

## Supporting information

**Supplementary Table S1. 200 cuproptosis-related genes and related data**

| Gene    | HR              | HR.95L           | HR.95H         | pvalue           |
|---------|-----------------|------------------|----------------|------------------|
| NPY     | 1. 119768705262 | 1. 0316641850708 | 1. 21539738553 | 0. 0068195415240 |
|         | 94              | 1                | 604            | 7706             |
| OTC     | 0. 646166414149 | 0. 4391567576102 | 0. 95075625625 | 0. 0266751726827 |
|         | 701             | 53               | 6081           | 593              |
| AHSB    | 0. 382325680360 | 0. 1516802745872 | 0. 96369106834 | 0. 0415127177377 |
|         | 714             | 41               | 1315           | 878              |
| ACE2    | 0. 079187989656 | 0. 0077432969923 | 0. 80982786945 | 0. 0325345867041 |
|         | 6677            | 2333             | 681            | 235              |
| SLC22A2 | 9. 700784683448 | 2. 1306606928546 | 44. 1671561268 | 0. 0033026849671 |
|         | 63              | 8                | 39             | 2338             |
| FGF23   | 12. 52282214376 | 3. 1960797213130 | 49. 0666967405 | 0. 0002860996024 |
|         | 18              | 5                | 504            | 84026            |
| ARG1    | 1. 759827039681 | 1. 0172812796324 | 3. 04438042024 | 0. 0432554787537 |
|         | 54              | 8                | 44             | 694              |
| GAD1    | 0. 695013079001 | 0. 4904484980764 | 0. 98490092614 | 0. 0408054224407 |
|         | 275             | 86               | 6789           | 593              |
| MGAM    | 3. 377664446579 | 1. 3122602421073 | 8. 69386783780 | 0. 0116250250613 |
|         | 66              |                  | 609            | 567              |
| VIP     | 2. 372058836280 | 1. 0076765854520 | 5. 58379861555 | 0. 0479883592235 |
|         | 25              | 8                | 572            | 405              |
| SLC38A4 | 1. 404191472077 | 1. 0565523611854 | 1. 86621483486 | 0. 0193349231622 |
|         | 62              | 9                | 454            | 828              |
| MYL2    | 2. 796284285578 | 1. 5826327058958 | 4. 94063200933 | 0. 0003989565178 |
|         | 9               | 3                | 887            | 32606            |
| KYAT1   | 8. 393295335110 | 1. 4533063518846 | 48. 4738861087 | 0. 0174162317635 |
|         | 61              | 6                | 566            | 705              |
| HPR     | 2. 069075177073 | 1. 0869967227404 | 3. 93844065839 | 0. 0268310512706 |
|         | 73              |                  | 476            | 729              |
| PON3    | 0. 826184842593 | 0. 6976888176658 | 0. 97834647316 | 0. 0268439374405 |
|         | 815             | 75               | 7435           | 578              |
| BHMT2   | 1. 208249425362 | 1. 0021950340405 | 1. 45666923533 | 0. 0473732840851 |
|         | 86              | 4                | 231            | 792              |
| AMT     | 0. 082964093119 | 0. 0083655913048 | 0. 82277994422 | 0. 0334528437892 |
|         | 9976            | 6941             | 4288           | 755              |
| HPGD    | 0. 914289257245 | 0. 8377688273748 | 0. 99779893760 | 0. 0444973818806 |
|         | 474             | 43               | 6521           | 958              |
| GAP43   | 1. 299349901593 | 1. 0254855636433 | 1. 64635195913 | 0. 0301319491216 |
|         | 65              |                  | 755            | 501              |

|                 |                       |                       |                       |                          |
|-----------------|-----------------------|-----------------------|-----------------------|--------------------------|
| CXCR2           | 1.900860035056<br>75  | 1.3575725668944<br>2  | 2.66156591624<br>538  | 0.0001840576970<br>30572 |
| REN             | 0.854914507996<br>732 | 0.7507851457418<br>84 | 0.97348598347<br>811  | 0.0180072210828<br>748   |
| CACNA1C         | 2.046666788999<br>52  | 1.4519801975978<br>3  | 2.88491878341<br>293  | 4.3290244371748<br>9e-05 |
| LEPR            | 1.266065711790<br>19  | 1.0109163014955<br>1  | 1.58561335315<br>249  | 0.0399257677408<br>219   |
| ARSH            | 0.564669399908<br>401 | 0.3713504680368<br>73 | 0.85862698081<br>0089 | 0.0075224465688<br>6092  |
| MAPT            | 1.665355715517<br>36  | 1.0597727268666<br>2  | 2.61698531099<br>809  | 0.0269867940267<br>938   |
| MEOX2           | 1.231394667602<br>01  | 1.0091011869530<br>1  | 1.50265686633<br>195  | 0.0404467110767<br>418   |
| PYY             | 0.897031566521<br>411 | 0.8060887813594<br>3  | 0.99823449965<br>254  | 0.0463312312249<br>476   |
| HGF             | 1.486589815551<br>07  | 1.0954898567779<br>2  | 2.01731605822<br>452  | 0.0109123814239<br>993   |
| MADCAM1         | 0.469875589007<br>301 | 0.2362541017557<br>66 | 0.93451528462<br>0109 | 0.0313164824219<br>374   |
| LYVE1           | 1.266380157380<br>35  | 1.1038943758470<br>2  | 1.45278274633<br>488  | 0.0007495497234<br>96998 |
| SYNGAP1-<br>AS1 | 0.495885154262<br>302 | 0.2806149681837<br>22 | 0.87629711205<br>1242 | 0.0157554264684<br>958   |
| ITGBL1          | 1.296133054057<br>98  | 1.0145542155273<br>3  | 1.65586113399<br>418  | 0.0379321972947<br>897   |
| IFNG            | 0.574097250600<br>147 | 0.3585663001539<br>84 | 0.91918190026<br>5331 | 0.0208397637358<br>684   |
| SLC7A11         | 0.792700892936<br>11  | 0.6700093969577<br>47 | 0.93785954124<br>6602 | 0.0067743125008<br>2483  |
| SCN4B           | 1.305056745161<br>09  | 1.0038237262599<br>8  | 1.69668544739<br>034  | 0.0467600546244<br>711   |
| PTGER3          | 1.164546217277<br>43  | 1.0014068057141<br>7  | 1.35426270765<br>954  | 0.0479038566036<br>69    |
| MS4A1           | 0.601080121804<br>873 | 0.3920337740880<br>55 | 0.92159741509<br>3655 | 0.0195750047683<br>569   |
| CETP            | 0.477518505723<br>661 | 0.2809011719094<br>53 | 0.81175853328<br>9637 | 0.0063271356668<br>4319  |
| SLC6A12         | 1.142018825907<br>28  | 1.0033483359419<br>2  | 1.29985464868<br>718  | 0.0443705189543<br>664   |
| CD40LG          | 0.417815621309<br>12  | 0.2588829171323<br>58 | 0.67431986375<br>7846 | 0.0003522889164<br>58301 |
| PAOX            | 0.482020094740        | 0.2629486223897       | 0.88360748811         | 0.0182669839978          |

