PRODUCTLINE CATALOG

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International Edition

Polyphenols

Flavonoids – Stilbenoids – Phenolic Acids

CONTENTS:

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Introduction

Polyphenols, a large class of chemicals which are found in plants, have attracted much attention in the last decades due to their properties and the hope that they will show beneficial health effects, when taken as a dietary input or as complement [1]. Phenolic compounds constitute one of the most extensive group of chemicals in the plant kingdom. It is estimated that more than 8000 compounds have been isolated and described [2].

Polyphenols are polyhydroxylated phytochemicals, which have common structures. They can be subdivided in three main subclasses, the flavonoids, phenolic acids, and the stilbenoids. By far most isolated compounds belong to the subclass of the flavonoids.

Flavonoids are characterized as containing two or more aromatic rings, each bearing one or more phenolic hydroxyl groups, and connected by a carbon bridge [3, 4]. One aromatic ring (A ring) is connected to the second aromatic ring (B ring) by a carbon bridge which consists of three carbon atoms. When the three carbon chain is connected to a hydroxyl group from A, the formed structure become cyclic (C ring), as a 6-membered ring. Most flavonoids bear this type of phenylbenzopyrane structure: they have further been subdivided into subclasses, based on the position of the B ring relative to the C ring, as well as the functional groups (ketones, hydroxyls) and presence of a double bond or not in the C ring. These subclasses are termed flavones, isoflavones and isoflavanes, flavanones, flavanols, anthocyanidins, chalcones and dihydrochalcones. The flavanols themselves are subdivided into monomers (catechins) and polymers (proanthocyanidins, theaflavins and thearubigins) [4].

Phenolic acids are usually divided in two main groups. They are derived from benzoic acids, containing seven carbon atoms, or from cinnamic acids, comprising nine carbon atoms [5]. All these compounds are hydroxylated. The main representative isolated compounds are gallic acid, chlorogenic acid, caffeic acid, ferulic acid, p-coumaric acid, and gentisic acid.

The smaller subclass of stilbenoids comprises polyhydroxylated stilbenes, the main representative being resveratrol.

All these polyphenols are found in plants, esterified with glucose and other carbohydrates (glycosides) or as free aglycones. This contributes to their complexity and the huge number of individual substances which have been isolated and identified. Dietary polyphenols have been isolated from fruits (berries, apples, citrus, cherries); vegetables (onion [6], celery, beer hops, soy beans); herbs, roots, spices (gingko, turmeric); green and black tea; red wine.

It is known that consumption of flavonoid-rich foods, especially fruit and vegetables, translates into benefits on human health: epidemiological studies have found associations between lower incidence of heart disease, cancer, gastrointestinal and neurological diseases, liver diseases, atherosclerosis, obesity and allergies [2, 5, 7-9]. Polyphenols are potent antioxidants; they are able to scavenge free radicals. It was first thought that the health benefits associated with the consumption of dietary polyphenols were due to antioxidant mechanisms. There is conflicting evidence however on how great the contribution of the total antioxidant capacity in human plasma results in increased antioxidant protection of lipids and proteins. Because those natural products generally have limited bioavailability and reach at best low micromolar concentrations in plasma, one can conclude that polyphenols are unlikely to make a significant contribution to the antioxidant capacity of human plasma [3, 10]. Other limiting factors are a low solubility of the aglycones (often less than 20mg/ml water), low absorption, and a rapid metabolism. Many of the positive effects were demonstrated *in vitro* and research has been done on animal populations, therefore the benefits on humans remain uncertain. Poor bioavailability of polyphenols, usually in a range of 2-20%, makes it even more difficult to draw clear conclusions and relevant data from small

