



EUROPEAN MEDICINES AGENCY  
SCIENCE MEDICINES HEALTH

27 March 2012  
EMA/HMPC/232102/2011  
Committee on Herbal Medicinal Products (HMPC)

## List of references supporting the assessment of *Rhodiola rosea* L., rhizoma et radix

Final

**The Agency acknowledges that copies of the underlying works used to produce this monograph were provided for research only with exclusion of any commercial purpose.**

Abidov M, Crendal F, Grachev S, Seifulla R, Ziegenfuss T. Effect of extracts from *Rhodiola rosea* and *Rhodiola crenulata* (Crassulaceae) roots on ATP content in mitochondria of skeletal muscles. *Bull Exp Biol Med* 2003, 136(6):585-7.

Abidov M, Grachev S, Seifulla RD, Ziegenfuss TN. Extract of *Rhodiola rosea* radix reduces the level of C-reactive protein and creatinine kinase in the blood. *Bull Exp Biol Med* 2004, 138(1):63-4.

Ali Z, Fronczek FR, Khan IA. Phenylalkanoids and monoterpene analogues from the roots of *Rhodiola rosea*. *Planta Med* 2008, 74:178-81.

Aslanyan G, Amroyan E, Gabrielyan E, Nylander M, Wikman G, Panossian A. Double-blind, placebo-controlled, randomised study of single dose effects of ADAPT-232 on cognitive functions. *Phytomed* 2010, 17(7):494-9.

Battistelli M, De Sanctis R, De Bellis R, Cucchiari L, Dacha M, Gobbi P. *Rhodiola rosea* as antioxidant in red blood cells: ultrastructural and haemolytic behaviour. *Eur J Histochem* 2005, 49(3):243-54.

Bjellin L, Löwkvist B, Thorsson L. Cytotoxicity test of a herbal extract (*Sedum rosea*). Swedish Herbal Institute, 1988, unpublished.

Blomkvist J, Taube A, Larhammar D. Perspective on Roseroot (*Rhodiola rosea*) studies. *Planta Med* 2009, 75(11):1187-90.

Boon-Niermeijer EK, van den Berg A, Wikman G, Wiegant FA. Phyto-adaptogens protect against environmental stress-induced death of embryos from the freshwater snail *Lymnaea stagnalis*. *Phytomed* 2000, 7(5):389-99.

Burgos R, Hancke J. Long-term toxicity test. 3 months subchronic toxicity test for *Sedum rosea*. Swedish Herbal Institute, Gothenburg, Sweden, 1991 unpublished results.



