**Supplementary Table 1. Herb-derived products with anti-aging effects on cells.**

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| --- | --- | --- | --- | --- | --- |
| Drugs | Mechanism | Models | Chinese medicine or active ingredient | Targets/signalling pathways | References |
| *Astragalus membranaceus*（Fisch. ）Bunge. | Telomerase activity | Rat liver cells | Astragalus Membranaceus Total Extract | Telomerase activity,TERT↑ | [14] |
| Nucleus pulposus cells | Cycloastragenol | [15] |
| Mouse embryonic fibroblasts | [16] |
| Oxidative stress | Rat liver cells | Astragalus Membranaceus Total Extract | TBA,8-OH-dG↓ | [14] |
| Mice | MDA,ROS↓SOD↑PI3K/Akt1  | [24] |
| Rat dermal fibroblasts | Astragaloside IV | ROS↓SOD↑ | [15] |
| Human umbilical vein endothelial cells | SIRT1/AMPK | [29] |
| Human renal cortical proximal tubular epithelial barrier cells | ROS↓AhR ↓ | [25] |
| Autophagy | Mouse macrophages | Astragalus Injection | Autophagosomes,IL-6↓AMPK/mTOR  | [35] |
| Rat lung tissue | AstragalosideIV | ROS,Autophagosomes↓SOD↑PI3K / Akt /mTOR  | [36] |
| Type 2 diabetic rats | Astragalus polysaccharide | IL-6↓AMPK/mTOR  | [22] |
| Cardiomyocyte-injured rats and mice with heart failure | Autophagosomes↓ AMPK/mTOR  | [37] |
| Mitochondrial disorders and DNA damage | Human renal cortical proximal tubule epithelial cells | Formononetin | ROS↓Sirt1/PGC-1α ↑ | [43] |
| Glial cells | Astragaloside | ROS↓PINK1/Parkin ↓ | [45] |
| Human monocytes | Ononin | Mitochondrial autophagy↑ | [46] |
| Rat aortic endothelial cells | Astragalus polysaccharide | Na+/Ca2+↑NLRP3,IL-1β,p16,p21,p53↓ | [47] |
| Inflammatory response | Mice with idiopathic pulmonary fibrosis | AstragalosideIV | IL-6↓TLR4/NF-κB ↓ | [57] |
| Human renal cortical proximal tubule epithelial cells | IL-6↓SITR1/p53↑ | [52] |
| Mouse asthma model | IL-4,IL-5,IL-17,mTORC1↓AKT/mTOR | [23] |
| Rat synovial fibroblasts | Astragalus polysaccharide | IL-6↓PI3K/AKT/mTOR  | [53] |
| Rat aortic endothelial cells | Na+/Ca2+↑NLRP3,IL-1β,p16,p21,p53↓ | [47] |
| Metabolism | Type 2 diabetic mice | AstragalosideIV | ROS,MDA↓, SOD↑PI3K/AKT,AMPK/sirt1 | [62] |
| Astragalus polysaccharide | ROS,IL-6,Shigella bacteria↓Heterotrophic bacteria,Lactobacillus↑ | [61] |
| T1R2,Gα,TRPM5↑ | [64] |
| Rats with non-alcoholic fatty liver disease | TLR4,NF-κB,NLRP3,Thick-walled Bacteria / Bacteroidetes↓Bacillus deformans↑ | [72] |
| Intestinal flora | Mice with idiopathic pulmonary fibrosis | IL-6↓TLR4/NF-κB  | [57] |
| Type 2 diabetic mice | ROS,IL-6,Shigella bacteria↓Heterotrophic bacteria,Lactobacillus↑ | [61] |