|         |                 |                  |                |                  |
|---------|-----------------|------------------|----------------|------------------|
|         | 094             | 09               | 5678           | 662              |
| FLNC    | 1. 118970606264 | 1. 0055387869609 | 1. 24519832941 | 0. 0392793319688 |
|         | 99              | 3                | 431            | 067              |
| NGFR    | 1. 141736868260 | 1. 0162231721454 | 1. 28275275753 | 0. 0256939645735 |
|         | 31              | 4                | 927            | 37               |
| LOXL4   | 1. 143444738914 | 1. 0232863767201 | 1. 27771257459 | 0. 0179654379416 |
|         | 19              | 5                | 837            | 086              |
| APC     | 1. 532649098365 | 1. 0862185425395 | 2. 16256044868 | 0. 0150670738188 |
|         | 85              | 4                | 257            | 632              |
| IGLL1   | 0. 639732535070 | 0. 4310185774318 | 0. 94951293947 | 0. 0266170579842 |
|         | 354             | 26               | 9445           | 385              |
| CMC2    | 0. 611765754754 | 0. 3881728854290 | 0. 96415116238 | 0. 0342379679231 |
|         | 862             | 06               | 0027           | 138              |
| PTGER2  | 1. 185707866591 | 1. 0583675389285 | 1. 32836948714 | 0. 0032970670692 |
|         | 11              | 4                | 37             | 3022             |
| NEFL    | 1. 522773528300 | 1. 1530645559994 | 2. 01102289236 | 0. 0030398135605 |
|         | 02              | 6                | 648            | 498              |
| PLA2G4A | 0. 870200130727 | 0. 7673137892618 | 0. 98688213103 | 0. 0303381008993 |
|         | 732             | 87               | 4021           |                  |
| VPS33B  | 0. 519980432428 | 0. 3393750304511 | 0. 79669871336 | 0. 0026648994060 |
|         | 806             | 34               | 5653           | 8113             |
| CTLA4   | 0. 692771821055 | 0. 5083290327987 | 0. 94413807806 | 0. 0201308511521 |
|         | 916             | 82               | 0767           | 211              |
| HAAO    | 0. 744847778729 | 0. 5842229018548 | 0. 94963448320 | 0. 0174559690991 |
|         | 429             | 11               | 2853           | 748              |
| JAK2    | 0. 677701360845 | 0. 4963749755434 | 0. 92526649633 | 0. 0143299958059 |
|         | 064             | 5                | 8609           | 948              |
| ACSM3   | 0. 770200597295 | 0. 6519321565522 | 0. 90992437497 | 0. 0021425760577 |
|         | 66              | 16               | 1492           | 0186             |
| CD274   | 0. 694378491797 | 0. 5169437230283 | 0. 93271562917 | 0. 0154091617797 |
|         | 608             | 44               | 2431           | 908              |
| RYR1    | 1. 197154809650 | 1. 0247282052255 | 1. 39859489663 | 0. 0233405814408 |
|         | 01              | 7                | 667            | 213              |
| FNTB    | 0. 652064958419 | 0. 4490171078758 | 0. 94693209354 | 0. 0246769838541 |
|         | 658             | 08               | 6048           | 98               |
| PGM3    | 0. 717708964438 | 0. 5604614010123 | 0. 91907517039 | 0. 0085696391300 |
|         | 09              | 9                | 4131           | 501              |
| ABCC3   | 1. 191757849311 | 1. 0247574378489 | 1. 38597361574 | 0. 0227590528053 |
|         | 24              | 2                | 296            | 139              |
| COG3    | 1. 493686656415 | 1. 1408796754166 | 1. 95559608574 | 0. 0035152254003 |
|         | 54              | 9                | 756            | 2151             |
| CFI     | 0. 815720313772 | 0. 7052435097200 | 0. 94350337313 | 0. 0060844521051 |
|         | 708             | 33               | 3622           | 3006             |
| PPARA   | 1. 367926541826 | 1. 051104363604  | 1. 78024474888 | 0. 0197661472786 |