- Bystritsky A, Kerwin L, Feusner JD. A pilot study of *Rhodiola rosea* (Rhodax) for generalized anxiety disorder (GAD). *J Altern Complement Med* 2008, 14(2):175-80.
- Calcabrini C, De Bellis R, Mancini U, Cucchiari L, Potenza L, De Sanctis R, Patrone V, Scesa C, Dacha M. *Rhodiola rosea* ability to enrich cellular antioxidant defences of cultured human keratinocytes. *Arch Dermatol Res* 2010, 302(3):191-200.
- Cao LL, Du GH, Wang MW. The effect of salidroside on cell damage induced by glutamate and intracellular free calcium in PC12 cells. *J Asian Nat Prod Res* 2006, 8(1-2):159-65.
- Chen QG, Zeng YS, Tang JY, Qin YJ, Chen SJ, Zhong ZQ. Effects of *Rhodiola rosea* on body weight and intake of sucrose and water in depressive rats induced by chronic mild stress. *Zhong Xi Yi Jie He Xue Bao* 2008a, 6(9):952-5.
- Chen QG, Zeng YS, Qu ZQ, Tang JY, Qin YJ, Chung P, Wong R, Hägg U. The effects of *Rhodiola rosea* extract on 5-HT level, cell proliferation and quantity of neurons at cerebral hippocampus of depressive rats. *Phytomed* 2009, 16(9):830-8.
- Chen TS, Liou SY, Chang YL. Antioxidant evaluation of three adaptogen extracts. *Am J Chin Med* 2008, 36(6):1209-17.
- Chen X, Liu J, Gu X, Ding F. Salidroside attenuates glutamate-induced apoptotic cell death in primary cultured hippocampal neurons of rats. *Brain Res* 2008b, 1238:189-198.
- Chen X, Zhang Q, Cheng Q, Ding F. Protective effect of salidroside against H<sub>2</sub>O<sub>2</sub>-induced cell apoptosis in primary culture of rat hippocampal neurons. *Mol Cell Biochem* 2009a, 332(1-2):85-93.
- Cifani C, Micioni Di B MV, Vitale G, Ruggieri V, Ciccocioppo R, Massi M. Effect of salidroside, active principle of *Rhodiola rosea* extract, on binge eating. *Physiol Behav* 2010, 101(5):555-62.
- Colson SN, Wyatt FB, Johnston DL, Autrey LD, FitzGerald YL, Earnest CP. Cordyceps sinensis- and *Rhodiola rosea*-based supplementation in male cyclists and its effect on muscle tissue oxygen saturation. *J Strength Cond Res* 2005, 19(2):358-63. [abstract only]
- Darbinyan V, Kteyan A, Panossian A, Gabrielian E, Wikman G, Wagner H. *Rhodiola rosea* in stress induced fatigue-a double blind cross-over study of a standardized extract SHR-5 with a repeated low-dose regimen on the mental performance of healthy physicians during night duty. *Phytomed* 2000, 7(5):365-71.
- Darbinyan V, Aslanyan G, Amroyan E, Gabrielyan E, Malmström C, Panossian A. Clinical trial of *Rhodiola rosea* L. extract SHR-5 in the treatment of mild to moderate depression. *Nord J Psychiatry* 2007, 61(5):343-8.
- De Bock K, Eijnde BO, Ramaekers M, Hespel P. Acute *Rhodiola rosea* intake can improve endurance exercise performance. *Int J Sport Nutr Exerc Metab* 2004, 14(3):298-307.
- De Sanctis R, De Bellis R, Scesa C, Mancini U, Cucchiari L, Dacha M. In vitro protective effect of *Rhodiola rosea* extract against hypochlorous acid-induced oxidative damage in human erythrocytes. *Biofactors* 2004, 20(3):147-59.
- Dieamant Gde C, Velazquez Pereda Mdel C, Eberlin S, Nogueira C, Werka RM, Queiroz ML. Neuroimmunomodulatory compound for sensitive skin care: in vitro and clinical assessment. *J Cosmet Dermatol* 2008, 7(2):112-9. [abstract only]
- Evdokimov VG. Effect of cryopowder *Rhodiola rosae* L. on cardiorespiratory parameters and physical performance of humans. *Aviakosm Ekolog Med* 2009, 43(6):52-6. [abstract only]