Polyphenol Subclasses

Flavonoids

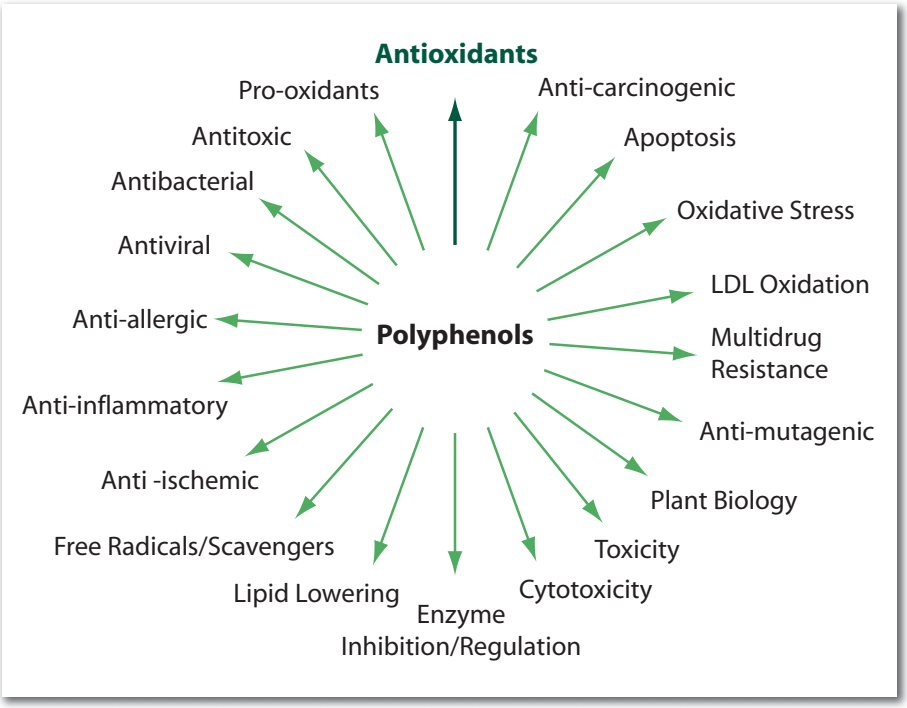
- Flavones
- Isoflavones + Isoflavanes
- Flavanones
- Flavonols
- Flavanols
  - Monomers ~ Catechins
  - Polymers ~ Proanthocyanidins
    ~ Condensed Tannins
    ~ Theaflavins
    ~ Thearubigins
- Anthocyanidins
- Chalcones + Dihydrochalcones

Stilbenoids

- Polyhydroxylated Stilbenes
  ~ Resveratrol Analogs

Phenolic Acids

- Derived from Cinnamic acid or Benzoic acid
- Chlorogenic acid
- Caffeic acid
- Ferulic acid
- p-Coumarinic acid
- Gentisic acid
- Gallic acid



clinical trials [1]. It is also believed, but has not been conclusively proven, that the metabolites are less or barely biologically active.

Nevertheless, there is mounting evidence and an accumulating number of studies which report the neuroprotective, cardioprotective and chemopreventive actions of dietary polyphenols. Despite the major focus on the antioxidant properties, there is an emerging belief that flavonoids and other polyphenols, and their metabolites, do not act as antioxidants, but may exert modulatory actions in cells through actions at protein kinase and lipid kinase signalling pathways [11]. Polyphenols from green tea exert their effect on multiple signalling pathways and regulate cell cycle proteins (Cyclin D1 as an example), protein kinases (e.g. IKK, Akt, MAPK), growth factors (e.g. EGF, HER-2), transcription factors (e.g. NF-κB, PPAR, p53), pro-apoptotic proteins (caspases, PARP, Bax and Bak) and anti-apoptotic proteins (e.g. Bcl-2, Bcl-XI, TRAF1) [9]. Enzyme inhibition, modulation of signalling cascades, interaction with oncoproteins, nucleic acids and nucleoproteins, antiproliferative activity, induction of apoptosis, metal chelation, these actions all provide insights into the beneficial health effects of polyphenols [7, 8, 12, 13]. A good deal of the recent research has been conducted on citrus flavonoids and on polyphenols found in green tea. Antibacterial, antitoxin, antiviral and antifungal activities of those compounds have been demonstrated [14].

As concluding remarks we would like to cite Halliwell and his word of caution [15]: "Flavonoids and other polyphenolic compounds have powerful antioxidant effect *in vitro* in many test systems, but can act as pro-oxidants in some others. Whether pro-oxidant, antioxidant, or any of the many other biological effects potentially exerted by flavonoids account for or contribute to the health benefits of diets rich in plant-derived foods and beverages is uncertain. Phenolic compounds may help to protect the gastrointestinal tract against damage by reactive species present in foods or generated within the stomach and intestines. The overall health benefit of flavonoids is uncertain, and consumption of large quantities of them in fortified foods or supplements should not yet be encouraged."