| STR↑ | [64] |
| Cholesterol gallstones in mice | Phyllostomycetes↑ | [73] |
| *Reynoutria japonica* Houtt.(R. japonica) | Telomerase activity | Human myeloid cells | Resveratrol | p53↓TERT↑ | [81] |
| Endothelial progenitor cells | Telomerase ↑PI3K-Akt | [82] |
| Oxidative stress | Bone marrow stromal stem cells | ROS↓PPAR-γ↑ | [88] |
| ROS,P53,P16,P21↓SOD↑,MAPK | [84] |
| Vascular smooth muscle cells | SOD↑,AMPK/sirt1 | [83] |
| Glomerular foot cells | Polydatin | ROS↓,HIF-1α/NOX4 | [97] |
| Human retinal epithelial cells | Polysaccharide | ROS↓SOD,NRF2↑ | [98] |
| Cardiac senescence in mice | ROS,p53↓SOD↑ | [99] |
| Renal aging mice | AKt,MDA↓SOD↑ | [100] |
| Liver-damaged mice | Aqueous extract of Tigernut | NRF2,SOD↑MDA↓ | [101] |
| Autophagy | Human umbilical vein endothelial cells | Resveratrol | Notch1,mTOR↓ | [110] |
| Myogenic cells | P16,P21↓Autophagosomes↑ | [102] |
| Atherosclerotic mice | Polydatin | NLRP3,mTOR,IL-1β,IL-18↓Autophagosomes↑ | [107] |
| Mitochondrial disorders and DNA damage | Human umbilical vein endothelial cells/Human myeloid cells | Resveratrol | ROS↓Autophagosomes,SOD ↑ | [106] |
| Human embryonic lung fibroblasts/human peritoneal mesothelial cells | ROS,p53↓SOD↑ | [104] |
| Human nasal epithelial cells/allergic rhinitis in mice | Polydatin | NLRP3,ROS↓PINK1-Parkin | [104] |
| Inflammatory response | Human airway epithelial cells | Resveratrol | SIRT1↑IL-1β,IL-6,IL-8,NF-κB,p65↓ | [110] |
| Osteoarthritic rats/rat chondrocytes | Polydatin | NF-κB,IL-6,MMP↓ | [112] |
| Mice with colitis | STAT17,Th3↓ | [114] |
| Metabolism | Human umbilical vein endothelial cells | Polydatin | miR-26a-5p/BID | [116] |
| Insulinoma cells/diabetic mice | TG,TC↓ | [118] |
| Fat cells | Polysaccharide | IL-1β,IL-6↓ NRF2↑ | [119] |
| Obese mice | IL-1,IL-1β,SREBP-1,PPARα↓AMPK↑ | [122] |
|  | Hyperlipidemic mice | TG,TC,PPARα,SREBP1c↓ | [123] |
| Type 2 diabetic mice | Saponin | Enterococcus,Enterobacteria-ceae,TG,TC,LDL↓AKT,Bifidobacte-rium bifidum,Lactobacillus↑ | [124] |
| Aqueous extract of Tigernut | TG,TC,LDL↓PI3K/AKT | [125] |
| Intestinal flora | Metabolic syndrome rats | Resveratrol | Enterobacte-riaceae,Streptococcus↓Bifidobacterium-bifidum,Lactobac-illus↑ | [128] |
| Obese mice | ROSHeterobacterium spp. ↑ | [127] |
| Type 2 diabetic mice | Saponin | Enterococcus,Enterobacteria-ceae,TG,TC,ox-LDL↓AKT,Bifidobacterium- bifidum,Lactob-acillus↑ | [124] |
| Mice | Morinda Citrifolia Ethanol Extract | Lactobacillus spp. ,Enterobacteriacea-e↑ | [126] |