- Evstatieva L, Todorova M, Antonova D, Staneva J. Chemical composition of the essential oils of *Rhodiola rosea* L. of three different origins. *Pharmacogn Mag* 2010, 6(24):256-8.
- Fintelmann V, Gruenwald J. Efficacy and tolerability of a *Rhodiola rosea* extract in adults with physical and cognitive deficiencies. *Adv Ther* 2007, 24(4):929-39.
- Ha Z, Zhu Y, Zhang X, Cui J, Zhang S, Ma Y, Wang W, Jian X. The effect of *rhodiola* and acetazolamide on the sleep architecture and blood oxygen saturation in men living at high altitude. *Zhonghua Jie He He Hu Xi Za Zhi* 2002, 25(9):527-30.
- Hancke J, Burgos R. Sub-chronic toxicological study in pigs. *Sedum rosea*. Swedish Herbal Institute, 1992 unpublished
- Hancke J, Burgos R, Caceres D. Evaluation of potential CNS toxicity of *Sedum rosea* dried extract. Swedish Herbal Institute, 1993, unpublished
- Hellum BH, Tosse A, Hoybakk K, Thomsen M, Rohloff J, Georg Nilsen O. Potent in vitro inhibition of CYP3A4 and P-glycoprotein by *Rhodiola rosea*. *Planta Med* 2010, 76(4):331-8.
- Hu X, Zhang X, Qiu S, Yu D, Lin S. Salidroside induces cell-cycle arrest and apoptosis in human breast cancer cells. *Biochem Biophys Res Commun* 2010, 398(1):62-7.
- Hu X, Lin S, Yu D, Qiu S, Zhang X, Mei R. A preliminary study: the anti-proliferation effect of salidroside on different human cancer cell lines. *Cell Biol Toxicol* 2010a, 26(6):499-507.
- Hung SK, Perry R, Ernst E. The effectiveness and efficacy of *Rhodiola rosea* L.: A systematic review of randomized clinical trials. *Phytomed* 2011, 18(4):235-44.
- Huang SC, Lee FT, Kuo TY, Yang JH, Chien CT. Attenuation of long-term *Rhodiola rosea* supplementation on exhaustive swimming-evoked oxidative stress in the rat. *Chin J Physiol* 2009, 52(5):316-24. [abstract only]
- Iovieno N, Dalton ED, Fava M, Mischoulon D. Second-tier natural antidepressants: Review and critique. *J Affect Disord* 2010, Jun 24. [Epub ahead of print]
- Ip SP, Che CT, Leung PS. Association of free radicals and the tissue renin-angiotensin system: prospective effects of *Rhodiola*, a genus of Chinese herb, on hypoxia-induced pancreatic injury. *J Pancreas* 2001, 2(1):16-25.
- Jafari M, Felgner JS, Bussel II, Hutchili T, Khodayari B, Rose MR, Vince-Cruz C, Mueller LD. *Rhodiola*: a promising anti-aging Chinese herb. *Rejuvenation Res* 2007, 10(4):587-602.
- Jeong HJ, Ryu YB, Park SJ, Kim JH, Kwon HJ, Kim JH, Park KH, Rho MC, Lee WS. Neuraminidase inhibitory activities of flavonols isolated from *Rhodiola rosea* roots and their in vitro anti-influenza viral activities. *Bioorg Med Chem* 2009, 17(19):6816-23.
- Kim SH, Hyun SH, Choung SY. Antioxidative effects of *Cinnamomi cassiae* and *Rhodiola rosea* extracts in liver of diabetic mice. *Biofactors* 2006, 26(3):209-19.
- Kobayashi K, Yamada K, Murata T, Hasegawa T, Takano F, Koga K, Fushiya S, Batkhuu J, Yoshizaki F. Constituents of *Rhodiola rosea* showing inhibitory effect on lipase activity in mouse plasma and alimentary canal. *Planta Med* 2008, 74(14):1716-9.
- Kucinskaite A, Poblocka-Olech L, Krauze-Baranowska M, Sznitowska M, Savickas A, Briedis V. Evaluation of biologically active compounds in roots and rhizomes of *Rhodiola rosea* L. cultivated in Lithuania. *Medicina (Kaunas)* 2007, 43(6):487-94.