Literature References

[1] Commentary: bioavailability of flavonoids and polyphenols: call to arms: M. Hu; Mol. Pharm. **4,** 803 (2007)

[2] Effects of dietary flavonoids on apoptotic pathways related to cancer chemoprevention: S. Ramos; J. Nutr. Biochem. **18,** 427 (2007)

[3] Consumption of flavonoid-rich foods and increased plasma antioxidant capacity in humans: cause, consequence, or epiphenomenon?: S. B. Lotito & B. Frei; Free Radic. Biol. Med. **41,** 1727 (2006)

[4] Overview of dietary flavonoids: nomenclature, occurrence and intake: G. R. Beecher; J. Nutr. **133,** 3248S (2003)

[5] New insights on the anticancer properties of dietary polyphenols: P. Fresco, et al.; Med. Res. Rev. **26,** 747 (2006)

[6] Onions: a source of unique dietary flavonoids: R. Slimestad, et al.; J. Agric. Food Chem. **55,** 10067 (2007)

[7] Antioxidant activity of tea polyphenols in vivo: evidence from animal studies: B. Frei & J. V. Higdon; J. Nutr. **133,** 3275S (2003)

[8] Polyphenols and cancer cell growth: M. Kampa, et al.; Rev. Physiol. Biochem. Pharmacol. **159,** 79 (2007)

[9] Green tea polyphenols: biology and therapeutic implications in cancer: S. Shankar, et al.; Front. Biosci. **12,** 4881 (2007)

[10] Plant polyphenols: how to translate their in vitro antioxidant actions to in vivo conditions: C. G. Fraga; IUBMB Life **59,** 308 (2007)

[11] Flavonoids: antioxidants or signalling molecules?: R. J. Williams, et al.; Free Radic. Biol. Med. **36,** 838 (2004)

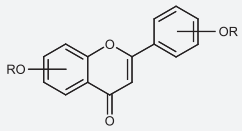
[12] Beneficial action of Citrus flavonoids on multiple cancer-related biological pathways: O. Benavente-Garcia, et al.; Curr. Cancer Drug Targets **7,** 795 (2007)

[13] Reading the tea leaves: anticarcinogenic properties of (-)-epigallocatechin-3-gallate: J. R. Carlson, et al.; Mayo Clin. Proc. **82,** 725 (2007)

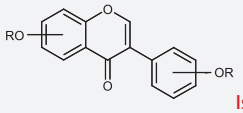
[14] Overview of antibacterial, antitoxin, antiviral, and antifungal activities of tea flavonoids and teas: M. Friedman; Mol. Nutr. Food Res. **51,** 116 (2007)

[15] Dietary polyphenols: good, bad, or indifferent for your health?: B. Halliwell; Cardiovasc. Res. **73,** 341 (2007)

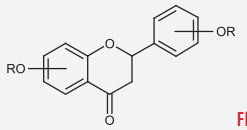
General Structures Overview



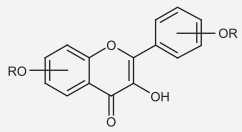
Flavones



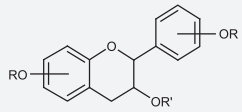
Isoflavones



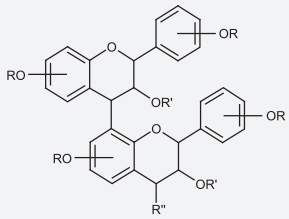
Flavanones



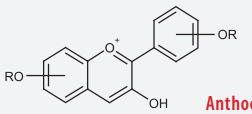
Flavonols



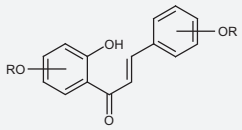
Catechins



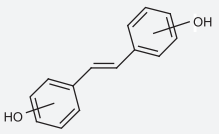
Proanthocyanidins



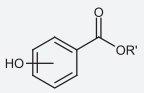
Anthocyanidins



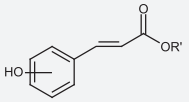
Chalcones



Stilbenoids



Benzoic acid



Cinnamic acid

Flavones

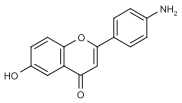
4′-Amino-6-hydroxyflavone

[Aminogenistein]

ALX-385-021-M001 1 mg

Inhibitor of the p56lck protein-tyrosine kinase.

