96 |
| *CYCS* | 1318.15 | *CYFIP2* | 106.88 | *CYLD* | 179.48 | *CYP17A1* | 42.35 | *CYP19A1* | 6.05 |
| *CYP1B1* | 161.33 | *CYP2D6* | 104.86 | *CYP4A11* | 32.27 | *CYP4A22* | 24.2 | *CYP8B1* | 268.21 |
| *DAB2* | 453.73 | *DACH2* | 0.0 | *DAPK1* | 92.76 | *DAPK2* | 78.83 | *DAPK3* | 96.8 |
| *DAXX* | 141.16 | *DCC* | 16.13 | *DCSTAMP* | 32.27 | *DDB1* | 508.18 | *DDB2* | 165.36 |
| *DDIT3* | 74.61 | *DDIT4* | 673.54 | *DDX21* | 645.31 | *DDX43* | 16.13 | *DDX50* | 106.88 |
| *DDX58* | 86.71 | *DEFB1* | 248.04 | *DEFB134* | 0.0 | *DEPTOR* | 102.85 | *DGAT2* | 286.36 |
| *DGLUCY* | 203.68 | *DHX16* | 207.71 | *DIO1* | 10.08 | *DIO2* | 730.01 | *DIPK2B* | 58.48 |
| *DKK1* | 86.71 | *DKK2* | 46.38 | *DKK4* | 30.25 | *DLK1* | 18.15 | *DLL1* | 165.36 |
| *DLL3* | 36.3 | *DLL4* | 76.63 | *DLX2* | 112.93 | *DMBT1* | 3121.69 | *DNAJC14* | 118.98 |
| *DNMT1* | 143.18 | *DNMT3A* | 116.96 | *DOCK9* | 195.61 | *DPF1* | 14.12 | *DPF3* | 52.43 |
| *DPP4* | 18.15 | *DSC3* | 144.21 | *DSP* | 1064.76 | *DST* | 393.24 | *DTX1* | 44.37 |
| *DTX3* | 221.83 | *DTX3L* | 359.82 | *DTX4* | 110.91 | *DUOX1* | 258.12 | *DUOX2* | 227.87 |
| *DUSP1* | 687.66 | *DUSP10* | 106.88 | *DUSP2* | 106.88 | *DUSP4* | 114.95 | *DUSP5* | 171.41 |
| *DUSP6* | 459.78 | *DUSP8* | 94.78 | *DVL1* | 316.61 | *DVL2* | 181.49 | *DVL3* | 506.16 |
| *E2F1* | 56.46 | *E2F2* | 141.16 | *E2F3* | 187.54 | *E2F4* | 873.18 | *E2F5* | 96.8 |
| *EBI3* | 42.35 | *ECSIT* | 86.71 | *EDC3* | 114.95 | *EDN1* | 96.8 | *EFNA1* | 340.8 |
| *EFNA2* | 50.41 | *EFNA3* | 94.78 | *EFNA4* | 149.23 | *EFNA5* | 80.66 | *EGF* | 14.12 |
| *EGFR* | 1054.68 | *EGLN1* | 302.49 | *EGLN2* | 328.7 | *EGLN3* | 233.92 | *EGR1* | 758.24 |
| *EGR2* | 463.82 | *EGR3* | 502.13 | *EHHADH* | 50.41 | *EIF2AK2* | 188.69 | *EIF2B4* | 133.1 |
| *EIF4EBP1* | 302.49 | *EIF5AL1* | 395.25 | *ELANE* | 34.28 | *ELAVL4* | 24.2 | *ELK1* | 215.78 |
| *ELMO1* | 112.93 | *ELOB* | 1308.77 | *ELOC* | 475.92 | *ELOVL6* | 87.02 | *EML4* | 2238.42 |
| *EMX2* | 60.5 | *ENDOG* | 118.98 | *ENG* | 282.32 | *ENO1* | 2315.05 | *ENTPD1* | 165.91 |
| *EOMES* | 22.18 | *EP300* | 457.77 | *EPAS1* | 1030.48 | *EPCAM* | 1897.61 | *EPHA2* | 153.26 |
| *EPM2AIP1* | 399.29 | *EPO* | 66.55 | *EPOR* | 36.3 | *EPS8L3* | 181.49 | *ERBB2* | 17818.61 |
| *ERCC1* | 306.52 | *ERCC2* | 54.45 | *ERCC3* | 147.21 | *ERCC4* | 48.44 | *ERCC5* | 183.51 |
| *ERCC6* | 131.08 | *EREG* | 24.2 | *ERG* | 225.86 | *ERN2* | 399.29 | *ERO1A* | 568.17 |
| *ESR1* | 617.08 | *ESR2* | 54.45 | *ETHE1* | 241.99 | *ETS1* | 298.46 | *ETS2* | 467.85 |
| *ETV1* | 336.77 | *ETV4* | 490.03 | *ETV5* | 229.89 | *ETV7* | 26.22 | *EVA1A* | 36.3 |
| *EWSR1* | 1899.63 | *EXO1* | 56.46 | *EYA1* | 12.1 | *EZH2* | 52.43 | *F12* | 2.02 |
| *F13A1* | 419.45 | *F2RL1* | 141.16 | *FAAP24* | 56.46 | *FABP1* | 185.53 | *FABP4* | 496.08 |
| *FADD* | 151.24 | *FAM124B* | 173.43 | *FAM13C* | 90.75 | *FAM167A* | 74.61 | *FAM30A* | 8.07 |
| *FANCA* | 38.32 | *FANCB* | 6.05 | *FANCC* | 76.63 | *FANCD2* | 110.91 | *FANCE* | 18.15 |
| *FANCF* | 320.64 | *FANCG* | 32.27 | *FANCL* | 64.53 | *FAP* | 18.15 | *FAS* | 50.41 |
| *FASLG* | 18.15 | *FAU* | 2264.63 | *FBP1* | 125.03 | *FBXW7* | 149.23 | *FCAR* | 45.64 |
| *FCER1A* | 34.28 | *FCER1G* | 167.38 | *FCER2* | 0.0 | *FCF1* | 261.47 | *FCGR1A* | 481.97 |
| *FCGR2A* | 163.34 | *FCGR2B* | 104.86 | *FCGR3A* | 75.36 | *FCGR3B* | 196.88 | *FCGRT* | 377.1 |
| *FCHO1* | 100.83 | *FCN1* | 14.58 | *FCRL2* | 16.13 | *FCRLA* | 102.85 | *FEN1* | 415.42 |
| *FEZ1* | 147.57 | *FGF1* | 26.22 | *FGF10* | 32.27 | *FGF11* | 34.28 | *FGF12* | 26.22 |
| *FGF13* | 24.26 | *FGF14* | 32.27 | *FGF16* | 50.41 | *FGF17* | 34.28 | *FGF18* | 22.18 |
| *FGF19* | 14.12 | *FGF2* | 108.9 | *FGF20* | 12.1 | *FGF21* | 70.58 | *FGF22* | 12.1 |
| *FGF23* | 72.6 | *FGF3* | 42.35 | *FGF4* | 2.02 | *FGF5* | 109.42 | *FGF6* | 46.38 |
| *FGF7* | 225.86 | *FGF8* | 8.07 | *FGF9* | 40.33 | *FGFR1* | 2936.16 | *FGFR2* | 5692.84 |
| *FGFR3* | 2581.24 | *FGFR4* | 441.63 | *FH* | 308.54 | *FHIT* | 52.43 | *FLCN* | 148.04 |
| *FLG* | 46.38 | *FLNA* | 3143.87 | *FLNB* | 457.77 | *FLNC* | 336.77 | *FLT1* | 123.01 |
| *FLT3* | 8.07 | *FLT3LG* | 62.51 | *FLT4* | 68.56 | *FN1* | 8195.43 | *FOLH1* | 12.1 |
| *FOS* | 1552.78 | *FOSL1* | 64.53 | *FOXA1* | 2559.06 | *FOXA2* | 278.29 | *FOXC1* | 794.54 |
| *FOXE1* | 288.37 | *FOXG1* | 252.07 | *FOXJ1* | 102.85 | *FOXL2* | 816.72 | *FOXM1* | 203.68 |