- Kwon YI, Jang HD, Shetty K. Evaluation of *Rhodiola crenulata* and *Rhodiola rosea* for management of type II diabetes and hypertension. *Asia Pac J Clin Nutr* 2006, 15(3):425-32.
- Lee FT, Kuo TY, Liou SY, Chien CT. Chronic *Rhodiola rosea* extract supplementation enforces exhaustive swimming tolerance. *Am J Chin Med* 2009, 37(3):557-72.
- Li J, Fan WH, Ao H. Effect of *rhodiola* on expressions of Flt-1, KDR and Tie-2 in rats with ischemic myocardium. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 2005, 25(5):445-8. [abstract only]
- Li HB, Ge YK, Zheng XX, Zhang L. Salidroside stimulated glucose uptake in skeletal muscle cells by activating AMP-activated protein kinase. *Eur J Pharmacol* 2008, 588(2-3):165-9.
- Li X, Ye X, Li X, Sun X, Liang Q, Tao L, Kang X, Chen J. Salidroside protects against MPP(+)-induced apoptosis in PC12 cells by inhibiting the NO pathway. *Brain Res* 2011, Jan 14. [Epub ahead of print]
- Majewska A, Hoser G, Furmanowa M, Urbanska N, Pietrosiuk A, Zobel A, Kuras M. Antiproliferative and antimitotic effect, S phase accumulation and induction of apoptosis and necrosis after treatment of extract from *Rhodiola rosea* rhizomes on HL-60 cells. *J Ethnopharmacol* 2006, 103(1):43-52.
- Mao GX, Wang Y, Qiu Q, Deng HB, Yuan LG, Li RG, Song DQ, Li YY, Li DD, Wang Z. Salidroside protects human fibroblast cells from premature senescence induced by H<sub>2</sub>O<sub>2</sub> partly through modulating oxidative status. *Mech Ageing Dev* 2010, 131(11-12):723-31.
- Maslov LN, Lishmanov YB. Cardioprotective and antiarrhythmic properties of *Rhodiola rosea* preparations. *Eksp Klin Farmakol* 2007, 70(5):59-67. [abstract only]
- Maslov LN, Lishmanov YB, Arbuzov AG, Krylatov AV, Budankova EV, Konkovskaya YN, Burkova VN, Severova EA. Antiarrhythmic activity of phytoadaptogens in short-term ischemia-reperfusion of the heart and postinfarction cardiosclerosis. *Bull Exp Biol Med* 2009, 147(3):331-4. [abstract only]
- Mattioli L, Perfumi M. *Rhodiola rosea* L. extract reduces stress- and CRF-induced anorexia in rats. *J Psychopharmacol* 2007, 21(7):742-50.
- Mattioli L, Funari C, Perfumi M. Effects of *Rhodiola rosea* L. extract on behavioural and physiological alterations induced by chronic mild stress in female rats. *J Psychopharmacol* 2009, 23(2):130-42.
- Mattioli L, Perfumi M. Evaluation of *Rhodiola rosea* L. extract on affective and physical signs of nicotine withdrawal in mice. *J Psychopharmacol* 2011, 25(3):402-410.
- Mattioli L, Perfumi M. Effects of a *Rhodiola rosea* L. extract on acquisition and expression of morphine tolerance and dependence in mice. *J Psychopharmacol* 2011a, 25(3): 411-420.
- Ming DS, Hillhouse BJ, Guns ES, Eberding A, Xie S, Vimalanathan S, Towers GH. Bioactive compounds from *Rhodiola rosea* (Crassulaceae). *Phytother Res* 2005, 19(9):740-3.
- Olsson EM, von Scheele B, Panossian AG. A randomised, double-blind, placebo-controlled, parallel-group study of the standardised extract shr-5 of the roots of *Rhodiola rosea* in the treatment of subjects with stress-related fatigue. *Planta Med* 2009, 75(2):105-12.
- Panossian A, Hambardzumyan M, Hovhanissyan A, Wikman G. The adaptogens *Rhodiola* and *Schizandra* modify the response to immobilization stress in rabbits by suppressing the increase of phosphorylated stress-activated protein kinase, nitric oxide and cortisol. *Drug Target Insights* 2007, 2:39-54.
- Panossian A, Hovhannissyan A, Abrahamyan H, Gabrielyan E, Wikman G. Pharmacokinetic and pharmacodynamic study of interaction of *Rhodiola rosea* SHR-5 extract with warfarin and theophylline in rats. *Phytother Res* 2009a, 23(3):351-7.