| *Bupleurum scorzonerifolium*. | Telomerase activity | Human aortic endothelial cells | Quercetin | ox-LDL↓Telomerase↑ | [133] |
| Vascular smooth muscle cells | ROS,MDA↓AMPK,SOD↑ | [134] |
| Oxidative stress | Lung epithelial cells | Chai Hu polysaccharide | ROS,MDA↓SOD↑ | [135] |
| Nerve cellsNerve cells | SaikosaponinD | ROS,MDA↓SOD↑PI3K/NRF2 | [136] |
| Chondrocytes | IL-6,ROS↓NRF2↑ | [137] |
| Cardiomyocyte inflammation | ROS,MDA↓p38-MAPK | [138] |
| Autophagy | Liver fibrosis mice | Quercetin | p62↑ | [140] |
| Myeloid nucleus | ROS↓Autophagoso-mes ↑p38MAPK / mTOR | [139] |
| Mitochondrial disorders and DNA damage | Rat neuronal cells neuronal cells | SaikosaponinD | NF-κB↓ | [141] |
| Human dermal fibroblasts | Quercetin | p16INK4A, p53↓ | [27] |
| Inflammatory response | Microglia/neuritis mice | Ethanolic extract of Radix Bupleurum | IL-6,IL-1β,ROS,NF-κB↓ | [142] |
| Nasopharyngeal carcinoma senescent cells | Quercetin | IL-6,IL-1β,NF-κB↓NRF2↑ | [143] |
| Pulmonary inflammation in mice | SaikosaponinA | IL-1β,NF-κB↓MDA,NRF2↑ | [144] |
| Mice with endometritis | IL-6,IL-1β,NF-κB↓NRF2↑ | [145] |
| Mice with acute lung injury | IL-6,IL-1β↓NF-κB/TLR4 | [146] |
| Macrophages | SaikosaponinB | IL-6,IL-1β,NF-κB↓ | [147] |
| Liver damaged mice | IL-6,IL-1β,NF-κB↓ Sirt-6,Na+-K+-ATPPase,Ca2+-Mg2+-ATPPase↑ | [148] |
| Depressed mice | SaikosaponinC | IL-6,IL-1β↓Microglia↑ | [152] |
| Diabetic rats | IL-6,IL-1β↓AQP1 / RhoA / ROCK  | [149] |
| Microglia/mouse neuroinflammation | SaikosaponinD | IL-6,IL-1β↓NF-κB/TLR4 | [153] |
| Liver fibrosis mice | IL-β,NLRP3↓ | [154] |
| ROS,MMP,NLRP3↓ | [155] |
| MDA,NLRP3,IL-1β↓SOD↑ | [156] |
| Metabolism | Hyperlipidemic rats | Saikosaponin | TC,TG↓ | [154] |
| Hyperlipidemic pancreatitis in rats | SaikosaponinA | PPARγ↑IL-6,IL-1β,NF-κB,TC↓ | [157] |
| Metabolic fatty liver mice | SaikosaponinD | PPARα,TG,SREBP1c↓ | [158] |
| Liver-damaged mice | Saikosaponinb2 | IL-6,IL-1β,NF-κB↓ Sirt6,Na+-K+-ATPPase,Ca2+-Mg2+-ATPase ↑ | [148] |
| Intestinal flora | Rats with severe acute pancreatitis | SaikosaponinA | SOD↓Prevotella,lactic acid bacteria↑Keap1/NRF2/ARE | [159] |
| Colitis mice | SaikosaponinD | IL-6,IL-1β,NF-κB,Ruminiclostridium↓Roseburia,Helicobater,Lactobacillus↑ | [160] |
| *Evodia rutaecarpa* (Juss.) Benth.  | Oxidative stress | Brain damaged mice | Corydaline | ROS↓SOD↑PGK1 / NRF2 | [166] |
| Endothelial cells | Rutinine | p21,ROS↓Cα,SIRT1↑ | [167] |
| Cardiomyocytes | IL-6,IL-1β,ROS,MDA↓SOD↑MAPK  | [173] |
| Cardiotoxic mice | MDA↓SOD,NRF2↑ | [174] |