LIT: Synthesis and protein-tyrosine kinase inhibitory activities of flavonoid analogues: M. Cushman, et al.; J. Med. Chem. **34,** 798 (1991) ▪ Expression of p56lck in B-cell neoplasias: A. Von Knethen, et al.; Leuk. Lymphoma **26,** 551 (1997)



Apigenin

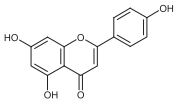
[4′,5,7-Trihydroxyflavone]

ALX-385-008-M010 10 mg

ALX-385-008-M050 50 mg

Synthetic. Antioxidant flavonoid. Has chemopreventive and antitumor properties. Induces apoptosis. MAP kinase (MAPK/ERK) inhibitor. Inhibits hypoxia-inducible factor-1 (HIF-1) and vascular endothelial growth factor (VEGF) expression.

LIT: Apigenin inhibits tumor angiogenesis through decreasing HIF-1alpha and VEGF expression: J. Fang, et al.; Carcinogenesis **28,** 858 (2007) ▪ Apigenin-induced cell cycle arrest is mediated by modulation of MAPK, PI3K-Akt, and loss of cyclin D1 associated retinoblastoma dephosphorylation in human prostate cancer cells: S. Shukla & S. Gupta; Cell Cycle **6,** 1102 (2007) ▪ **For a comprehensive bibliography please visit our website.**



Baicalein

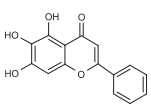
[5,6,7-Trihydroxyflavone]

ALX-385-022-M005 5 mg

ALX-385-022-M025 25 mg

Inhibitor of 12-lipoxygenase, leukotriene biosynthesis and the release of lysosomal enzymes. Inhibits cellular Ca^{2+} uptake and calcium mobilization. Inhibitor of protein tyrosine kinase in leukemia (CEM) cells. Induces cell cycle arrest and apoptosis. Anti-inflammatory compound. Has anti-thrombotic, anti-proliferative and anti-mitogenic effects.

LIT: Inhibition of reverse transcriptase activity by a flavonoid compound, 5,6,7-trihydroxyflavone: K. Ono, et al.; BBRC **160,** 982 (1989) ▪ Protective effects of baicalein against cell damage by reactive oxygen species: D. Gao, et al.; Chem. Pharm. Bull. (Tokyo) **46,** 1383 (1998) ▪ Mechanisms in mediating the anti-inflammatory effects of baicalin and baicalein in human leukocytes: Y.C. Shen, et al.; Eur. J. Pharmacol. **465,** 171 (2003) ▪ Baicalein induced cell cycle arrest and apoptosis in human lung squamous carcinoma CH27 cells: H.Z. Lee, et al.; Anticancer Res. **25,** 959 (2005) ▪ Baicalein inhibition of hydrogen peroxide-induced apoptosis via ROS-dependent heme oxygenase 1 gene expression: H.Y. Lin, et al.; Biochim. Biophys. Acta **1773,** 1073 (2007) ▪ **For a comprehensive bibliography please visit our website.**



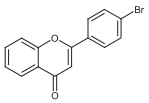
4′-Bromoflavone

[4′-Bromo-2-phenylbenzopyran]

ALX-385-029-G001 1 g

Synthetic. Chemopreventive compound. Potent inducer of phase II detoxifying enzymes.

LIT: Simple vs. complex inheritance of inducible aryl hydrocarbon hydroxylase in mouse tissues: K. Burki, et al.; Biochem. Genet. **13,** 417 (1975) ▪ Cancer chemopreventive activity mediated by 4′-bromoflavone, a potent inducer of phase II detoxification enzymes: L.L. Song, et al.; Cancer Res. **59,** 578 (1999)



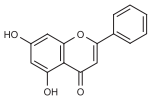
Chrysin

[5,7-Dihydroxyflavone]

ALX-385-009-G001 1 g

Antioxidant flavonoid. Shows anti-inflammatory and antitumor properties. Inhibits hypoxia-inducible factor-1α (HIF-1α). Induces apoptosis.

LIT: Chrysin-induced apoptosis is mediated through caspase activation and Akt inactivation in U937 leukemia cells: K.J. Woo, et al.; BBRC **325,** 1215 (2004) ▪ Chrysin inhibits expression of hypoxia-inducible factor-1alpha through reducing hypoxia-inducible factor-1alpha stability and inhibiting its protein synthesis: B. Fu, et al.; Mol. Cancer Ther. **6,** 220 (2007) ▪ **For a comprehensive bibliography please visit our website.**



Diosmin

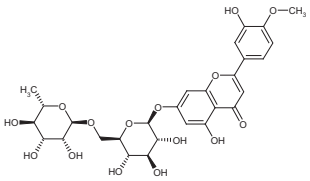
[3′,5,7-Trihydroxy-4′-methoxyflavone 7-rutinoside]

ALX-385-031-G005 5 g

ALX-385-031-G025 25 g

Isolated from *Citrus aurantium L.* and *Citrus reticulate Blanca.* Flavonoid glycoside. Reduces venous hyperpressure. Reduces capillary hyperpermeability and the expression of endothelial adhesion molecules (ICAM1, VCAM1). Effectively inhibits the P-glycoprotein (Pgp)-mediated efflux in cells. Anti-inflammatory.