|         |                |                 |               |                 |
|---------|----------------|-----------------|---------------|-----------------|
|         | 99             |                 | 369           | 854             |
| SLC35A1 | 0.740662677552 | 0.5949354014650 | 0.92208532316 | 0.0072393742032 |
|         | 561            | 29              | 0208          | 5936            |
| ALPL    | 0.904825887370 | 0.8420040387747 | 0.97233486866 | 0.0064473352261 |
|         | 149            | 14              | 2347          | 6211            |
| ALOX12  | 1.488341104415 | 1.1536894207636 | 1.92006549009 | 0.0022124934016 |
|         | 89             | 4               | 324           | 4654            |
| SLAIN1  | 0.863438629101 | 0.7484187210837 | 0.99613524518 | 0.0441091728648 |
|         | 938            | 36              | 1849          | 245             |
| COL8A2  | 1.119371128267 | 1.0022641447350 | 1.25016117695 | 0.0454920289022 |
|         | 45             | 1               | 204           | 673             |
| SLC33A1 | 0.696200920058 | 0.5052705313151 | 0.95927961567 | 0.0268178036733 |
|         | 263            | 17              | 1247          | 941             |
| SLC16A1 | 0.868074462856 | 0.7542908519924 | 0.99902215580 | 0.0484259282042 |
|         | 797            | 57              | 8477          | 127             |
| CDC7    | 0.787397281408 | 0.6580591046899 | 0.94215622023 | 0.0090333619840 |
|         | 187            | 47              | 9703          | 4115            |
| REPS1   | 1.434183721687 | 1.1080102852737 | 1.85637531969 | 0.0061618553844 |
|         | 28             | 9               | 708           | 4921            |
| PRSS1   | 0.875553756494 | 0.8026707595146 | 0.95505457427 | 0.0027263368364 |
|         | 338            | 75              | 5084          | 6723            |
| RXRA    | 1.246244071153 | 1.0163739538967 | 1.52810319364 | 0.0343373783203 |
|         | 56             | 7               | 318           | 344             |
| SNX14   | 0.764272009224 | 0.5946743815807 | 0.98223788038 | 0.0357324876269 |
|         | 524            | 53              | 6598          | 968             |
| TRPM2   | 1.258231402307 | 1.0239277201849 | 1.54615040744 | 0.0288980964238 |
|         | 75             | 9               | 019           | 435             |
| BTRC    | 1.372505093003 | 1.0368817094054 | 1.81676483752 | 0.0268904207325 |
|         | 23             | 8               | 415           | 276             |
| IGF2R   | 1.339789841891 | 1.1023269872339 | 1.62840685316 | 0.0032956287537 |
|         | 7              | 4               | 111           | 7947            |
| UFD1    | 0.687964370542 | 0.5116301353570 | 0.92507251318 | 0.0133075085334 |
|         | 759            | 21              | 5769          | 419             |
| TIMM8A  | 0.693127181021 | 0.5125144443922 | 0.93738877865 | 0.0173245776755 |
|         | 383            | 69              | 253           | 062             |
| PTRH2   | 0.734364883907 | 0.5782797919360 | 0.93257933311 | 0.0113250878098 |
|         | 057            | 43              | 1938          | 757             |
| GGCX    | 1.395188785411 | 1.0343455833649 | 1.88191623597 | 0.0291739041239 |
|         | 89             | 8               | 068           | 842             |
| NPC1    | 1.293291628708 | 1.0374079054745 | 1.61229081449 | 0.0222276277059 |
|         | 02             | 9               | 987           | 72              |
| PTPRU   | 1.206539440865 | 1.0621229029320 | 1.37059225288 | 0.0038950073297 |
|         | 94             | 1               | 006           | 0857            |
| MVK     | 1.407987551776 | 1.0904943802935 | 1.81791761771 | 0.0086791374190 |

|         |                       |                       |                       |                          |
|---------|-----------------------|-----------------------|-----------------------|--------------------------|
|         | 31                    | 4                     | 704                   | 7542                     |
| BACE1   | 0.822653649234<br>064 | 0.6782045309267<br>21 | 0.99786863068<br>1924 | 0.0475215642706<br>914   |
| AP1S2   | 0.734748729918<br>648 | 0.6221067563781<br>03 | 0.86778626109<br>1422 | 0.0002832891764<br>41682 |
| SLC4A11 | 1.127708303679<br>41  | 1.0237187120325       | 1.24226118292<br>064  | 0.0148971653932<br>335   |
| SELL    | 0.821886515677<br>261 | 0.7152726969485<br>84 | 0.94439148528<br>0845 | 0.0056562270589<br>9917  |
| GARS1   | 0.760456710977<br>074 | 0.5952258079103<br>46 | 0.97155466309<br>5476 | 0.0284632202175<br>311   |
| AGFG1   | 1.465132524513<br>2   | 1.0596059856090<br>6  | 2.02585993618<br>425  | 0.0208800208020<br>345   |
| PPP3CA  | 1.336524579666<br>29  | 1.0821608296298       | 1.65067696329<br>688  | 0.0070807166695<br>8585  |
| PNP     | 0.857550562207<br>826 | 0.7387950025423<br>17 | 0.99539515591<br>2464 | 0.0433157756352<br>683   |
| RIN2    | 1.381997027875<br>32  | 1.1096573375640<br>7  | 1.72117618691<br>991  | 0.0038628168578<br>2643  |
| CDC45   | 0.824957681895<br>149 | 0.6907573119574<br>39 | 0.98523050735<br>3284 | 0.0336512908593<br>138   |
| CD38    | 0.682840575264<br>824 | 0.5519498123809<br>4  | 0.84477110195<br>3356 | 0.0004420382744<br>01555 |
| GRIN2D  | 1.174465313795<br>88  | 1.0343236704592<br>4  | 1.33359490138<br>829  | 0.0131191454071<br>061   |
| PDP1    | 1.397221006295<br>01  | 1.1470893271858       | 1.70189582813<br>181  | 0.0008890576787<br>92234 |
| ANXA4   | 1.212968547007<br>51  | 1.0244967419145<br>7  | 1.43611261591<br>713  | 0.0250353743681<br>789   |
| HIF1AN  | 1.448268654183<br>46  | 1.1055232479142<br>7  | 1.89727542921<br>199  | 0.0071869466491<br>8385  |
| RPS6KA1 | 1.223734246603<br>95  | 1.0102983996317<br>6  | 1.48226059435<br>229  | 0.0389477271121<br>984   |
| PSMD6   | 0.716810251239<br>268 | 0.5175854272232<br>55 | 0.99271909380<br>8786 | 0.0450757251668<br>758   |
| GCH1    | 0.758307041955<br>455 | 0.6215176230080<br>19 | 0.92520235724<br>9672 | 0.0064116704064<br>8986  |
| AUH     | 1.322569808449<br>65  | 1.0511113977452       | 1.66413465021<br>389  | 0.0170675019142<br>477   |
| XDH     | 1.204968594297<br>74  | 1.0252656588901<br>2  | 1.41616887355<br>384  | 0.0236495473659<br>98    |
| FOXO1   | 1.192975083435<br>89  | 1.0021708014980<br>3  | 1.42010677977<br>397  | 0.0472168086708<br>541   |
| DCAF8   | 0.757340433266        | 0.5748419540969       | 0.99777778530         | 0.0481798838723          |

