

**Table 4S.** Significant (FDR<0.05) KEGG pathways involved in longevity identified by iGSEA4GWAS software. The analysis has been performed considering all the annotated common variants in Cohort 1.

| Pathway | Gene Set Name                                        | P-value | FDR value |
|---------|------------------------------------------------------|---------|-----------|
| KEGG    | AXON GUIDANCE                                        | 0.001   | 1.00E-03  |
| KEGG    | CALCIUM SIGNALING PATHWAY                            | 0.001   | 1.00E-03  |
| KEGG    | GLYCINE SERINE AND THREONINE METABOLISM              | 0.001   | 0.001     |
| KEGG    | LONG TERM POTENTIATION                               | 0.001   | 0.001     |
| KEGG    | MELANOGENESIS                                        | 0.001   | 0.001     |
| KEGG    | PPAR SIGNALING PATHWAY                               | 0.001   | 0.001     |
| KEGG    | TASTE TRANSDUCTION                                   | 0.001   | 0.001037  |
| KEGG    | O GLYCAN BIOSYNTHESIS                                | 0.001   | 0.00104   |
| KEGG    | DILATED CARDIOMYOPATHY                               | 0.001   | 0.001176  |
| KEGG    | MTOR SIGNALING PATHWAY                               | 0.001   | 0.001383  |
| KEGG    | NATURAL KILLER CELL MEDIATED CYTOTOXICITY            | 0.001   | 0.001432  |
| KEGG    | T CELL RECEPTOR SIGNALING PATHWAY                    | 0.001   | 0.0015    |
| KEGG    | CARDIAC MUSCLE CONTRACTION                           | 0.001   | 0.001516  |
| KEGG    | PURINE METABOLISM                                    | 0.001   | 0.001981  |
| KEGG    | LONG TERM DEPRESSION                                 | 0.001   | 0.002048  |
| KEGG    | CHEMOKINE SIGNALING PATHWAY                          | 0.001   | 0.002216  |
| KEGG    | HYPERTROPHIC CARDIOMYOPATHY HCM                      | 0.001   | 0.002672  |
| KEGG    | VASOPRESSIN REGULATED WATER REABSORPTION             | 0.002   | 0.003628  |
| KEGG    | JAK STAT SIGNALING PATHWAY                           | 0.002   | 0.010869  |
| KEGG    | PROGESTERONE MEDIATED OOCYTE MATURATION              | 0.001   | 0.014443  |
| KEGG    | ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY ARVC | 0.003   | 0.022281  |
| KEGG    | FOCAL ADHESION                                       | 0.009   | 0.030066  |
| KEGG    | ADIPOCYTOKINE SIGNALING PATHWAY                      | 0.011   | 0.032412  |
| KEGG    | FRUCTOSE AND MANNOSE METABOLISM                      | 0.024   | 0.049648  |