LIT: The effect of diosmin hesperidin on intestinal ischaemia--reperfusion injury: M. Pehlivan, et al.; Acta Chir. Belg. **104,** 715 (2004) ▪ Treatment of metastatic melanoma B16F10 by the flavonoids tangeretin, rutin, and diosmin: C. Martinez Conesa, et al.; J. Agric. Food Chem. **53,** 6791 (2005) ▪ **For a comprehensive bibliography please visit our website.**



Luteolin

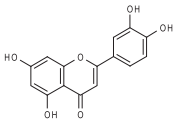
[3′,4′,5,7-Tetrahydroxyflavone]

ALX-385-007-M010 10 mg

ALX-385-007-M050 50 mg

Antioxidant flavonoid. Inhibits VEGF-induced angiogenesis. Inhibitor of phosphoinositide 3-kinase (PI(3)K). Inhibitor of fatty acid synthase (FAS). Apoptosis inducer.

LIT: Luteolin inhibits vascular endothelial growth factor-induced angiogenesis; inhibition of endothelial cell survival and proliferation by targeting phosphatidylinositol 3′-kinase activity: E. Bagli, et al.; Cancer Res. **64,** 7936 (2004) ▪ Pharmacological inhibitors of Fatty Acid Synthase (FASN)--catalyzed endogenous fatty acid biogenesis: a new family of anti-cancer agents?: R. Lupu & J. A. Menendez; Curr. Pharm. Biotechnol. **7,** 483 (2006) ▪ **For a comprehensive bibliography please visit our website.**

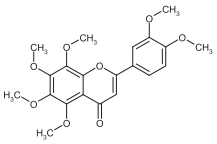


Nobiletin

ALX-385-026-M010 10 mg

Antioxidant and anti-inflammatory. Inhibits mitogen-activated protein kinase MEK. Suppresses the expression of matrix metalloproteinases (MMP) 1, 3 and 9. Suppresses NF-κB transcriptional activation, nitric oxide (NO) and PGE2 production, inducible nitric oxide (iNOS; NOS II) and cyclooxygenase-2 (COX-2) expression.

LIT: A citrus polymethoxyflavonoid, nobiletin, is a novel MEK inhibitor that exhibits antitumor metastasis in human fibrosarcoma HT-1080 cells: Y. Miyata, et al.; BBRC **366,** 168 (2008) ▪ **For a comprehensive bibliography please visit our website.**



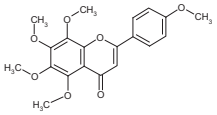
Tangeretin

[4′,5,6,7,8-Pentamethoxyflavone; Ponkanetin]

ALX-385-027-M010 10 mg

Flavonoid. Induces G1 cell cycle arrest in cancer cells. Inhibits cell proliferation in several cancer lines. Reduces elevation of blood pressure and plasma glucose levels.

LIT: Tangeretin suppresses IL-1beta-induced cyclooxygenase (COX)-2 expression through inhibition of p38 MAPK, JNK, and AKT activation in human lung carcinoma cells: K.H. Chen, et al.; Biochem. Pharmacol. **73,** 215 (2007) ▪ Tangeretin and nobiletin induce G1 cell cycle arrest but not apoptosis in human breast and colon cancer cells: K.L. Morley, et al.; Cancer Lett. **251,** 168 (2007) ▪ **For a comprehensive bibliography please visit our website.**



Wogonin

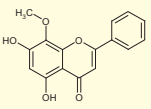
[5,7-Dihydroxy-8-methoxyflavone]

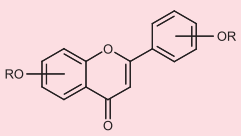
ALX-385-033-M005 5 mg

ALX-385-033-M025 25 mg

Isolated from *Scutellaria baicalensis.* Cell-permeable and orally available flavonoid. Induces apoptosis in tumor cells. Anti-inflammatory. Suppresses the release of nitric oxide (NO) by inducible nitric oxide synthase (iNOS; NOS II), PGE2 by cyclooxygenase-2 (COX-2), proinflammatory cytokines, MCP-1 gene expression and NF-κB activation. Antioxidant.