| Inflammatory bowel disease in mice | ROS↓NRF2↑ | [164] |
| Cerebral ischemia/reperfusion in rats | IL-6, IL-1β,SOD↓ NRF2↑ | [169] |
| Gastric mucosal injury in mice | IL-6,IL-1β,MDA↓SOD,PI3K,NRF2↑ | [170] |
| Renal ischemia-reperfusion in mice | p38,c-Jun,IL-6, IL-1β,NF-κB,MDA,ROS↓SOD↑ | [172] |
| Autophagy | Astrocytes | Corydaline | Autophagosomes↑JNK / p38 MAPK | [175] |
| Colitis mice | IL-1β,NFκB,NLRP3↓Autophagosomes↑ | [176] |
| Mitochondrial disorders and DNA damage | Mouse liver cells | Rutinine | JNK / p38 MAPK ,PI3K/Akt | [177] |
| Endothelial inflammation | NF-κB↓NRF2↑ | [178] |
| Liver cells | ROS↓NRF2↑ | [179] |
| Liver-damaged mice | IL-1β,IL-6,MDA↓NRF2↑ | [181] |
| Inflammatory response | Colitis mice | Corydaline | IL-1β,NFκB,NLRP3↓Autophagosomes↑ | [182] |
| IL-1β,IL-6,NF-κB,NLRP3,Enterobacteriaceae↓Lactobacillus↑ | [183] |
| Mouse mammary epithelial cells | IL-1β,NF-κB,p38,JNK,AKT↓p38/JNK-MAPK | [184] |
| Asthmatic mice | NF-κB/TLR-4 | [183] |
| Human umbilical vein endothelial cells | [184] |
| Rat kidney cells | ROS,NF-κB↓ | [187] |
| Mouse microglia | IL-6,NF-κB ↓AKT/NRF2 | [188] |
| Pulmonary inflammation/fibrosis in mice | IL-6↓ERK1/2↑ | [190] |
| Human myeloid cells | IL-6↓SIRT1↑PI3K / Akt | [189][191] |
| Acute pancreatitis in rats | Rutinine | IL-6↓MAPK/NF-κB | [191] |
| Macrophages | IL-1β,NF-κB,MDA↓p38/JNK-MAPK | [186] |
| Hepatotoxic mice | IL-6,IL-1β,NF-κB,MDA↓NRF2↑ | [181] |
| Metabolism | Type 2 diabetic rats | Corydaline | TC,TG,MDA,IL-6,IL-1β↓ | [194] |
| Hyperlipidemic mice | TC,TG↓PPARγ↑ | [196] |
| Obese/diabetic mice | AMPK/mTOR | [198] |
| Hyperlipidaemic/hyperglycaemic rats | TC,TG,NF-κB,IL-6↓PI3K / Akt,AMPK↑ | [195] |
| Myocardial infarction rats | PPARα↓ATP↑ | [197] |
| Obese mice | TG,PPARα↓ | [178] |
| Intestinal flora | Liver fibrosis mice | Corydaline | IL-6,IL-1β,Enterococcu,Rachnochia↓Lactobacillus,Ackermaniaspp.,Mycobacterium avium↑ | [199] |
| Colitis mice | IL-1β ,Thick-walledbacteria/bacteroids,Alloprevotella, Lachnoclostridium, Oscillibacter, Lachnospiraceae,Ruminococcaceae, Bacteroidales. ↓Bacteroides, Parasutterella, Turicibacter↑ | [198] |
| NLRP3,IL-1β,IL-6,NF-κB,Enterobacteriaceae↓Lactobacillus↑ | [182] |
| *Panax ginseng*C.A.Mey. | Telomerase activity | Human diploid cells | Ginsenoside Rg1 | P21↓ | [204] |
| Human fibroblasts | P21↓Telomerase activity↑ | [205] |
| Aging rats | IL-6,IL-1β↓SOD,Telomerase↑ | [203] |
| Mesenchymal stem cells | NRF2↑PI3K/AKT | [209] |
| Neuronal damage | ROS,miR-144↓NRF2↑ | [212] |