| *FOXO1* | 292.41 | *FOXO3* | 788.49 | *FOXO4* | 139.14 | *FOXP3* | 54.45 | *FPR1* | 189.56 |
| *FPR2* | 100.83 | *FPR3* | 8.07 | *FRAT1* | 179.48 | *FRAT2* | 338.79 | *FST* | 28.23 |
| *FSTL3* | 205.69 | *FUBP1* | 135.11 | *FUS* | 5.91 | *FUT4* | 426.53 | *FUT5* | 270.22 |
| *FUT7* | 362.99 | *FUT8* | 165.36 | *FYB1* | 187.54 | *FYN* | 191.58 | *FZD1* | 455.75 |
| *FZD10* | 600.94 | *FZD2* | 662.37 | *FZD3* | 95.36 | *FZD4* | 546.5 | *FZD5* | 657.41 |
| *FZD6* | 165.36 | *FZD7* | 494.07 | *FZD8* | 500.11 | *FZD9* | 649.34 | *G6PD* | 189.56 |
| *GAB1* | 324.67 | *GAB2* | 514.23 | *GABPA* | 213.76 | *GABRB2* | 8.07 | *GADD45A* | 163.34 |
| *GADD45B* | 161.33 | *GADD45G* | 159.31 | *GADD45GIP1* | 465.83 | *GADL1* | 42.35 | *GAGE1* | 34.0 |
| *GAGE10* | 6.84 | *GAGE12F* | 615.85 | *GAGE12I* | 0.06 | *GAGE12J* | 541.78 | *GAGE13* | 0.0 |
| *GAGE2A* | 372.77 | *GAGE2C* | 103.94 | *GAGE2E* | 0.56 | *GAPDH* | 5343.97 | *GAS1* | 318.62 |
| *GATA1* | 14.12 | *GATA2* | 141.16 | *GATA3* | 86.71 | *GBP1* | 80.66 | *GBP2* | 225.86 |
| *GBP4* | 216.08 | *GCG* | 10.08 | *GDF15* | 137.13 | *GDF6* | 131.08 | *GEMIN4* | 195.61 |
| *GFAP* | 72.6 | *GHR* | 36.3 | *GIMAP4* | 104.86 | *GIMAP6* | 108.9 | *GJA1* | 197.63 |
| *GJB6* | 131.08 | *GLI1* | 88.73 | *GLI2* | 173.43 | *GLI3* | 40.33 | *GLIS3* | 78.65 |
| *GLS* | 153.26 | *GLUD1* | 469.87 | *GLUL* | 1511.42 | *GMIP* | 147.21 | *GNA11* | 437.6 |
| *GNA14* | 106.88 | *GNAQ* | 411.38 | *GNAS* | 3196.3 | *GNG12* | 387.19 | *GNG4* | 31.28 |
| *GNG7* | 40.33 | *GNGT1* | 8.07 | *GNL3* | 399.29 | *GNLY* | 56.46 | *GOT1* | 175.44 |
| *GOT2* | 106.88 | *GPATCH3* | 127.05 | *GPC4* | 96.8 | *GPI* | 702.66 | *GPM6B* | 32.27 |
| *GPR160* | 838.9 | *GPR18* | 143.18 | *GPR3* | 369.04 | *GPS1* | 389.2 | *GPSM3* | 203.68 |
| *GPT* | 52.43 | *GPX1* | 1679.82 | *GPX3* | 453.73 | *GPX4* | 1722.17 | *GRAP2* | 40.33 |
| *GRB2* | 332.74 | *GRB7* | 377.1 | *GREM1* | 272.24 | *GRIA3* | 20.17 | *GRIN1* | 22.18 |
| *GRIN2A* | 70.58 | *GRIN2B* | 74.61 | *GSK3B* | 290.39 | *GSN* | 2377.56 | *GSTA1* | 39.71 |
| *GSTA2* | 14.36 | *GSTA3* | 0.0 | *GSTA4* | 84.7 | *GSTA5* | 6.43 | *GSTM1* | 1620.86 |
| *GSTM2* | 215.59 | *GSTM3* | 129.73 | *GSTM4* | 693.71 | *GSTM5* | 97.44 | *GSTO1* | 248.04 |
| *GSTO2* | 139.14 | *GSTP1* | 4464.74 | *GSTT1* | 278.29 | *GSTT2* | 41.95 | *GSTT2B* | 62.92 |
| *GTF2H3* | 233.92 | *GTF3C1* | 270.22 | *GTPBP4* | 312.73 | *GUSB* | 233.92 | *GZMA* | 62.51 |
| *GZMB* | 75.8 | *GZMH* | 55.27 | *GZMK* | 106.88 | *GZMM* | 48.4 | *H2AX* | 776.39 |
| *H3-3A* | 2669.97 | *H3-5* | 576.75 | *H3C10* | 1441.86 | *H3C2* | 1443.88 | *H3C8* | 798.57 |
| *HACD2* | 383.15 | *HAMP* | 28.23 | *HAVCR2* | 68.56 | *HBB* | 840.92 | *HBEGF* | 76.63 |
| *HCK* | 58.48 | *HDAC1* | 611.03 | *HDAC10* | 70.58 | *HDAC11* | 147.21 | *HDAC2* | 352.9 |
| *HDAC3* | 235.94 | *HDAC4* | 44.37 | *HDAC5* | 86.71 | *HDAC6* | 92.76 | *HDC* | 20.17 |
| *HELLS* | 118.98 | *HERC6* | 100.83 | *HES1* | 157.29 | *HES5* | 14.12 | *HEY1* | 50.41 |
| *HEY2* | 44.37 | *HEYL* | 161.33 | *HFM1* | 10.08 | *HGD* | 30.25 | *HGF* | 38.32 |
| *HHEX* | 78.65 | *HHIP* | 18.57 | *HIF1A* | 205.69 | *HK1* | 248.04 | *HK2* | 129.06 |
| *HLA-A* | 3017.81 | *HLA-B* | 4927.97 | *HLA-C* | 2924.93 | *HLA-DMA* | 697.74 | *HLA-DMB* | 254.09 |
| *HLA-DOA* | 125.03 | *HLA-DOB* | 46.38 | *HLA-DPA1* | 1363.22 | *HLA-DPB1* | 443.65 | *HLA-DQA1* | 416.14 |
| *HLA-DQA2* | 180.77 | *HLA-DQB1* | 465.31 | *HLA-DQB2* | 67.07 | *HLA-DRA* | 2105.32 | *HLA-DRB1* | 833.07 |
| *HLA-DRB3* | 0.0 | *HLA-DRB4* | 369.72 | *HLA-DRB5* | 674.65 | *HLA-E* | 2688.82 | *HLA-F* | 556.58 |
| *HLA-F-AS1* | 18.15 | *HLA-G* | 74.65 | *HLF* | 225.86 | *HMBS* | 56.46 | *HMGA1* | 1260.37 |
| *HMGA2* | 30.25 | *HMGB1* | 1242.08 | *HMGN5* | 32.27 | *HMOX1* | 169.39 | *HNF1A* | 72.6 |
| *HNRNPL* | 1439.85 | *HOXA10* | 330.72 | *HOXA11* | 209.73 | *HOXA9* | 278.29 | *HOXC10* | 494.07 |
| *HOXD11* | 36.3 | *HPGD* | 1258.35 | *HPRT1* | 110.91 | *HRAS* | 127.05 | *HSD11B1* | 20.17 |
| *HSD17B8* | 121.0 | *HSDL2* | 149.23 | *HSP90AA1* | 1889.55 | *HSP90AB1* | 1855.27 | *HSP90B1* | 1328.93 |
| *HSPA1A* | 2978.51 | *HSPA2* | 1131.31 | *HSPA6* | 1788.72 | *HSPB1* | 5852.15 | *HTR3A* | 143.18 |
| *HYDIN* | 8.07 | *IBSP* | 20.17 | *ICAM1* | 167.38 | *ICAM2* | 106.88 | *ICAM3* | 62.51 |
| *ICAM4* | 135.11 | *ICAM5* | 20.17 | *ICOS* | 20.17 | *ICOSLG* | 50.41 | *ID1* | 439.62 |