LIT: Wogonin preferentially kills malignant lymphocytes and suppresses T-cell tumor growth by inducing PLC{gamma}1- and Ca2+-dependent apoptosis: S. Baumann, et al.; Blood **111,** 2354 (2007) ▪ Wogonin prevents glucocorticoid-induced thymocyte apoptosis without diminishing its anti-inflammatory action : R. Enomoto, et al.; J. Pharmacol. Sci. **104,** 355 (2007) ▪ **For a comprehensive bibliography please visit our website.**

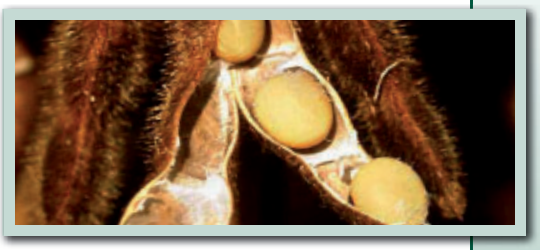




Flavones

POLYPHENOLS

Isoflavones



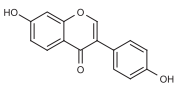
Daidzein

[4′,7-Dihydroxyisoflavone]

ALX-350-009-M010	10 mg
ALX-350-009-M025	25 mg
ALX-350-009-M050	50 mg

Synthetic. Inactive analog of the tyrosine kinase inhibitor genistein (Prod. No. ALX-350-006). Shows anti-inflammatory effect.

LIT: Genistein, a specific inhibitor of tyrosine-specific protein kinases: T. Akiyama, et al.; J. Biol. Chem. **262,** 5592 (1987) ▪ Genistein and daidzein, and their ß-glycoside conjugates: anti-tumor isoflavones in soybean foods from American and Asian diets: L. Coward, et al.; J. Agric. Food Chem. **41,** 1961 (1993) ▪ Daidzein inhibits insulin- or insulin-like growth factor-1-mediated signaling in cell cycle progression of Swiss 3T3 cells: K. Higashi and H. Ogawara; Biochim. Biophys. Acta **1221,** 29 (1994) ▪ Decreased circulating levels of tumor necrosis factor-alpha in postmenopausal women during consumption of soy-containing isoflavones: Y. Huang, et al.; J. Clin. Endocrinol. Metab. **90,** 3956 (2005) ▪ Clinical review: a critical evaluation of the role of soy protein and isoflavone supplementation in the control of plasma cholesterol concentrations: A. Dewell, et al.; J. Clin. Endocrinol. Metab. **91,** 772 (2006) ▪ **For a comprehensive bibliography please visit our website.**



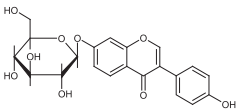
Daidzin

[Daidzein-7-O-glucoside]

ALX-350-248-M002	2 mg
ALX-350-248-M010	10 mg

Glucoside of the isoflavone daidzein (Prod. No. ALX-350-009) found in soy beans.

LIT: Metabolism of puerarin and daidzin by human intestinal bacteria and their relation to in vitro cytotoxicity: D.H. Kim, et al.; Biol. Pharm. Bull. **21,** 628 (1998) ▪ Daidzin and its antidipsotropic analogs inhibit serotonin and dopamine metabolism in isolated mitochondria: W.M. Keung & B.L. Vallee; PNAS **95,** 2198 (1998) ▪ Daidzein and genistein but not their glucosides are absorbed from the rat stomach: M.K. Piskula, et al.; FEBS Lett. **447,** 287 (1999)



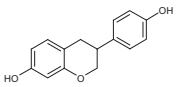
(R,S)-Equol

[(±)-Equol; 4′,7-Dihydroxyisoflavane]

ALX-385-032-M005	5 mg
ALX-385-032-M025	25 mg

Flavonoid. Racemic mixture. Urinary metabolite of daidzein. Inhibits 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced neoplastic cell transformation by targeting the MEK/ERK/p90RSK/activator protein-1 signalling pathway. Shows positive effects on the incidence of prostate cancer and physiological changes after menopause. Functions as a DHT blocker. Preferentially activates estrogen receptor β (ERβ).