- Panossian A, Hovhannisyan A, Abrahamyan H, Gabrielyan E, Wikman G. Pharmacokinetics of active constituents of *Rhodiola rosea* SHR-5 extract. In: Gupta VK (ed.). *Comprehensive bioactive natural products*. Vol. 2: Efficacy, safety & clinical evaluation I. Studium press, Houston 2010, 307-329.
- Panossian A, Nikoyan N, Ohanyan N, Hovhannisyan A, Abrahamyan H, Gabrielyan E, Wikman G. Comparative study of *Rhodiola* preparations on behavioral despair of rats. *Phytomed* 2008, 15(1-2):84-91.
- Panossian A, Wagner H. Stimulating effect of adaptogens: an overview with particular reference to their efficacy following single dose administration. *Phytother Res* 2005, 19(10):819-38.
- Panossian A, Wikman G. Evidence-based efficacy of adaptogens in fatigue, and molecular mechanisms related to their stress-protective activity. *Curr Clin Pharmacol* 2009, 4(3):198-219.
- Panossian A, Wikman G, Kaur P, Asea A. Adaptogens exert a stress-protective effect by modulation of expression of molecular chaperones. *Phytomed* 2009, 16(6-7):617-22.
- Panossian A, Wikman G, Sarris J. Rosenroot (*Rhodiola rosea*): traditional use, chemical composition, pharmacology and clinical efficacy. *Phytomed* 2010, 17(7):481-93.
- Panossian A, Wikman G, Kaur P, Asea A. Adaptogens (ADAPT-232) stimulate neuropeptide Y expression in neuroglia cells. Abstract of a short lecture. *Planta Med* 2011, 77:1248.
- Parisi A, Tranchita E, Duranti G, Ciminelli E, Quaranta F, Ceci R, Cerulli C, Borriore P, Sabatini S. Effects of chronic *Rhodiola Rosea* supplementation on sport performance and antioxidant capacity in trained male: preliminary results. *J Sports Med Phys Fitness* 2010, 50(1):57-63.
- Perfumi M, Mattioli L. Adaptogenic and central nervous system effects of single doses of 3% rosavin and 1% salidroside *Rhodiola rosea* L. extract in mice. *Phytother Res* 2007, 21(1):37-43.
- Pooja, Bawa AS, Khanum F. Anti-inflammatory activity of *Rhodiola rosea*-"a second-generation adaptogen". *Phytother Res* 2009, 23(8):1099-102.
- Provalova NV, Skurikhin EG, Pershina OV, Suslov NI, Minakova MY, Dygai AM, Gol'dberg ED. Mechanisms underlying the effects of adaptogens on erythropoiesis during paradoxical sleep deprivation. *Bull Exp Biol Med* 2002, 133(5):428-32. [abstract only]
- Qian EW, Ge DT, Kong SK. Salidroside promotes erythropoiesis and protects erythroblasts against oxidative stress by up-regulating glutathione peroxidase and thioredoxin. *J Ethnopharmacol* 2011, 133(2):308-14.
- Qin YJ, Zeng YS, Zhou CC, Li Y, Zhong ZQ. Effects of *Rhodiola rosea* on level of 5-hydroxytryptamine, cell proliferation and differentiation, and number of neuron in cerebral hippocampus of rats with depression induced by chronic mild stress. *Zhongguo Zhong Yao Za Zhi* 2008, 33(23):2842-6. [abstract only]
- Qu ZQ, Zhou Y, Zeng YS, Li Y, Chung P. Pretreatment with *Rhodiola rosea* extract reduces cognitive impairment induced by intracerebroventricular streptozotocin in rats: implication of anti-oxidative and neuroprotective effects. *Biomed Environ Sci* 2009, 22(4):318-26.
- Ouyang JF, Lou J, Yan C, Ren ZH, Qiao HX, Hong DS. In-vitro promoted differentiation of mesenchymal stem cells towards hepatocytes induced by salidroside. *J Pharm Pharmacol* 2010, 62(4):530-8. [abstract only]
- Rohloff J. Volatiles from rhizomes of *Rhodiola rosea* L. *Phytochem* 2002, 59(6):655-61.
- Saratikov AS. The golden root (*Rhodiola rosea*). Tomsk University Publishers, Tomsk 1974.

Sarris J. Herbal medicines in the treatment of psychiatric disorders: a systematic review. *Phytother Res* 2007, 21(8):703-16.