|          |                 |                  |                |                  |
|----------|-----------------|------------------|----------------|------------------|
|          | 605             | 78               | 7031           | 307              |
| PER1     | 1. 210038178311 | 1. 0322144202726 | 1. 41849635522 | 0. 0187261926360 |
|          | 17              | 4                | 807            | 312              |
| CYBRD1   | 1. 187305168004 | 1. 0492976724094 | 1. 34346391785 | 0. 0064643100526 |
|          | 62              | 2                | 422            | 284              |
| PXN      | 1. 293047014514 | 1. 0423668529204 | 1. 60401357454 | 0. 0194216866976 |
|          | 06              | 6                | 842            | 987              |
| GJB1     | 0. 881161587804 | 0. 7967715696407 | 0. 97448977022 | 0. 0137757815687 |
|          | 294             | 07               | 6004           | 253              |
| BLOC1S1  | 0. 762737123031 | 0. 6514609512960 | 0. 89302039929 | 0. 0007620436999 |
|          | 586             | 63               | 3451           | 45739            |
| CASP8    | 0. 747379161081 | 0. 5966058112979 | 0. 93625573174 | 0. 0113116712894 |
|          | 661             | 74               | 3365           | 034              |
| STAB1    | 1. 159830356169 | 1. 0252958045407 | 1. 31201790657 | 0. 0184189911172 |
|          | 82              | 1                | 439            | 438              |
| PPP1R15A | 1. 211188646460 | 1. 0230822309183 | 1. 43388077026 | 0. 0260841378051 |
|          | 94              |                  | 726            | 008              |
| GAS1     | 1. 122045635810 | 1. 0168551021680 | 1. 23811780671 | 0. 0218618152597 |
|          | 05              | 3                | 22             | 547              |
| UQCC2    | 0. 799370547245 | 0. 6764580838986 | 0. 94461621054 | 0. 0085676054449 |
|          | 12              | 35               | 2193           | 3223             |
| CASP3    | 0. 780866013472 | 0. 6226754727399 | 0. 97924481963 | 0. 0322295700447 |
|          | 42              | 08               | 8181           | 598              |
| TXNL1    | 0. 734044139042 | 0. 5525653712584 | 0. 97512588752 | 0. 0328591653264 |
|          | 645             | 07               | 3049           | 657              |
| HSPA14   | 0. 746295551013 | 0. 5911785685246 | 0. 94211305875 | 0. 0138335968000 |
|          | 838             | 01               | 4889           | 052              |
| SLC1A4   | 0. 792431681164 | 0. 6625889720989 | 0. 94771871515 | 0. 0108315856743 |
|          | 042             | 95               | 3398           | 075              |
| ELOC     | 0. 798983931415 | 0. 6475072035810 | 0. 98589686590 | 0. 0364032131742 |
|          | 69              | 36               | 3484           | 781              |
| LRP1     | 1. 161706932106 | 1. 0175283200324 | 1. 32631492365 | 0. 0266249477672 |
|          | 24              | 1                | 804            | 665              |
| DDIT3    | 0. 825610974147 | 0. 6845950064719 | 0. 99567404697 | 0. 0449276543841 |
|          | 039             | 03               | 393            | 792              |
| ELAVL1   | 0. 618842458714 | 0. 4370568768166 | 0. 87623833194 | 0. 0068404528623 |
|          | 552             | 82               | 7131           | 8236             |
| NME1     | 0. 840138670016 | 0. 7213476023239 | 0. 97849217573 | 0. 0251232331302 |
|          | 116             | 81               | 1161           | 039              |
| LTA4H    | 1. 276276984505 | 1. 0367252733011 | 1. 57118089346 | 0. 0214473520914 |
|          | 78              | 9                | 119            | 038              |
| TDP2     | 0. 663458019016 | 0. 5115942179486 | 0. 86040171595 | 0. 0019768803116 |
|          | 797             | 48               | 8948           | 7535             |
| COA6     | 0. 772796902683 | 0. 6341820221122 | 0. 94170921277 | 0. 0106054999677 |