LIT: Equol is a novel anti-androgen that inhibits prostate growth and hormone feedback: T.D. Lund, et al.; Biol. Reprod. **70,** 1188 (2004) ▪ Phytoestrogens and their human metabolites show distinct agonistic and antagonistic properties on estrogen receptor alpha (ER-alpha) and ERbeta in human cells: S.O. Mueller, et al.; Toxicol. Sci. **80,** 14 (2004) ▪ Isoflavones, equol and cardiovascular disease: pharmacological and therapeutic insights: K.A. Jackman, et al.; Curr. Med. Chem. **14,** 2824 (2007) ▪ Equol, a metabolite of the soybean isoflavone daidzein, inhibits neoplastic cell transformation by targeting the MEK/ERK/p90RSK/activator protein-1 pathway: N.J. Kang, et al.; J. Biol. Chem. **282,** 32856 (2007) ▪ **For a comprehensive bibliography please visit our website.**



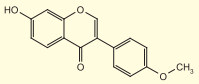
Formononetin (high purity)

[7-Hydroxy-4′-methoxyisoflavone (high purity)]

ALX-270-312-M005	5 mg

Interacts with human estrogen receptors with low potency. Enhances IL-4 production in a dose-dependent manner. Inhibits lecithin peroxidation induced by hydroxyl radicals. Selective inhibitor of the γ-isoform of alcohol dehydrogenase. Antioxidant.

LIT: Antioxidant activity of phytoestrogenic isoflavones: M.B. Ruiz-Larrea, et al.; Free Radic. Res. **26,** 63 (1997) ▪ Inhibitory effects of isoflavones on lipid peroxidation by reactive oxygen species: S. Toda and Y. Shirataki; Phytother. Res. **13,** 163 (1999) ▪ Formononetin, a phyto-oestrogen, and its metabolites up-regulate interleukin-4 production in activated T cells via increased AP-1 DNA binding activity: J. Park, et al.; Immunology **116,** 71 (2005) ▪ **For a comprehensive bibliography please visit our website.**



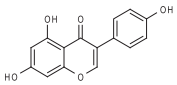
Genistein (synthetic)

[4′,5,7-Trihydroxyisoflavone]

ALX-350-006-M010	10 mg
ALX-350-006-M025	25 mg
ALX-350-006-M050	50 mg
ALX-350-006-M100	100 mg
ALX-350-006-G001	1 g

Synthetic. Tyrosine protein kinase inhibitor. Inhibits phosphorylation of EGFR kinase. Inhibits tumor cell proliferation and induces tumor cell differentiation. Inhibits topoisomerase II activity *in vivo*. Produces cell cycle arrest and apoptosis. Direct inhibitor of insulin-induced glucose uptake in adipocytes (IC_{50}=20μM).

LIT: Genistein, a specific inhibitor of tyrosine-specific protein kinases: T. Akiyama, et al.; J. Biol. Chem. **262,** 5592 (1987) ▪ Mechanisms of cancer chemoprevention by soy isoflavone genistein: F.H. Sarkar & Y. Li; Cancer Metastasis Rev. **21,** 265 (2002) ▪ Genistein directly inhibits GLUT4-mediated glucose uptake in 3T3-L1 adipocytes: M. Bazuine, et al.; BBRC **325,** 511 (2005) ▪ The role of genistein and synthetic derivatives of isoflavone in cancer prevention and therapy: F.H. Sarkar, et al.; Mini Rev. Med. Chem. **6,** 401 (2006) ▪ **For a comprehensive bibliography please visit our website.**



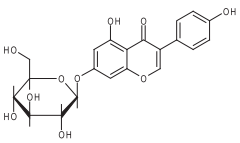
Genistin

[Genistein-7-O-glucoside]

ALX-350-247-M010	10 mg

Glucoside of genistein (Prod. No. ALX-350-006) found in soy beans. Useful as a negative control for genistein and other tyrosine kinase inhibitors. Selective inhibitor of terminal deoxyribonucleotidyltransferase (TdT). Displays antioxidant and anticarcinogenic properties.