Schriner SE, Abrahamyan A, Avanesian A, Bussel I, Maler S, Gazarian M, Holmbeck MA, Jafari M. Decreased mitochondrial superoxide levels and enhanced protection against paraquat in *Drosophila melanogaster* supplemented with *Rhodiola rosea*. *Free Radic Res* 2009, 43(9):836-43. [abstract only]

Schriner SE, Avanesian A, Liu Y, Luesch H, Jafari M. Protection of human cultured cells against oxidative stress by *Rhodiola rosea* without activation of antioxidant defenses. *Free Radic Biol Med* 2009a, 47(5):577-84.

Schutgens FW, Neogi P, van Wijk EP, van Wijk R, Wikman G, Wiegant FA. The influence of adaptogens on ultraweak biophoton emission: a pilot-experiment. *Phytother Res* 2009, 23(8):1103-8.

Shen W, Fan WH, Shi HM. Effects of rhodiola on expression of vascular endothelial cell growth factor and angiogenesis in aortic atherosclerotic plaque of rabbits. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 2008, 28(11):1022-5. [abstract only]

Shevtsov VA, Zholus BI, Shervarly VI, Vol'skij VB, Korovin YP, Khristich MP, Roslyakova NA, Wikman G. A randomized trial of two different doses of a SHR-5 *Rhodiola rosea* extract versus placebo and control of capacity for mental work. *Phytomed* 2003, 10(2-3):95-105.

Skarpanska-Stejnborn A, Pilaczynska-Szczesniak L, Basta P, Deskur-Smielecka E. The influence of supplementation with *Rhodiola rosea* L. extract on selected redox parameters in professional rowers. *Int J Sport Nutr Exerc Metab* 2009, 19(2):186-99.

Spasov AA, Mandrikov VB, Mironova IA. The effect of rhodaxon on psycho-physiologic and physical adaptation of students to the academic load. *Exp Clin Pharmacol* 2000b, 63:76-78.

Spasov AA, Wikman GK, Mandrikov VB, Mironova IA, Neumoin VV. A double-blind, placebo-controlled pilot study of the stimulating and adaptogenic effect of *Rhodiola rosea* SHR-5 extract on the fatigue of students caused by stress during an examination period with a repeated low-dose regimen. *Phytomed* 2000a, 7(2):85-9.

Tan CB, Gao M, Xu WR, Yang XY, Zhu XM, Du GH. Protective effects of salidroside on endothelial cell apoptosis induced by cobalt chloride. *Biol Pharm Bull* 2009, 32(8):1359-63.

Tharakan B, Manyam BV. Botanical therapies in chronic fatigue. *Phytother Res* 2006, 20:91-95.

Tolonen A, Pakonen M, Hohtola A, Jalonen J. Phenylpropanoid glycosides from *Rhodiola rosea*. *Chem Pharm Bull (Tokyo)* 2003, 51(4):467-70.

van Diermen D, Marston A, Bravo J, Reist M, Carrupt PA, Hostettmann K. Monoamine oxidase inhibition by *Rhodiola rosea* L. roots. *J Ethnopharmacol* 2009, 122(2):397-401.

Walker TB, Altobelli SA, Caprihan A, Robergs RA. Failure of *Rhodiola rosea* to alter skeletal muscle phosphate kinetics in trained men. *Metabolism* 2007, 56(8):1111-7.

Walker TB, Robergs RA. Does *Rhodiola rosea* possess ergogenic properties? *Int J Sport Nutr Exerc Metab* 2006, 16(3):305-15.

Wang H, Ding Y, Zhou J, Sun X, Wang S. The in vitro and in vivo antiviral effects of salidroside from *Rhodiola rosea* L. against coxsackievirus B3. *Phytomed* 2009a, 16(2-3):146-55.