| *ID2* | 229.89 | *ID3* | 387.19 | *ID4* | 110.91 | *IDH1* | 574.73 | *IDH2* | 399.29 |
| *IDO1* | 56.16 | *IDO2* | 0.0 | *IER3* | 574.73 | *IFI16* | 256.11 | *IFI27* | 766.31 |
| *IFI35* | 78.65 | *IFI44L* | 167.38 | *IFI6* | 457.77 | *IFIH1* | 127.05 | *IFIT1* | 233.92 |
| *IFIT2* | 207.71 | *IFIT3* | 50.41 | *IFITM1* | 1759.76 | *IFITM2* | 2761.44 | *IFNA1* | 908.01 |
| *IFNA17* | 446.37 | *IFNA2* | 527.04 | *IFNA7* | 467.63 | *IFNA8* | 564.93 | *IFNAR1* | 352.9 |
| *IFNAR2* | 94.78 | *IFNB1* | 237.96 | *IFNG* | 6.05 | *IFNGR1* | 397.27 | *IFNGR2* | 713.87 |
| *IFNL1* | 20.17 | *IFNL2* | 28.23 | *IGF1* | 420.94 | *IGF1R* | 84.7 | *IGF2* | 203.68 |
| *IGF2R* | 260.32 | *IGFBP2* | 570.7 | *IGFBP3* | 411.38 | *IGFBP7* | 1704.02 | *IGLL1* | 56.46 |
| *IGSF6* | 70.74 | *IHH* | 171.41 | *IKBKB* | 185.53 | *IKBKE* | 38.32 | *IKBKG* | 50.41 |
| *IKZF1* | 102.85 | *IKZF2* | 82.68 | *IKZF3* | 68.95 | *IKZF4* | 70.58 | *IL10* | 42.35 |
| *IL10RA* | 82.68 | *IL11* | 24.2 | *IL11RA* | 60.5 | *IL12A* | 28.23 | *IL12B* | 12.1 |
| *IL12RB1* | 24.2 | *IL12RB2* | 10.08 | *IL13* | 10.08 | *IL13RA1* | 411.38 | *IL13RA2* | 0.0 |
| *IL15* | 28.23 | *IL15RA* | 129.06 | *IL16* | 50.41 | *IL17A* | 6.05 | *IL17B* | 68.56 |
| *IL17F* | 36.3 | *IL17RA* | 213.4 | *IL17RB* | 18.15 | *IL18* | 239.97 | *IL18R1* | 62.51 |
| *IL18RAP* | 30.25 | *IL19* | 18.15 | *IL1A* | 6.05 | *IL1B* | 56.46 | *IL1R1* | 661.44 |
| *IL1R2* | 90.75 | *IL1RAP* | 98.81 | *IL1RAPL2* | 6.05 | *IL1RL1* | 34.28 | *IL1RL2* | 46.38 |
| *IL1RN* | 792.52 | *IL2* | 12.1 | *IL20RA* | 14.12 | *IL20RB* | 131.08 | *IL21* | 22.18 |
| *IL21R* | 20.17 | *IL22* | 18.15 | *IL22RA1* | 24.2 | *IL22RA2* | 0.0 | *IL23A* | 76.63 |
| *IL23R* | 12.1 | *IL24* | 40.33 | *IL25* | 405.34 | *IL26* | 8.07 | *IL27* | 8.07 |
| *IL2RA* | 98.81 | *IL2RB* | 36.3 | *IL2RG* | 354.92 | *IL3* | 20.17 | *IL32* | 348.87 |
| *IL33* | 64.53 | *IL34* | 42.35 | *IL3RA* | 48.4 | *IL4* | 16.13 | *IL4R* | 211.74 |
| *IL5* | 10.08 | *IL5RA* | 20.17 | *IL6* | 167.38 | *IL6R* | 56.46 | *IL6ST* | 641.28 |
| *IL7* | 72.6 | *IL7R* | 106.88 | *IL9* | 6.05 | *ILF3* | 356.94 | *ILK* | 403.32 |
| *ING4* | 72.6 | *INHBA* | 90.75 | *INHBB* | 74.61 | *INPP5D* | 114.95 | *INS* | 26.22 |
| *INSRR* | 133.1 | *IRAK1* | 496.08 | *IRAK2* | 141.16 | *IRAK3* | 108.96 | *IRAK4* | 77.88 |
| *IRF1* | 160.72 | *IRF2* | 173.43 | *IRF3* | 248.04 | *IRF4* | 54.45 | *IRF5* | 66.55 |
| *IRF7* | 98.81 | *IRF8* | 94.78 | *IRF9* | 221.83 | *IRGM* | 10.08 | *IRS1* | 435.58 |
| *ISG15* | 330.72 | *ISG20* | 197.63 | *ISL1* | 30.25 | *ITCH* | 302.49 | *ITGA1* | 381.14 |
| *ITGA2* | 312.57 | *ITGA2B* | 16.13 | *ITGA3* | 106.88 | *ITGA4* | 137.13 | *ITGA5* | 173.43 |
| *ITGA6* | 358.95 | *ITGA7* | 183.51 | *ITGA8* | 229.89 | *ITGA9* | 78.65 | *ITGAE* | 0.0 |
| *ITGAL* | 40.92 | *ITGAM* | 44.37 | *ITGAV* | 433.57 | *ITGAX* | 62.51 | *ITGB1* | 1623.36 |
| *ITGB2* | 181.49 | *ITGB3* | 60.5 | *ITGB4* | 330.72 | *ITGB6* | 584.81 | *ITGB7* | 8.07 |
| *ITGB8* | 187.54 | *ITK* | 62.51 | *ITPK1* | 339.59 | *JADE1* | 139.14 | *JAG1* | 276.27 |
| *JAG2* | 50.41 | *JAK1* | 274.26 | *JAK2* | 149.23 | *JAK3* | 129.18 | *JAM3* | 104.86 |
| *JAML* | 76.63 | *JCHAIN* | 2750.63 | *JUN* | 1050.64 | *JUNB* | 1738.3 | *JUP* | 1468.08 |
| *KAT2B* | 258.12 | *KATNAL2* | 16.13 | *KBTBD8* | 32.27 | *KCNAB1* | 24.2 | *KCNIP3* | 16.13 |
| *KCNJ11* | 753.02 | *KCNN4* | 133.1 | *KDELR2* | 1369.27 | *KDM5C* | 294.42 | *KDM6A* | 213.76 |
| *KDR* | 163.34 | *KEAP1* | 262.16 | *KIF12* | 34.28 | *KIF2C* | 90.75 | *KIF7* | 50.41 |
| *KIR2DL1* | 154.03 | *KIR2DL2* | 43.7 | *KIR2DL3* | 179.17 | *KIR2DS4* | 186.21 | *KIR3DL1* | 150.26 |
| *KIR3DL2* | 171.93 | *KIR3DL3* | 288.37 | *KIR3DS1* | 0.0 | *KIT* | 344.84 | *KITLG* | 246.02 |
| *KLF2* | 377.1 | *KLF4* | 675.56 | *KLK2* | 58.48 | *KLK3* | 28.23 | *KLRB1* | 30.25 |
| *KLRC1* | 128.34 | *KLRC2* | 14.84 | *KLRD1* | 48.62 | *KLRF1* | 18.15 | *KLRG1* | 36.3 |
| *KLRK1* | 30.25 | *KMT2C* | 233.92 | *KMT2D* | 312.57 | *KRAS* | 84.7 | *KREMEN1* | 299.79 |
| *KRT1* | 78.65 | *KRT10* | 24.2 | *KRT13* | 21867.93 | *KRT14* | 416.69 | *KRT15* | 2181.95 |
| *KRT17* | 230.64 | *KRT18* | 1058.71 | *KRT19* | 1548.74 | *KRT20* | 36.3 | *KRT5* | 4152.22 |
| *KRT6A* | 4608.08 | *KRT6B* | 1074.2 | *KRT6C* | 535.16 | *KRT7* | 745.82 | *KYAT1* | 28.23 |