|        |                       |                       |                       |                         |
|--------|-----------------------|-----------------------|-----------------------|-------------------------|
|        | 517                   | 52                    | 1611                  | 167                     |
| GMNN   | 0.778882407117<br>079 | 0.6636771042623<br>91 | 0.91408578090<br>2045 | 0.0022138911096<br>9623 |
| COMMD4 | 0.726019564404<br>651 | 0.5786134515573<br>6  | 0.91097848914<br>4348 | 0.0056890164526<br>533  |
| IDO1   | 0.898877052154<br>686 | 0.8259209098428<br>31 | 0.97827763562<br>0162 | 0.0135689155308<br>505  |
| ECE1   | 1.174637043948        | 1.0001453599673<br>3  | 1.37957165052<br>485  | 0.0497932898445<br>681  |
| PYM1   | 0.749928632590<br>249 | 0.5627689100695<br>42 | 0.99933195298<br>437  | 0.0494691281322<br>418  |
| ERBB2  | 1.217265789198<br>4   | 1.0539059757521<br>8  | 1.40594705376<br>376  | 0.0074938418449<br>2692 |
| CRYAB  | 1.087527551912<br>54  | 1.0065416544250<br>3  | 1.17502953898<br>563  | 0.0335778820705<br>145  |
| MBD2   | 0.758942922413<br>043 | 0.6031004800242<br>81 | 0.95505538224<br>3536 | 0.0186674979907<br>553  |
| ADI1   | 0.740498330345<br>587 | 0.5879561992566<br>51 | 0.93261671181<br>9455 | 0.0106888814933<br>814  |
| TGFBI  | 1.131801868269<br>29  | 1.0173818051001<br>2  | 1.25909020841<br>177  | 0.0227941790870<br>418  |
| H6PD   | 1.225933352551<br>28  | 1.0458030080515<br>7  | 1.43708956020<br>093  | 0.0119944526597<br>79   |
| APEX2  | 0.711986952708<br>617 | 0.5524275340671<br>42 | 0.91763243061<br>9742 | 0.0086919281202<br>7321 |
| PUM3   | 0.768543177836<br>229 | 0.6257545981868<br>33 | 0.94391414447<br>4661 | 0.0120605316477<br>975  |
| KCTD1  | 0.830597440956<br>547 | 0.7168536071511<br>78 | 0.96238911549<br>2129 | 0.0135053646427<br>027  |
| DCTN1  | 1.291980522757<br>05  | 1.0333214466064<br>9  | 1.61538665113<br>882  | 0.0246054183682<br>035  |
| DAXX   | 0.748306961496<br>497 | 0.5792324191995<br>17 | 0.96673336999<br>6752 | 0.0264949585207<br>416  |
| CDKN1B | 1.205293189394<br>13  | 1.0036824767444<br>6  | 1.44740164948<br>574  | 0.0455735884015<br>321  |
| RANBP1 | 0.778309373101<br>92  | 0.6314114890592<br>78 | 0.95938305012<br>6024 | 0.0188489629327<br>475  |
| HPS1   | 1.343203169821<br>09  | 1.0713868669904<br>2  | 1.68398065255<br>877  | 0.0105370697613<br>381  |
| GLUD1  | 1.251591166702<br>57  | 1.0032365336122<br>5  | 1.56142683812<br>325  | 0.0467456675784<br>76   |
| NAPRT  | 0.870070772542<br>715 | 0.7683212826067<br>6  | 0.98529504046<br>1003 | 0.0282765109606<br>951  |
| UBE2L3 | 0.727011469220        | 0.5650470797143       | 0.93540112913         | 0.0131646189540         |

|          |                 |                  |                |                  |
|----------|-----------------|------------------|----------------|------------------|
|          | 465             | 33               | 3012           | 5                |
| CIZ1     | 1. 331946664102 | 1. 0382822930255 | 1. 70867010631 | 0. 0240966599202 |
|          | 26              | 7                | 901            | 849              |
| FURIN    | 0. 829902435941 | 0. 7015462443789 | 0. 98174291246 | 0. 0296375755656 |
|          | 894             | 9                | 0407           | 131              |
| CD79A    | 0. 886056489703 | 0. 8105145323813 | 0. 96863914412 | 0. 0077960190749 |
|          | 804             | 99               | 4303           | 2652             |
| RELB     | 1. 199023047826 | 1. 0015268152589 | 1. 43546457999 | 0. 0480893470687 |
|          | 89              | 5                | 566            | 794              |
| BIRC5    | 0. 869205747332 | 0. 7632005242122 | 0. 98993463346 | 0. 0346508194935 |
|          | 303             | 83               | 3854           | 292              |
| FLOT2    | 1. 228283088240 | 1. 0065171039817 | 1. 49891078739 | 0. 0429800183894 |
|          | 35              | 2                | 647            | 874              |
| HNRNPA2B | 0. 762276836249 | 0. 5907847132342 | 0. 98354944206 | 0. 0368404593653 |
| 1        | 748             | 97               | 6356           | 766              |
| GSTK1    | 0. 805170246592 | 0. 6654703398331 | 0. 97419687579 | 0. 0258244869658 |
|          | 548             | 24               | 2353           | 635              |
| VCP      | 0. 805526559061 | 0. 6550476094561 | 0. 99057385751 | 0. 0403908015249 |
|          | 773             | 04               | 3453           | 926              |
| FUS      | 0. 743111440410 | 0. 5637182680671 | 0. 97959325455 | 0. 0351849507740 |
|          | 071             | 01               | 5659           | 164              |
| QPR1     | 0. 859851931924 | 0. 7539738386274 | 0. 98059814141 | 0. 0243095732778 |
|          | 443             | 91               | 5725           | 698              |
| COX7A2   | 0. 848280575441 | 0. 7242935179493 | 0. 99349216421 | 0. 0412559068279 |
|          | 76              | 83               | 1376           | 048              |
| COA4     | 0. 758212084493 | 0. 6221284111375 | 0. 92406254847 | 0. 0060982331327 |
|          | 557             | 79               | 1096           | 4956             |
| CITED2   | 1. 312005118099 | 1. 1343995072342 | 1. 51741729341 | 0. 0002530107832 |
|          | 11              | 4                | 461            | 41838            |
| GL01     | 0. 782376877235 | 0. 6415647110317 | 0. 95409483643 | 0. 0153450723264 |
|          | 659             | 52               | 2996           | 698              |
| CALM1    | 0. 728862012273 | 0. 5858183665287 | 0. 90683369332 | 0. 0045495949890 |
|          | 275             | 84               | 1811           | 3392             |
| HSPD1    | 0. 810988940183 | 0. 6666620481883 | 0. 98656142626 | 0. 0361462616184 |
|          | 129             | 32               | 7891           | 046              |
| CCL5     | 0. 917747625701 | 0. 8458038561204 | 0. 99581090625 | 0. 0393268303930 |
|          | 407             | 83               | 8851           | 542              |
| STAT1    | 0. 809971018812 | 0. 7077292489559 | 0. 92698309739 | 0. 0022041341972 |
|          | 758             | 82               | 8284           | 013              |
| TIMM23   | 0. 709031573664 | 0. 5598791014211 | 0. 89791844556 | 0. 0043236762286 |
|          | 128             | 52               | 5393           | 8968             |
| B4GALT5  | 1. 241489014163 | 1. 0280991134108 | 1. 49916963470 | 0. 0245795280463 |
|          | 51              | 9                | 105            | 265              |
| SSR4     | 0. 844999819200 | 0. 7262993977853 | 0. 98309966471 | 0. 0292088240952 |