| Haematopoietic stem cells / haematopoietic progenitor cells | Ginsenoside Rg1 | SIRT6,NF-κB↓Telomerase activity↑ | [203] |
| Oxidative stress | Neural stem cell aging | Ginsenoside Rg1 | ROS,MDA,p53,p16,p21↓SOD↑ Akt/mTOR | [206] |
| Mice with cerebral infarction | HIF-1α↓PI3K/Akt/mTOR | [207] |
| Rat Bone Marrow Stem Cells | PI3K / AKT | [208] |
| Mesenchymal stem cells | NRF2↑PI3K/AKT | [209] |
| Rat cardiomyocytes | ROS,MDA↓SOD,NRF2↑PI3K / AKT | [210] |
| Neuronal damage | ROS,miR-144↓NRF2↑ | [212] |
| Cardiomyocytes | ROS,SOD,c-Jun ↓ NRF2↑ | [214] |
| Hepatotoxic mice | SOD↓NRF2↑ | [215] |
| Liver-damaged mice | ROS,MDA↓NRF2↑ | [213] |
| Alzheimer's disease tree shrew | MDA,IL-1β↓SOD↑ | [216] |
| Autophagy | Liver-damaged mice | Ginsenoside Rg1 | IL-6,IL-1β, NF-κB,NLRP3↓ | [217] |
| Lung epithelial cells | IL-6,IL-1β↓ | [216] |
| Cardiomyocytes | Autophagosomes↑ | [218] |
| Mitochondrial disorders and DNA damage | Chronic Restraint Stress Depression in Rats | Ginsenoside Rg1 | IL-6,IL-1β,ROS,GAS5↓MMP,NRF2↑ | [218] |
| Cardiomyocyte model/septic mice | ROS↓MMP↑ | [219] |
| Cardiomyocytes | PINK1,AMPK↑ | [217] |
| Chronic Parkinson's disease in mice | ROS↓Mitochondrial disorders and DNA damage | [225] |
| Aging mice | ROS,MDA↓SOD↑p16Ink4ap53-p21 | [226] |
| Liver-damaged mice | MDA,IL-6,IL-1β↓SOD,NRF2↑ | [221] |
| Human renal tubular epithelial cells | IL-1β,MDA↓SOD↑ | [220] |
| Nerve cellsNerve cells | Ginseng polysaccharide | PINK1/Parkin | [217] |
| Inflammatory response | Cardiomyocytes | Ginsenoside Rg1 | IL-1β,MMP,NLRP3↓NF-κB/TLR4 | [229] |
| Haematopoietic stem cells / haematopoietic progenitor cells | SIRT6,NF-κB↓ | [230] |
| Endothelial cells | NF-κB,IL-6,p65↓ | [223] |
| Microglia | IL-1β,IL-6↓NF-κB/TLR4 | [226] |
| Spinal cord injury | IL-1β,IL-6,MDA↓SOD,NRF2↑ | [227] |
| Cognitively impaired rats | IL-1β,IL-6,MDA,p21,p53↓PI3K / AKT | [228] |
| Mice with chronic kidney injury | IL-1β,ROS,NLRP3↓ | [230] |
| Aging mice | ROS,NOX4,NF-κB,NLRP3↓ | [232] |
| Rat brain type I astrocytes | p38/JNK-MAPK | [232] |
| Metabolism | High fat diet -fed mice/glucagon attacked mice | Ginsenoside Rg1 | TG,TC,Akt↓ | [219] |
| Obese mice | AMPK↑ | [218] |
| Diabetic rats | TG,TC,IL-1β,IL-6,NF-κB↓ | [233] |
| Type 2 diabetic rats | TC, TG↓ | [234] |
| NASH Mice | TC,TG,ROS,IL-6↓ | [232] |
| Intestinal flora | Colitis mice | Ginsenoside Rg1 | IL-6,M1/M2,Bacteroide,Ruminococcaceae↓ | [235] |
| Colitis mice | ROS↓MMP↑ | [236] |
| Alzheimer's disease tree shrew | Firmicutes/Bacteroides,Lactobacillus salivarius↑Bacteroidetes↓ | [237] |