| *L1CAM* | 22.18 | *LAG3* | 40.33 | *LAIR1* | 137.13 | *LAIR2* | 18.15 | *LAMA1* | 42.35 |
| *LAMA2* | 157.29 | *LAMA3* | 288.37 | *LAMA4* | 244.01 | *LAMA5* | 816.72 | *LAMB1* | 201.66 |
| *LAMB2* | 508.18 | *LAMB3* | 241.99 | *LAMB4* | 20.17 | *LAMC1* | 556.58 | *LAMC2* | 237.96 |
| *LAMC3* | 83.45 | *LAMP1* | 802.6 | *LAMP2* | 175.44 | *LAMP3* | 54.45 | *LAPTM5* | 885.28 |
| *LAT* | 48.4 | *LBP* | 14.12 | *LCK* | 66.55 | *LCN2* | 2817.18 | *LCOR* | 288.37 |
| *LCP1* | 203.68 | *LDHA* | 933.68 | *LDHB* | 677.58 | *LEF1* | 121.0 | *LEFTY1* | 136.5 |
| *LEFTY2* | 69.19 | *LEP* | 42.35 | *LEPR* | 58.48 | *LEXM* | 20.17 | *LFNG* | 270.22 |
| *LGALS3* | 1276.5 | *LGALS4* | 490.03 | *LGALS9* | 354.92 | *LGR5* | 72.6 | *LHX3* | 46.38 |
| *LIF* | 44.37 | *LIFR* | 276.27 | *LIG1* | 70.58 | *LIG3* | 102.71 | *LIG4* | 268.21 |
| *LILRA1* | 110.91 | *LILRA4* | 110.91 | *LILRA5* | 62.51 | *LILRB1* | 148.12 | *LILRB2* | 182.6 |
| *LILRB3* | 71.39 | *LILRB4* | 193.59 | *LLGL1* | 228.52 | *LMNA* | 4008.99 | *LOXL2* | 274.26 |
| *LRG1* | 50.41 | *LRP1* | 861.08 | *LRP2* | 6.05 | *LRP5* | 262.16 | *LRP6* | 183.51 |
| *LRRC32* | 169.39 | *LRRN3* | 46.38 | *LST1* | 26.22 | *LTA* | 40.33 | *LTB* | 46.38 |
| *LTBP1* | 375.09 | *LTBR* | 411.38 | *LTF* | 405.34 | *LTK* | 22.18 | *LUM* | 1141.39 |
| *LY6E* | 931.67 | *LY6K* | 147.21 | *LY86* | 8.07 | *LY9* | 26.22 | *LY96* | 54.45 |
| *LYN* | 229.89 | *LYZ* | 3510.28 | *M6PR* | 284.34 | *MAD2L1* | 108.8 | *MAD2L2* | 78.65 |
| *MADCAM1* | 58.48 | *MAF* | 185.53 | *MAFF* | 116.96 | *MAGEA1* | 194.68 | *MAGEA10* | 22.18 |
| *MAGEA12* | 135.11 | *MAGEA3* | 587.96 | *MAGEA4* | 531.29 | *MAGEA6* | 194.48 | *MAGEB2* | 32.27 |
| *MAGEC1* | 12.1 | *MAGEC2* | 36.3 | *MALT1* | 166.91 | *MAML2* | 147.21 | *MAP2K1* | 187.54 |
| *MAP2K2* | 635.23 | *MAP2K3* | 199.64 | *MAP2K4* | 82.68 | *MAP2K6* | 48.4 | *MAP3K1* | 147.21 |
| *MAP3K12* | 70.58 | *MAP3K13* | 54.45 | *MAP3K14* | 98.81 | *MAP3K20* | 395.25 | *MAP3K5* | 139.14 |
| *MAP3K7* | 175.44 | *MAP3K8* | 143.18 | *MAP4K2* | 41.02 | *MAPK1* | 304.51 | *MAPK10* | 30.25 |
| *MAPK11* | 30.25 | *MAPK12* | 42.35 | *MAPK14* | 123.01 | *MAPK3* | 564.65 | *MAPK8* | 42.35 |
| *MAPK8IP1* | 78.65 | *MAPK8IP2* | 41.46 | *MAPK9* | 185.53 | *MAPKAPK2* | 453.73 | *MAPT* | 72.6 |
| *MARCKS* | 909.48 | *MARCO* | 36.3 | *MASP1* | 143.18 | *MASP2* | 22.18 | *MAVS* | 493.96 |
| *MAX* | 526.33 | *MBL2* | 58.48 | *MBNL1* | 990.15 | *MBNL3* | 219.81 | *MCAM* | 231.71 |
| *MCAT* | 50.41 | *MCL1* | 1399.52 | *MCM2* | 94.78 | *MCM4* | 118.98 | *MCM5* | 137.13 |
| *MCM7* | 167.38 | *MDC1* | 54.45 | *MDFIC* | 92.76 | *MDM2* | 342.82 | *MDM4* | 150.07 |
| *ME2* | 219.93 | *MECOM* | 352.9 | *MED12* | 163.34 | *MEF2C* | 88.73 | *MEFV* | 112.87 |
| *MEIS1* | 76.63 | *MELK* | 82.68 | *MEN1* | 209.73 | *MERTK* | 104.86 | *MET* | 1546.73 |
| *MFGE8* | 252.07 | *MFNG* | 104.86 | *MGMT* | 183.51 | *MGP* | 3391.91 | *MGST1* | 274.26 |
| *MGST2* | 298.46 | *MGST3* | 978.05 | *MIA* | 96.8 | *MIB1* | 177.46 | *MICA* | 127.05 |
| *MICB* | 32.27 | *MIF* | 2438.06 | *MITF* | 92.76 | *MKI67* | 256.11 | *MLANA* | 6.05 |
| *MLEC* | 461.8 | *MLF1* | 123.01 | *MLH1* | 48.4 | *MLLT3* | 123.01 | *MLPH* | 145.19 |
| *MME* | 44.37 | *MMP1* | 514.23 | *MMP11* | 217.79 | *MMP12* | 62.51 | *MMP2* | 935.7 |
| *MMP3* | 26.22 | *MMP7* | 479.95 | *MMP9* | 90.75 | *MMRN2* | 88.73 | *MNAT1* | 66.55 |
| *MNX1* | 50.41 | *MPL* | 16.35 | *MPO* | 12.1 | *MPPED1* | 22.18 | *MR1* | 123.01 |
| *MRC1* | 88.73 | *MRE11* | 159.31 | *MRM2* | 70.58 | *MRPL19* | 318.62 | *MRPS5* | 316.61 |
| *MS4A1* | 26.22 | *MS4A2* | 17.38 | *MS4A4A* | 123.01 | *MS4A6A* | 350.89 | *MSH2* | 108.9 |
| *MSH3* | 102.85 | *MSH6* | 159.31 | *MSMB* | 8.07 | *MSR1* | 272.24 | *MSRB2* | 161.33 |
| *MST1R* | 258.12 | *MTF1* | 96.94 | *MTF2* | 96.8 | *MTMR14* | 125.03 | *MTOR* | 84.7 |
| *MTRR* | 135.11 | *MUC1* | 4146.11 | *MUC2* | 18.15 | *MUC4* | 270.22 | *MUTYH* | 84.7 |
| *MX1* | 274.26 | *MXI1* | 360.97 | *MYB* | 336.77 | *MYBL2* | 246.02 | *MYC* | 492.05 |
| *MYCN* | 18.15 | *MYCT1* | 88.73 | *MYD88* | 189.56 | *NAALAD2* | 18.15 | *NANOG* | 230.62 |
| *NASP* | 256.11 | *NAT1* | 32.27 | *NAT8L* | 60.5 | *NBN* | 207.71 | *NCAM1* | 50.41 |
| *NCF1* | 96.8 | *NCF4* | 58.48 | *NCL* | 2667.95 | *NCOA1* | 104.86 | *NCOA2* | 250.06 |
| *NCOA3* | 358.95 | *NCOA4* | 2222.28 | *NCOR1* | 459.78 | *NCOR2* | 367.02 | *NCR1* | 24.2 |