|         |                       |                       |                       |                          |
|---------|-----------------------|-----------------------|-----------------------|--------------------------|
|         | 584                   | 4                     | 9882                  | 279                      |
| CXCR4   | 0.853541985154<br>689 | 0.7585226027293<br>55 | 0.96046435241<br>3968 | 0.0085421581391<br>6945  |
| DPM3    | 0.805780754965<br>564 | 0.7011234748266<br>31 | 0.92606031374<br>6341 | 0.0023492624282<br>9305  |
| MORF4L2 | 0.702831933379<br>093 | 0.5241885977697<br>47 | 0.94235687055<br>9734 | 0.0184353947009<br>525   |
| SUMO2   | 0.790517336625<br>553 | 0.6355331251899<br>93 | 0.98329675470<br>2971 | 0.0347507854548<br>949   |
| CXCL9   | 0.885619096846<br>026 | 0.8247209720189<br>57 | 0.95101399298<br>5183 | 0.0008324708358<br>37791 |
| APEX1   | 0.793242083281<br>077 | 0.6329299116203<br>65 | 0.99415905479<br>5186 | 0.0443445162383<br>289   |
| FLOT1   | 0.788121467918<br>192 | 0.6440939100546<br>22 | 0.96435541230<br>4472 | 0.0207520178236<br>296   |
| CUTA    | 0.802529393269<br>413 | 0.6673393870857<br>27 | 0.96510627054<br>9915 | 0.0194221597347<br>851   |
| CFL1    | 0.749037624145<br>561 | 0.5837769491050<br>97 | 0.96108173377<br>8118 | 0.0230814005809<br>312   |
| IDH2    | 0.863462665026<br>334 | 0.7461890893723<br>54 | 0.99916734848<br>2008 | 0.0487068730387<br>143   |
| XBP1    | 0.820519360035<br>112 | 0.7106285565720<br>67 | 0.94740355417<br>1908 | 0.0070083592410<br>475   |
| IGFBP7  | 0.848908083750<br>641 | 0.7341887747644<br>97 | 0.98155264616<br>8344 | 0.0270133305456<br>1     |
| GNAS    | 0.715902377882<br>403 | 0.5730051109865<br>99 | 0.89443567750<br>2475 | 0.0032605946996<br>4145  |
| PRDX6   | 0.719725582592<br>045 | 0.5453988639684<br>44 | 0.94977263147<br>9901 | 0.0201185745337<br>149   |
| ILF2    | 0.764935833117<br>452 | 0.5966810150133<br>93 | 0.98063590773<br>6996 | 0.0344942232254<br>913   |
| CXCL10  | 0.918452442992<br>486 | 0.8635532826413<br>61 | 0.97684173865<br>7601 | 0.0068293567605<br>3675  |
| UCP2    | 0.855454807443<br>82  | 0.7502469943482<br>92 | 0.97541600711<br>7002 | 0.0197153979940<br>276   |
| RPL21   | 1.182509135611<br>01  | 1.0050290866788<br>5  | 1.39133073294<br>855  | 0.0433394308841<br>627   |
| GSTP1   | 0.819659557046<br>502 | 0.6803362115199<br>86 | 0.98751437610<br>0399 | 0.0364256222189<br>967   |
| HLA-A   | 0.880328985521<br>096 | 0.7817668750274<br>02 | 0.99131742147<br>7391 | 0.0353864241416<br>974   |
| PRDX5   | 0.804293122251<br>144 | 0.6620944565026<br>41 | 0.97703193275<br>0994 | 0.0282322300944<br>595   |
| TUBB    | 0.793075153813        | 0.6390852502372       | 0.98416948186         | 0.0353053977496          |

|          |                |                 |               |                 |
|----------|----------------|-----------------|---------------|-----------------|
|          | 178            | 2               | 8548          | 021             |
| HSP90AA1 | 0.805099793009 | 0.6591562275036 | 0.98335667578 | 0.0336339166758 |
|          | 12             | 8               | 853           | 037             |
| TMSB4X   | 0.855471050322 | 0.7437145196050 | 0.98402101699 | 0.0288536547658 |
|          | 217            | 92              | 9903          | 368             |
| HSP90AB1 | 0.768905876058 | 0.6130285849156 | 0.96441872497 | 0.0230026662645 |
|          | 768            | 93              | 5131          | 202             |
| IGHG1    | 0.954184093463 | 0.9199858269190 | 0.98965359854 | 0.0117869079892 |
|          | 042            | 96              | 1745          | 719             |