Wang Q, Wang J, Sun LJ, Hu LP, Li J, Shao JQ, Lu B, Wang YT, Wu B, Wang GH. Salidroside protects the hypothalamic-pituitary-gonad axis of male rats undergoing negative psychological stress in experimental navigation and intensive exercise. *Zhonghua Nan Ke Xue* 2009, 15(4):331-6. [abstract only]



- Wiegant FA, Surinova S, Ytsma E, Langelaar-Makkinje M, Wikman G, Post JA. Plant adaptogens increase lifespan and stress resistance in *C. elegans*. *Biogerontol* 2009, 10(1):27-42.
- Wing SL, Askew EW, Luetkemeier MJ, Ryuji DT, Kamimori GH, Grissom CK. Lack of effect of Rhodiola or oxygenated water supplementation on hypoxemia and oxidative stress. *Wilderness Environ Med* 2003, 14(1):9-16.
- Wu T, Zhou H, Jin Z, Bi S, Yang X, Yi D, Liu W. Cardioprotection of salidroside from ischemia/reperfusion injury by increasing N-acetylglucosamine linkage to cellular proteins. *Eur J Pharmacol* 2009, 24; 613(1-3):93-9.
- Wu YL, Piao DM, Han XH, Nan JX. Protective effects of salidroside against acetaminophen-induced toxicity in mice. *Biol Pharm Bull* 2008, 31(8):1523-9. [abstract only]
- Wu YL, Lian LH, Jiang YZ, Nan JX. Hepatoprotective effects of salidroside on fulminant hepatic failure induced by D-galactosamine and lipopolysaccharide in mice. *J Pharm Pharmacol* 2009a, 61(10):1375-82. [abstract only]
- Yin D, Yao W, Chen S, Hu R, Gao X. Salidroside, the main active compound of Rhodiola plants, inhibits high glucose-induced mesangial cell proliferation. *Planta Med* 2009, 75(11):1191-5.
- Yu S, Liu M, Gu X, Ding F. Neuroprotective effects of salidroside in the PC12 cell model exposed to hypoglycemia and serum limitation. *Cell Mol Neurobiol* 2008, 28(8):1067-78.
- Yu S, Shen Y, Liu J, Ding F. Involvement of ERK1/2 pathway in neuroprotection by salidroside against hydrogen peroxide-induced apoptotic cell death. *J Mol Neurosci* 2010, 40(3):321-31.
- Zhang J, Liu A, Hou R, Zhang J, Jia X, Jiang W, Chen J. Salidroside protects cardiomyocyte against hypoxia-induced death: a HIF-1alpha-activated and VEGF-mediated pathway. *Eur J Pharmacol* 2009, 607(1-3):6-14.
- Zhang L, Yu H, Sun Y, Lin X, Chen B, Tan C, Cao G, Wang Z. Protective effects of salidroside on hydrogen peroxide-induced apoptosis in SH-SY5Y human neuroblastoma cells. *Eur J Pharmacol* 2007, 564(1-3):18-25.
- Zhang L, Yu H, Zhao X, Lin X, Tan C, Cao G, Wang Z. Neuroprotective effects of salidroside against beta-amyloid-induced oxidative stress in SH-SY5Y human neuroblastoma cells. *Neurochem Int* 2010, 57(5):547-55.
- Zhong H, Xin H, Wu LX, Zhu YZ. Salidroside attenuates apoptosis in ischemic cardiomyocytes: a mechanism through a mitochondria-dependent pathway. *J Pharmacol Sci* 2010, 114(4):399-408.
- Zhu BW, Sun YM, Yun X, Han S, Piao ML, Murata Y, Tada M. Reduction of noise-stress-induced physiological damage by radices of Astragali and Rhodiolae: glycogen, lactic acid and cholesterol contents in liver of the rat. *Biosci Biotechnol Biochem* 2003, 67(9):1930-6.
- Zhu J, Wan X, Zhu Y, Ma X, Zheng Y, Zhang T. Evaluation of salidroside in vitro and in vivo genotoxicity. *Drug Chem Toxicol* 2010, 33(2):220-6.
- Zubeldia JM, Nabi HA, Del Rio MJ, Genovese J. Exploring new applications for Rhodiola rosea: can we improve the quality of life of patients with short-term hypothyroidism induced by hormone withdrawal? *J Med Food* 2010, 13(6):1287-92.