| *NCR3* | 96.8 | *NDC1* | 159.31 | *NDC80* | 46.38 | *NDUFA1* | 1796.78 | *NDUFA11* | 641.28 |
| *NDUFA12* | 584.81 | *NDUFA13* | 578.76 | *NDUFA2* | 443.65 | *NDUFA3* | 1962.14 | *NDUFA4L2* | 272.24 |
| *NDUFA6* | 725.97 | *NDUFA7* | 213.76 | *NDUFB1* | 594.89 | *NDUFB10* | 580.78 | *NDUFB11* | 1631.42 |
| *NDUFB4* | 1393.47 | *NDUFB7* | 417.43 | *NDUFB8* | 451.72 | *NDUFS7* | 320.64 | *NDUFS8* | 1088.96 |
| *NECTIN1* | 340.8 | *NECTIN2* | 427.52 | *NECTIN4* | 141.16 | *NEFL* | 207.71 | *NEIL1* | 28.23 |
| *NEIL3* | 118.98 | *NF1* | 288.37 | *NF2* | 248.04 | *NFAM1* | 48.4 | *NFATC1* | 175.44 |
| *NFATC2* | 250.06 | *NFATC3* | 125.03 | *NFATC4* | 92.76 | *NFE2L2* | 387.19 | *NFIL3* | 556.58 |
| *NFKB1* | 201.66 | *NFKB2* | 74.61 | *NFKBIA* | 742.11 | *NFKBIE* | 114.95 | *NFKBIZ* | 266.19 |
| *NGF* | 36.3 | *NGFR* | 125.03 | *NID2* | 344.84 | *NKD1* | 108.9 | *NKG7* | 161.33 |
| *NKX2-1* | 191.58 | *NKX3-1* | 14.12 | *NLRC5* | 121.0 | *NLRP3* | 58.48 | *NOD1* | 40.33 |
| *NOD2* | 8.07 | *NODAL* | 70.58 | *NOG* | 90.75 | *NOL7* | 203.68 | *NOP16* | 167.38 |
| *NOS1* | 26.22 | *NOS2* | 16.13 | *NOS3* | 50.41 | *NOTCH1* | 207.71 | *NOTCH2* | 2843.4 |
| *NOTCH3* | 235.94 | *NOTCH4* | 106.88 | *NOX1* | 14.12 | *NPM1* | 3964.62 | *NPM2* | 28.23 |
| *NPTX2* | 62.51 | *NPY1R* | 2.02 | *NQO1* | 880.73 | *NR3C1* | 114.95 | *NR4A1* | 290.39 |
| *NR4A3* | 350.89 | *NRAS* | 229.89 | *NRDE2* | 50.8 | *NRG1* | 131.08 | *NRP1* | 276.27 |
| *NSD1* | 346.85 | *NSD2* | 284.34 | *NSD3* | 693.71 | *NT5E* | 98.81 | *NTF3* | 133.1 |
| *NTHL1* | 68.56 | *NTN3* | 16.13 | *NTRK1* | 617.08 | *NTRK2* | 237.96 | *NTRK3* | 282.32 |
| *NUBP1* | 137.13 | *NUF2* | 70.58 | *NUMB* | 163.34 | *NUMBL* | 92.76 | *NUP107* | 123.82 |
| *NUPR1* | 518.26 | *OAS1* | 181.49 | *OAS2* | 90.75 | *OAS3* | 205.69 | *OASL* | 108.9 |
| *OAT* | 405.34 | *OAZ1* | 3468.54 | *OLFML2B* | 118.98 | *OLR1* | 18.15 | *OPN3* | 149.23 |
| *ORC6* | 53.1 | *OSM* | 38.32 | *OTC* | 20.17 | *OTOA* | 106.88 | *P2RY13* | 177.46 |
| *P4HA1* | 229.89 | *P4HA2* | 343.47 | *PAK1* | 268.21 | *PAK2* | 469.87 | *PAK3* | 22.28 |
| *PAK4* | 135.17 | *PAK5* | 22.18 | *PAK6* | 314.59 | *PALMD* | 139.14 | *PANX3* | 42.35 |
| *PARG* | 310.56 | *PARP12* | 205.69 | *PARP2* | 151.24 | *PARP4* | 231.91 | *PARP9* | 322.65 |
| *PASD1* | 6.05 | *PAX3* | 26.22 | *PAX5* | 24.2 | *PAX8* | 326.69 | *PBK* | 48.4 |
| *PBRM1* | 431.55 | *PBX1* | 304.51 | *PBX3* | 112.93 | *PC* | 50.41 | *PCBP1* | 2254.55 |
| *PCDH7* | 90.75 | *PCK1* | 40.33 | *PCK2* | 157.29 | *PCLAF* | 322.27 | *PCNA* | 296.44 |
| *PCP4* | 44.37 | *PDCD1* | 127.05 | *PDCD1LG2* | 28.23 | *PDE5A* | 248.04 | *PDGFA* | 179.48 |
| *PDGFB* | 365.0 | *PDGFC* | 70.58 | *PDGFD* | 100.83 | *PDGFRA* | 851.0 | *PDGFRB* | 879.23 |
| *PDK1* | 102.85 | *PDLIM4* | 159.31 | *PDPK1* | 377.1 | *PDPN* | 107.42 | *PDZK1IP1* | 304.51 |
| *PEBP1* | 881.25 | *PECAM1* | 649.34 | *PEG3* | 20.17 | *PER2* | 116.08 | *PF4* | 48.4 |
| *PFKFB3* | 266.19 | *PFKM* | 92.76 | *PGF* | 58.48 | *PGK1* | 652.43 | *PGM2* | 145.19 |
| *PGPEP1* | 59.83 | *PGR* | 28.23 | *PHF10* | 266.19 | *PHF6* | 123.01 | *PHGDH* | 56.46 |
| *PHLDA2* | 250.06 | *PI15* | 48.4 | *PIAS1* | 429.53 | *PIAS2* | 175.44 | *PIAS3* | 256.11 |
| *PIAS4* | 82.68 | *PIGR* | 1375.38 | *PIK3CA* | 167.38 | *PIK3CB* | 252.07 | *PIK3CD* | 56.46 |
| *PIK3CG* | 114.95 | *PIK3R1* | 254.09 | *PIK3R2* | 169.39 | *PIK3R3* | 197.63 | *PIK3R4* | 173.43 |
| *PIK3R5* | 42.35 | *PIM1* | 256.11 | *PIM2* | 60.5 | *PIN1* | 153.26 | *PITX2* | 108.9 |
| *PKM* | 1399.52 | *PKMYT1* | 157.29 | *PKP3* | 360.97 | *PLA1A* | 30.25 | *PLA2G10* | 278.29 |
| *PLA2G1B* | 2.02 | *PLA2G2A* | 114.95 | *PLA2G3* | 88.73 | *PLA2G4A* | 56.46 | *PLA2G4C* | 32.27 |
| *PLA2G4E* | 30.45 | *PLA2G4F* | 30.25 | *PLA2G5* | 22.18 | *PLA2G6* | 112.93 | *PLAT* | 102.85 |
| *PLAU* | 104.86 | *PLAUR* | 96.8 | *PLCB1* | 94.78 | *PLCB4* | 54.45 | *PLCD3* | 69.09 |
| *PLCE1* | 83.77 | *PLCG1* | 127.05 | *PLCG2* | 86.71 | *PLD1* | 231.91 | *PLD2* | 40.33 |
| *PLEKHA5* | 118.98 | *PLK1* | 308.54 | *PLK3* | 118.98 | *PLOD2* | 235.94 | *PMAIP1* | 104.86 |
| *PMCH* | 56.46 | *PMEL* | 0.0 | *PML* | 905.45 | *PMS2* | 36.3 | *PNKP* | 78.65 |
| *PNMA1* | 736.06 | *PNOC* | 64.53 | *PNPLA5* | 70.58 | *POLB* | 74.61 | *POLD1* | 34.28 |
| *POLD2* | 223.84 | *POLD4* | 348.87 | *POLE2* | 62.51 | *POLK* | 100.83 | *POLR1B* | 110.91 |
| *POLR1C* | 94.78 | *POLR2A* | 923.6 | *POLR2D* | 89.52 | *POLR2H* | 445.67 | *POLR2J* | 542.46 |