**Supplementary Table 2. 62 Cuproptosis-related Genes analyzed with LASSO Regression**

| Gene    | Coef                 |
|---------|----------------------|
| NPY     | 0.0135732812109809   |
| AHSG    | -0.561271543765313   |
| ACE2    | -0.0385417588833998  |
| SLC22A2 | 0.952557817484441    |
| FGF23   | 1.1357462242778      |
| GAD1    | -0.0677094349641544  |
| MYL2    | 0.62721981223141     |
| KYAT1   | 1.97225786273736     |
| HPR     | 0.120833790910917    |
| BHMT2   | 0.0230058797303406   |
| AMT     | -2.00172577883352    |
| CXCR2   | 0.345613453960716    |
| REN     | -0.0115013756468305  |
| CACNA1C | 0.476708349681969    |
| ARSH    | -0.273738610658473   |
| MEOX2   | 0.0192229056037472   |
| LYVE1   | 0.118630934682722    |
| SLC7A11 | -0.115291002992019   |
| CETP    | -0.189930537803133   |
| CD40LG  | -0.653447359825286   |
| NEFL    | 0.098837615927497    |
| PLA2G4A | -0.0552797434117821  |
| HAAO    | -0.180505456313912   |
| ACSM3   | -0.005689778044511   |
| RYR1    | 0.045001986605304    |
| FNTB    | -0.065546147760714   |
| PGM3    | -0.0865849287445835  |
| ALPL    | -0.0385654390728529  |
| ALOX12  | 0.0571395362743804   |
| REPS1   | 0.238055996036934    |
| SNX14   | -0.0672583707368904  |
| MVK     | 0.0616547722829491   |
| BACE1   | -0.0617772237838801  |
| AP1S2   | -0.00257309718246001 |
| GARS1   | -0.010684161404821   |
| AGFG1   | 0.136617086217292    |
| PPP3CA  | 0.0446553242487762   |
| CD38    | -0.0460042857158858  |
| GRIN2D  | 0.0650548975820607   |
| PDP1    | 0.143963833663349    |
| AUH     | 0.0917213235704573   |

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|          |                       |
|----------|-----------------------|
| FOXO1    | 0.038846423205137     |
| GAS1     | 0.037434134064215     |
| TXNL1    | -0.0418537375586716   |
| ELAVL1   | -0.0708971864853319   |
| TDP2     | -0.0129042576343187   |
| ADI1     | -0.0043067842799895   |
| PUM3     | -0.155356891091965    |
| CDKN1B   | 0.119227370951847     |
| NAPRT    | -0.0213142378403041   |
| FURIN    | -0.0919208747332471   |
| FLOT2    | 0.0302423678423873    |
| GSTK1    | -0.00948361046867879  |
| GLO1     | -0.102022014907769    |
| CALM1    | -0.162108793858512    |
| DPM3     | -0.0011548766200263   |
| CXCL9    | -0.0162106158515676   |
| CUTA     | -0.000416318814452632 |
| IGFBP7   | -0.0741769271520729   |
| GNAS     | -0.1553474206216      |
| HSP90AB1 | -0.0873477243586898   |

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**Supplementary Table S3. Co-differentially expressed Cuproptosis-related Genes**

| GSE14407     | GSE54388     | GSE18520  |
|--------------|--------------|-----------|
| LRRN4        | BNC1         | BNC1      |
| KLHL14       | LINC01105    | RTP3      |
| SLC4A4       | SLC4A4       | LINC01105 |
| LINC01105    | PDE8B        | SLC4A4    |
| SLC26A7      | KLHL14       | SPIN3     |
| BNC1         | LOC100996760 | CCDC60    |
| MICALL2      | CP           | BEST1     |
| LOC100996760 | LHX9         | KLHL14    |
| CP           | HBB          | RBL1      |
| ALDH1A3      | ABCA8        | HIF3A     |
| NXPH2        | MAF          | NFIA-AS2  |
| LHX9         | EFEMP1       | ZNF577    |
| HBB          | SFRP1        | UBAC2-AS1 |
| GADL1        | SPOCK1       | LINC00550 |
| PCDH9        | C7           | CP        |
| ABCA8        | CDK1         | MB21D1    |
| CSGALNACT1   | TSPAN8       | LHX9      |
| TXNIP        | KDR          | ANKH      |
| EFEMP1       | CLDN3        | PRKCQ-AS1 |
| DCN          | MMP7         | HBB       |
| SFRP1        | REEP1        | GPD1      |
| SPOCK1       | FOLR1        | C16orf45  |
| NELL2        | NEK2         | PAK1      |
| PRAME        | MNDA         | ABCA8     |
| RGS4         | AOX1         | RNF187    |
| REEP1        | BCHE         | EFEMP1    |
| TFAP2A       | NPY1R        | SFRP1     |
| HLF          | SCGB2A1      | SLC4A2    |
| MAL          | PRG4         | SPOCK1    |
| HSD17B2      | LHX2         | CYP1B1    |
| GLDC         | WNT2B        | REEP1     |
| AOX1         | CLEC4M       | TCF21     |
| GFPT2        | PTGIS        | MNDA      |
| RNASE4       | MECOM        | AOX1      |
| BMP2         | CD24         | BCAP29    |
| S100A1       | PEG3         | BCHE      |
| SULT1C2      | GPM6A        | NPY1R     |
| BCHE         | ADH1B        | SCGB2A1   |
| AQP9         | CHRD1        | HMGA1     |
| OMD          | TCEAL2       | MEOX2     |
| PPM1E        | IGK          | SLC5A1    |