| *POLR3G* | 64.53 | *POSTN* | 518.26 | *POU2AF1* | 64.67 | *POU2F2* | 30.25 | *POU5F1* | 161.33 |
| *PPA1* | 907.47 | *PPAN* | 211.74 | *PPARD* | 123.01 | *PPARG* | 1068.79 | *PPARGC1A* | 44.37 |
| *PPARGC1B* | 102.85 | *PPAT* | 84.7 | *PPBP* | 30.25 | *PPIA* | 1911.73 | *PPL* | 2274.72 |
| *PPP2CB* | 399.29 | *PPP2R1A* | 1084.93 | *PPP2R2B* | 18.15 | *PPP2R2C* | 82.68 | *PPP2R3A* | 129.97 |
| *PPP3CA* | 276.27 | *PPP3CB* | 187.54 | *PPP3CC* | 22.18 | *PPP3R1* | 211.74 | *PPP3R2* | 209.73 |
| *PRAME* | 108.9 | *PRC1* | 106.88 | *PRCC* | 235.94 | *PRDM1* | 229.89 | *PRDM6* | 68.56 |
| *PRDX1* | 3315.28 | *PRDX5* | 1379.35 | *PRF1* | 110.91 | *PRG2* | 6.05 | *PRICKLE1* | 68.56 |
| *PRKAA2* | 131.08 | *PRKACA* | 451.72 | *PRKACB* | 203.68 | *PRKACG* | 540.45 | *PRKAR1B* | 108.9 |
| *PRKAR2A* | 90.75 | *PRKAR2B* | 195.61 | *PRKCA* | 110.91 | *PRKCB* | 84.7 | *PRKCD* | 312.57 |
| *PRKCE* | 70.58 | *PRKCG* | 28.23 | *PRKCQ* | 74.61 | *PRKDC* | 435.58 | *PRKX* | 283.13 |
| *PRL* | 20.17 | *PRLR* | 34.28 | *PRM1* | 50.41 | *PRMT8* | 18.15 | *PROM1* | 54.45 |
| *PROS1* | 54.45 | *PRPF38A* | 347.44 | *PRR5* | 139.14 | *PRRX1* | 157.29 | *PRSS1* | 34.28 |
| *PRUNE1* | 193.59 | *PSAT1* | 86.71 | *PSEN1* | 312.57 | *PSEN2* | 72.6 | *PSMB10* | 151.24 |
| *PSMB2* | 811.64 | *PSMB5* | 320.64 | *PSMB7* | 550.53 | *PSMB8* | 161.33 | *PSMB9* | 151.24 |
| *PSMC4* | 241.99 | *PSMD7* | 332.74 | *PSPH* | 323.76 | *PTCD2* | 47.05 | *PTCH1* | 98.81 |
| *PTCH2* | 38.32 | *PTCRA* | 48.4 | *PTEN* | 1294.65 | *PTGDR2* | 217.79 | *PTGDS* | 734.04 |
| *PTGER4* | 161.33 | *PTGS2* | 18.15 | *PTK2* | 58.48 | *PTK7* | 70.58 | *PTN* | 84.7 |
| *PTPN11* | 778.4 | *PTPN5* | 74.61 | *PTPN6* | 260.14 | *PTPN7* | 54.45 | *PTPRC* | 425.5 |
| *PTPRCAP* | 354.92 | *PTPRD* | 68.56 | *PTPRE* | 145.19 | *PTPRN2* | 72.6 | *PTPRR* | 24.2 |
| *PTPRZ1* | 70.58 | *PTTG1* | 528.35 | *PTTG2* | 320.64 | *PUM1* | 201.66 | *PURA* | 570.7 |
| *PVR* | 143.18 | *PVRIG* | 108.9 | *PYCARD* | 157.29 | *PYCR1* | 131.08 | *PYCR2* | 213.76 |
| *PYCR3* | 92.78 | *PYGL* | 177.46 | *RAB7A* | 1052.66 | *RAC1* | 2520.74 | *RAC2* | 300.47 |
| *RAC3* | 84.7 | *RAD21* | 248.04 | *RAD23B* | 806.64 | *RAD50* | 74.9 | *RAD51* | 102.85 |
| *RAD51C* | 40.33 | *RAD52* | 24.2 | *RAD54L* | 64.53 | *RAF1* | 2238.42 | *RAG1* | 58.48 |
| *RALA* | 326.69 | *RALB* | 205.69 | *RALBP1* | 169.39 | *RALGDS* | 189.56 | *RANBP2* | 1339.02 |
| *RAP1A* | 479.95 | *RAP1B* | 889.88 | *RAPGEF1* | 223.84 | *RARA* | 153.26 | *RARB* | 112.93 |
| *RASA4* | 161.33 | *RASAL1* | 62.51 | *RASGEF1B* | 123.01 | *RASGRF1* | 42.35 | *RASGRF2* | 14.12 |
| *RASGRP1* | 50.41 | *RASGRP2* | 18.15 | *RASSF1* | 100.83 | *RASSF5* | 86.71 | *RB1* | 268.21 |
| *RBL2* | 413.4 | *RBM45* | 54.45 | *RBP4* | 133.1 | *RBX1* | 566.66 | *RCC1* | 149.23 |
| *REG4* | 80.66 | *REL* | 83.83 | *RELA* | 383.15 | *RELB* | 177.46 | *RELN* | 56.46 |
| *REN* | 30.25 | *REPS1* | 229.89 | *RET* | 336.77 | *REV1* | 82.68 | *REV3L* | 60.5 |
| *RFC3* | 56.46 | *RFC4* | 72.6 | *RGMB* | 187.54 | *RGS17* | 18.15 | *RHOA* | 1337.0 |
| *RHOB* | 2464.28 | *RICTOR* | 135.11 | *RIMKLA* | 42.41 | *RIMKLB* | 137.13 | *RIN1* | 56.55 |
| *RIPK1* | 169.39 | *RIPK2* | 175.44 | *RIPK3* | 106.88 | *RNF43* | 22.18 | *RNF8* | 58.48 |
| *RNLS* | 82.68 | *ROBO4* | 94.5 | *ROCK1* | 339.59 | *ROPN1* | 44.37 | *ROR2* | 60.5 |
| *RORA* | 135.11 | *RORC* | 189.56 | *ROS1* | 133.1 | *RPA3* | 8.07 | *RPL23* | 11115.42 |
| *RPL4* | 4533.3 | *RPL7A* | 6265.55 | *RPLP0* | 6918.93 | *RPS11* | 17258.0 | *RPS14* | 5230.94 |
| *RPS27A* | 3762.96 | *RPS4Y1* | 1347.08 | *RPS6* | 7880.84 | *RPS6KA5* | 146.81 | *RPS6KA6* | 46.38 |
| *RPS6KB1* | 241.99 | *RPS6KB2* | 381.14 | *RPS9* | 5283.47 | *RPTOR* | 64.53 | *RRAD* | 157.29 |
| *RRAS2* | 280.31 | *RRM2* | 112.97 | *RRS1* | 606.99 | *RSAD2* | 44.37 | *RSPH14* | 10.08 |
| *RUNX1* | 282.32 | *RUNX1T1* | 70.58 | *RUNX2* | 82.68 | *RUNX3* | 66.55 | *RXRA* | 187.54 |
| *RXRB* | 92.76 | *RXRG* | 52.43 | *RYBP* | 250.06 | *S100A12* | 46.38 | *S100A2* | 1026.45 |
| *S100A4* | 373.07 | *S100A7* | 2807.1 | *S100A8* | 7348.46 | *S100A9* | 8481.79 | *S100B* | 104.86 |
| *S100P* | 1328.93 | *SAA1* | 114.95 | *SAMD9* | 129.06 | *SAMHD1* | 951.83 | *SAMSN1* | 72.6 |
| *SAP130* | 157.29 | *SBNO2* | 373.07 | *SCGB2A2* | 8.07 | *SCUBE2* | 4.03 | *SDC1* | 365.0 |
| *SDC4* | 3738.76 | *SDHA* | 133.1 | *SEL1L3* | 235.94 | *SELE* | 44.37 | *SELENBP1* | 522.3 |
| *SELENOK* | 201.66 | *SELL* | 127.05 | *SELP* | 14.12 | *SELPLG* | 365.0 | *SEMA6A* | 171.41 |
| *SEMG1* | 18.15 | *SENP1* | 48.4 | *SERINC1* | 727.99 | *SERINC2* | 756.22 | *SERINC3* | 1211.19 |
| *SERINC5* | 145.19 | *SERPINA1* | 284.34 | *SERPINA3* | 318.62 | *SERPINB2* | 92.76 | *SERPINB3* | 689.67 |
| *SERPINB5* | 191.58 | *SERPINE1* | 254.09 | *SERPING1* | 481.97 | *SERPINH1* | 715.89 | *SETBP1* | 62.51 |
| *SETD2* | 225.86 | *SF3A1* | 435.58 | *SF3A3* | 362.99 | *SF3B1* | 294.42 | *SFN* | 2345.3 |
| *SFRP1* | 246.02 | *SFRP2* | 732.02 | *SFRP4* | 179.48 | *SFTPB* | 0.0 | *SFTPC* | 64.53 |
| *SFXN1* | 154.03 | *SGK1* | 302.49 | *SGK2* | 284.34 | *SH2B2* | 28.23 | *SH2B3* | 227.87 |
| *SH2D1A* | 94.78 | *SH2D1B* | 24.2 | *SHC1* | 344.84 | *SHC2* | 62.51 | *SHC3* | 4.03 |
| *SHC4* | 28.23 | *SHH* | 72.6 | *SIGIRR* | 84.7 | *SIGLEC1* | 165.36 | *SIGLEC5* | 86.71 |
| *SIGLEC8* | 64.53 | *SIN3A* | 219.81 | *SIRPA* | 270.22 | *SIRPB2* | 86.71 | *SIRT4* | 82.68 |
| *SIT1* | 34.28 | *SIX1* | 94.78 | *SKAP2* | 337.9 | *SKP1* | 1062.02 | *SKP2* | 202.65 |
| *SLAMF1* | 106.88 | *SLAMF6* | 48.42 | *SLAMF7* | 80.48 | *SLAMF8* | 112.93 | *SLC11A1* | 72.6 |
| *SLC16A1* | 266.19 | *SLC16A2* | 42.35 | *SLC1A5* | 131.08 | *SLC23A2* | 110.91 | *SLC25A1* | 153.26 |
| *SLC26A4* | 44.95 | *SLC2A1* | 139.14 | *SLC35F2* | 106.96 | *SLC35F3* | 20.17 | *SLC39A6* | 145.19 |
| *SLC3A1* | 16.13 | *SLC43A1* | 60.5 | *SLC45A3* | 78.65 | *SLC4A1AP* | 215.78 | *SLC4A4* | 98.81 |
| *SLC4A7* | 106.88 | *SLC5A5* | 38.38 | *SLC5A8* | 30.25 | *SLC6A13* | 32.27 | *SLC7A5* | 237.96 |
| *SMAD2* | 501.75 | *SMAD3* | 189.56 | *SMAD4* | 153.26 | *SMAD5* | 179.48 | *SMAD9* | 86.71 |
| *SMAP1* | 286.36 | *SMARCA2* | 429.53 | *SMARCA4* | 268.21 | *SMARCB1* | 294.42 | *SMARCC1* | 296.44 |
| *SMARCC2* | 508.18 | *SMARCD1* | 244.01 | *SMARCD2* | 258.12 | *SMARCD3* | 34.28 | *SMARCE1* | 496.2 |
| *SMC1A* | 189.56 | *SMC1B* | 102.85 | *SMC3* | 334.75 | *SMO* | 58.48 | *SMPD3* | 38.32 |
| *SNAI1* | 104.86 | *SNAI2* | 163.34 | *SNCA* | 80.66 | *SOCS1* | 90.75 | *SOCS2* | 320.64 |
| *SOCS3* | 566.66 | *SOD1* | 1455.98 | *SOD2* | 1381.37 | *SORBS2* | 316.61 | *SOS1* | 211.74 |
| *SOS2* | 78.65 | *SOST* | 308.54 | *SOX10* | 108.9 | *SOX11* | 221.83 | *SOX17* | 246.02 |
| *SOX2* | 469.87 | *SOX4* | 615.06 | *SOX9* | 387.19 | *SP1* | 433.57 | *SPA17* | 30.25 |
| *SPACA3* | 12.1 | *SPANXB1* | 131.08 | *SPI1* | 280.31 | *SPIB* | 38.42 | *SPINK1* | 5553.7 |
| *SPINK5* | 659.43 | *SPINT1* | 352.9 | *SPN* | 67.58 | *SPO11* | 10.08 | *SPOCK2* | 56.46 |
| *SPOP* | 165.36 | *SPP1* | 171.41 | *SPRED1* | 182.12 | *SPRED2* | 114.95 | *SPRY1* | 82.68 |
| *SPRY2* | 411.38 | *SPRY4* | 225.86 | *SRC* | 141.16 | *SRD5A2* | 159.31 | *SREBF1* | 286.36 |
| *SRGN* | 832.85 | *SRP54* | 256.11 | *SRR* | 16.13 | *SRSF2* | 715.89 | *SS18* | 365.1 |
| *SSBP1* | 326.69 | *SST* | 125.03 | *SSX1* | 476.18 | *SSX2* | 69.13 | *SSX4* | 233.1 |
| *ST6GAL1* | 209.73 | *STAG2* | 292.41 | *STAT1* | 625.14 | *STAT2* | 187.79 | *STAT3* | 1480.48 |
| *STAT4* | 24.2 | *STAT5A* | 153.26 | *STAT5B* | 149.23 | *STAT6* | 1084.93 | *STC1* | 100.83 |
| *STING1* | 173.43 | *STK11* | 316.61 | *STK11IP* | 143.18 | *STK17B* | 115.17 | *STK4* | 144.27 |
| *STMN1* | 427.52 | *STON1-GTF2A1L* | 36.3 | *SUFU* | 50.41 | *SULF1* | 292.41 | *SULT2A1* | 24.04 |
| *SUMO1* | 532.38 | *SUV39H2* | 76.63 | *SYCP1* | 8.07 | *SYK* | 121.78 | *SYT12* | 58.48 |
| *SYT17* | 54.45 | *TAB1* | 68.56 | *TACSTD2* | 3789.18 | *TAF3* | 70.58 | *TAGAP* | 50.41 |
| *TAL1* | 66.55 | *TANK* | 123.01 | *TAP1* | 316.61 | *TAP2* | 328.7 | *TAPBP* | 973.81 |
| *TAPBPL* | 260.14 | *TARP* | 26.22 | *TBC1D10B* | 195.61 | *TBC1D2* | 262.16 | *TBK1* | 133.1 |
| *TBL1XR1* | 762.27 | *TBP* | 74.61 | *TBX21* | 16.13 | *TBXAS1* | 102.85 | *TCF3* | 44.37 |
| *TCF7* | 135.11 | *TCF7L1* | 72.6 | *TCF7L2* | 131.08 | *TCIM* | 171.41 | *TCL1A* | 24.2 |
| *TCL1B* | 28.23 | *TDO2* | 8.07 | *TECR* | 1042.58 | *TERC* | 2486.46 | *TERF2* | 199.72 |
| *TERT* | 40.33 | *TET2* | 123.01 | *TFDP1* | 338.79 | *TFE3* | 534.4 | *TFEB* | 256.11 |
| *TFG* | 2280.77 | *TFRC* | 302.49 | *TG* | 38.32 | *TGFA* | 28.23 | *TGFB1* | 213.76 |
| *TGFB2* | 102.85 | *TGFB3* | 96.8 | *TGFBR1* | 177.46 | *TGFBR2* | 528.35 | *TH* | 64.53 |