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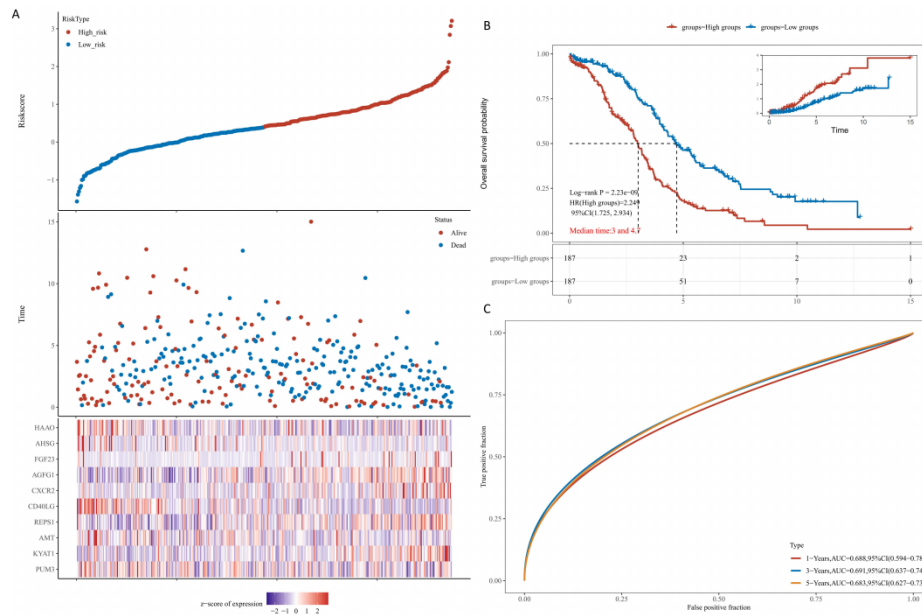
|           |           |              |
|-----------|-----------|--------------|
| PRG4      | ALDH1A1   | MECOM        |
| DSC3      | DIRAS3    | SPTAN1       |
| LHX2      | Igk       | CD24         |
| MEOX2     | C8orf4    | GPM6A        |
| ZIC1      | CEP55     | ADH1B        |
| HSPB3     | OGN       | IGK          |
| RARRES1   | NDUFAF4   | LOC647070    |
| FGF9      | PEX5L     | DIRAS3       |
| WNT2B     | HAND2-AS1 | Igk          |
| PTH2R     | EHF       | MAGEF1       |
| CDKN2A    | SOX17     | ZNF302       |
| SGCG      | LPAR3     | C8orf4       |
| MUC1      | PSAT1     | OGN          |
| PGR       | NUF2      | NDUFAF4      |
| TRPA1     | ITLN1     | RNF128       |
| MECOM     | MGARP     | ELL3         |
| LGALS2    | CHMP4C    | PEX5L        |
| CD24      | MUM1L1    | HAND2-AS1    |
| TFPI2     | SHISA3    | TMEM255A     |
| SPON1     | ARX       | SOX17        |
| GPM6A     | C1orf168  | LPAR3        |
| ADH1B     | Ndufaf4   | ITLN1        |
| SEL1L2    | PRSS35    | RTBDN        |
| CHRD1     | SERTM1    | MGARP        |
| EPB42     |           | PLEKHH2      |
| TCEAL2    |           | MIAT         |
| IGK       |           | TCEAL7       |
| SOSTDC1   |           | KIAA2026     |
| Igk       |           | DPP10        |
| SDPR      |           | SHISA3       |
| OGN       |           | DLX6-AS1     |
| PDGFD     |           | Ndufaf4      |
| RAB38     |           | PRSS35       |
| PEX5L     |           | CAPSL        |
| TMOD2     |           | LOC101060391 |
| HAND2-AS1 |           |              |
| EHF       |           |              |
| TMEM255A  |           |              |
| MMP28     |           |              |
| SOX17     |           |              |
| DEPDC1    |           |              |
| PDE7B     |           |              |
| C21orf62  |           |              |
| MCM10     |           |              |

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ITLN1  
MGARP  
SLC4A11  
STK31  
ARHGAP18  
TCEAL7  
ST6GALNAC1  
RERG  
MUM1L1  
ANKRD29  
LIX1  
ARX  
C1orf168  
KCNT2  
UNC5A  
CRNDE  
LOC101928554  
AADACL2  
SERTM1

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**Fig. S1 The validation of 11 CRGs using the TCGA database is crucial for OS.** **A** The gene expression of PUM3, KYAT1, AMT, REPS1, CD40LG, CXCR2, AGFG1, FGF23, AHSG, and HAAO, survival time and survival status of TCGA dataset. The top scatterplot represents the gene expression from low to high. Different colors represent different groups. The scatter plot distribution represents the gene expression of different samples correspond to the survival time and survival status. The bottom figure is the gene expression heatmap; **B** Kaplan-Meier survival analysis of PUM3, KYAT1, AMT, REPS1, CD40LG, CXCR2, AGFG1, FGF23, AHSG, and HAAO from TCGA dataset, comparison among different groups was made by log-rank test. HR (High exp) represents the hazard ratio of the low-expression sample relatives to the high-expression sample.  $HR > 1$  indicates the gene is a risk factor, and  $HR < 1$  indicates the gene is a protective factor. HR (95%CI), the median survival time (LT50) for different groups; **C** The ROC curve and AUC of PUM3, KYAT1, AMT, REPS1, CD40LG, CXCR2, AGFG1, FGF23, AHSG, and HAAO. The higher values of AUC corresponding to higher predictive power.