| *THBD* | 399.29 | *THBS1* | 1129.29 | *THBS4* | 258.12 | *THEM4* | 78.65 | *THRA* | 268.21 |
| *THRB* | 98.81 | *THY1* | 389.2 | *TIAM1* | 135.11 | *TICAM1* | 248.04 | *TICAM2* | 248.04 |
| *TIE1* | 28.23 | *TIGIT* | 48.4 | *TIRAP* | 57.09 | *TLK2* | 283.96 | *TLR1* | 0.0 |
| *TLR10* | 6.33 | *TLR2* | 26.22 | *TLR3* | 54.45 | *TLR4* | 153.26 | *TLR5* | 52.43 |
| *TLR6* | 80.66 | *TLR7* | 26.54 | *TLR8* | 22.18 | *TLR9* | 306.52 | *TLX1* | 78.65 |
| *TM4SF4* | 104.86 | *TMEFF2* | 90.75 | *TMEM140* | 159.31 | *TMEM163* | 6.05 | *TMEM43* | 260.14 |
| *TMEM45B* | 330.72 | *TMPRSS2* | 2643.75 | *TMPRSS3* | 71.23 | *TMPRSS4* | 231.91 | *TMUB2* | 139.14 |
| *TNC* | 106.88 | *TNF* | 24.2 | *TNFAIP3* | 199.64 | *TNFAIP6* | 30.25 | *TNFAIP8* | 223.84 |
| *TNFRSF10A* | 62.51 | *TNFRSF10B* | 181.47 | *TNFRSF10C* | 30.25 | *TNFRSF10D* | 52.43 | *TNFRSF11A* | 112.93 |
| *TNFRSF11B* | 48.4 | *TNFRSF12A* | 334.75 | *TNFRSF13B* | 32.27 | *TNFRSF13C* | 28.23 | *TNFRSF14* | 157.29 |
| *TNFRSF17* | 10.08 | *TNFRSF18* | 12.1 | *TNFRSF19* | 34.28 | *TNFRSF1A* | 465.83 | *TNFRSF1B* | 116.96 |
| *TNFRSF25* | 18.15 | *TNFRSF4* | 42.35 | *TNFRSF6B* | 92.76 | *TNFRSF8* | 82.68 | *TNFRSF9* | 20.17 |
| *TNFSF10* | 165.36 | *TNFSF11* | 32.27 | *TNFSF12* | 157.29 | *TNFSF13* | 187.54 | *TNFSF13B* | 68.56 |
| *TNFSF14* | 74.61 | *TNFSF15* | 93.23 | *TNFSF18* | 12.1 | *TNFSF4* | 50.41 | *TNFSF8* | 84.7 |
| *TNFSF9* | 32.27 | *TNKS* | 268.21 | *TNN* | 40.33 | *TNR* | 84.7 | *TOLLIP* | 102.85 |
| *TOP2A* | 252.07 | *TOX* | 116.96 | *TP53* | 631.19 | *TP63* | 102.85 | *TP73* | 54.45 |
| *TPI1* | 1058.71 | *TPM1* | 1919.8 | *TPM2* | 3594.48 | *TPM3* | 2041.56 | *TPM4* | 2868.7 |
| *TPO* | 18.15 | *TPR* | 1218.02 | *TPSAB1* | 743.84 | *TPSB2* | 185.81 | *TPTE* | 6.05 |
| *TPX2* | 183.51 | *TRAF1* | 189.56 | *TRAF2* | 250.06 | *TRAF3* | 145.19 | *TRAF4* | 308.54 |
| *TRAF5* | 110.91 | *TRAF6* | 58.48 | *TRAF7* | 199.64 | *TRAT1* | 40.33 | *TREM1* | 80.66 |
| *TREM2* | 92.76 | *TRIM15* | 22.18 | *TRIM21* | 159.31 | *TRIM29* | 740.09 | *TRIM39* | 48.4 |
| *TSC1* | 169.39 | *TSC2* | 254.09 | *TSHR* | 2.02 | *TSLP* | 18.15 | *TSPAN7* | 118.98 |
| *TSPAN8* | 685.64 | *TTC30A* | 492.05 | *TTC31* | 88.73 | *TTK* | 145.19 | *TTPA* | 32.27 |
| *TTR* | 38.32 | *TUBB* | 1357.17 | *TUSC3* | 68.56 | *TWF1* | 562.63 | *TWIST1* | 135.11 |
| *TWIST2* | 229.89 | *TXK* | 28.23 | *TXLNGY* | 50.41 | *TXN2* | 342.82 | *TXNIP* | 6019.53 |
| *TXNRD1* | 260.14 | *TXNRD2* | 56.46 | *TXNRD3* | 46.38 | *TYK2* | 239.97 | *TYMP* | 338.79 |
| *TYMS* | 163.34 | *TYROBP* | 272.24 | *TYRP1* | 58.48 | *U2AF1* | 405.34 | *UBA7* | 76.63 |
| *UBB* | 4781.34 | *UBC* | 15426.93 | *UBE2C* | 477.93 | *UBE2T* | 16.13 | *ULBP2* | 143.18 |
| *UNC5D* | 12.1 | *UNG* | 169.39 | *UPK1B* | 18.37 | *UPK3A* | 20.17 | *UQCR10* | 1165.59 |
| *UQCR11* | 863.1 | *UQCRQ* | 1024.43 | *USP39* | 116.96 | *USP9Y* | 141.16 | *UTY* | 173.43 |
| *VCAM1* | 64.53 | *VCAN* | 409.37 | *VEGFA* | 266.19 | *VEGFB* | 237.96 | *VEGFC* | 58.48 |
| *VEGFD* | 64.53 | *VHL* | 567.79 | *VPS33B* | 20.17 | *VSIR* | 447.68 | *VTCN1* | 24.2 |
| *WDR3* | 88.73 | *WDR76* | 125.03 | *WEE1* | 149.23 | *WIF1* | 40.33 | *WIPF1* | 90.75 |
| *WNT1* | 159.31 | *WNT10A* | 78.65 | *WNT10B* | 114.95 | *WNT11* | 104.86 | *WNT16* | 24.2 |
| *WNT2* | 84.7 | *WNT2B* | 98.93 | *WNT3* | 92.76 | *WNT3A* | 76.63 | *WNT4* | 50.41 |
| *WNT5A* | 74.61 | *WNT5B* | 143.18 | *WNT6* | 26.22 | *WNT7A* | 62.51 | *WNT7B* | 44.37 |
| *WNT8A* | 20.17 | *WNT8B* | 22.18 | *WNT9A* | 50.41 | *WNT9B* | 139.14 | *WRN* | 122.25 |
| *WT1* | 6.05 | *WWC1* | 207.71 | *XAGE1B* | 437.6 | *XCL1* | 27.1 | *XCL2* | 15.25 |
| *XCR1* | 4.03 | *XIAP* | 210.01 | *XIST* | 199.64 | *XPA* | 116.96 | *XRCC2* | 26.88 |
| *XRCC4* | 24.2 | *XRCC5* | 998.21 | *XRCC6* | 730.01 | *YRDC* | 56.46 | *YTHDF2* | 594.89 |
| *ZAP70* | 48.4 | *ZBTB16* | 425.5 | *ZBTB17* | 94.78 | *ZBTB20* | 405.34 | *ZBTB32* | 40.33 |
| *ZBTB46* | 141.16 | *ZC3H12A* | 294.42 | *ZC3H14* | 238.52 | *ZEB1* | 223.84 | *ZEB2* | 102.85 |
| *ZIC2* | 46.38 | *ZKSCAN5* | 56.46 | *ZNF143* | 68.56 | *ZNF205* | 145.19 | *ZNF346* | 78.65 |
| *ZNF365* | 60.5 | *ZNF384* | 165.36 |  |  |  |  |  |  |

注：TPM(Transcripts Per Million) 是归一化后的基因或转录本表达值。

## 参考文献

1. {%p for a in (refer.fixed + refer.dynamic.s\_var12 + refer.dynamic.s\_var\_onco\_nodrug +refer.dynamic.s\_var3 + refer.dynamic.g\_var45 + refer.dynamic.knb)|unique%}
2. {{a}}
3. {%p endfor%}