LIT: Selective inhibitors of terminal deoxyribonucleotidyltransferase (TdT): baicalin and genistin: Y. Uchiyama, et al.; Biochim. Biophys. Acta **1725,** 298 (2005) ▪ Genistin inhibits UV light-induced plasmid DNA damage and cell growth in human melanoma cells: A. Russo, et al.; J. Nutr. Biochem. **17,** 103 (2006) ▪ Pro-apoptotic effect and cytotoxicity of genistein and genistin in human ovarian cancer SK-OV-3 cells: E.J. Choi, et al.; Life Sci. **80,** 1403 (2007) ▪ **For a comprehensive bibliography please visit our website.**

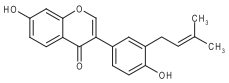


Neobavaisoflavone

ALX-350-146-M001 1 mg

Isolated from plant *Psoralea corylifolia*. Inhibits platelet aggregation. DNA polymerase inhibitor. Shows antifungal activity.

LIT: Prenylated isoflavanone from the roots of Erythrina sigmoidea: A.E. Nkengfack, et al.; Phytochemistry **36,** 1047 (1994) ▪ Antiplatelet flavonoids from seeds of Psoralea corylifolia: W.J. Tsai, et al.; J. Nat. Prod. **59,** 671 (1996) ▪ DNA polymerase and topoisomerase II inhibitors from Psoralea corylifolia: N.J. Sun, et al.; J. Nat. Prod. **61,** 362 (1998) ▪ Studies on the chemical constituents of Psoralea corylifolia L.: B. Ruan, et al.; J. Asian Nat. Prod. Res. **9,** 41 (2007)



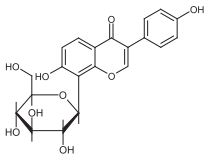
Puerarin

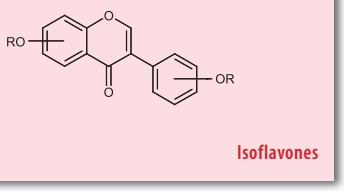
[NPI-031G]

ALX-350-249-M005 5 mg

Isolated from Kudzu root. Biologically active isoflavone. Affects serotonin levels and platelet aggregation in blood cells. 5-HT2c antagonist. Antibacterial. Displays cardioprotective effects. Induces apoptosis.

LIT: Daidzin and its antidipsotropic analogs inhibit serotonin and dopamine metabolism in isolated mitochondria: W.M. Keung & B.L. Vallee; PNAS **95,** 2198 (1998) ▪ NPI-031G (puerarin) reduces anxiogenic effects of alcohol withdrawal or benzodiazepine inverse or 5-HT2C agonists: D.H. Overstreet, et al.; Pharmacol. Biochem. Behav. **75,** 619 (2003) ▪ Puerarin reduces increased c-fos, c-jun, and type IV collagen expression caused by high glucose in glomerular mesangial cells: C.P. Mao & Z.L. Gu; Acta Pharmacol. Sin. **26,** 982 (2005) ▪ Induction of apoptosis by puerarin in colon cancer HT-29 cells: Z. Yu & W. L; Cancer Lett. **238,** 53 (2006) ▪ Opening the calcium-activated potassium channel participates in the cardioprotective effect of puerarin: Q. Gao, et al.; Eur. J. Pharmacol. **574,** 179 (2007) ▪ **For a comprehensive bibliography please visit our website.**





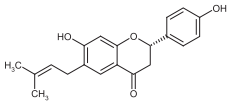
Flavanones

Bavachin

ALX-350-147-MC05 0.5 mg

Isolated from plant *Psoralea corylifolia*. Weak antioxidant. Antimutagenic. Stimulates bone formation and has potential activity against osteoporosis. Shows inhibitory activities against the antigen-induced degranulation and weak estrogen-like activity.

LIT: Antiplatelet flavonoids from seeds of Psoralea corylifolia: W.J. Tsai, et al.; J. Nat. Prod. **59,** 671 (1996) ▪ Osteoblastic proliferation stimulating activity of Psoralea corylifolia extracts and two of its flavonoids: D. Wang, et al.; Planta Med. **67,** 748 (2001) ▪ Antioxidative components of Psoralea corylifolia (Leguminosae): H. Haraguchi, et al.; Phytother. Res. **16,** 539 (2002) ▪ Bioactive constituents from Chinese natural medicines. XX. Inhibitors of antigen-induced degranulation in RBL-2H3 cells from the seeds of Psoralea corylifolia: H. Matsuda, et al.; Chem. Pharm. Bull. (Tokyo) **55,** 106 (2007) ▪ Synthesis of four natural prenylflavonoids and their estrogen-like activities: X. Dong, et al.; Arch. Pharm. (Weinheim) **340,** 372 (2007) ▪ **For a comprehensive bibliography please visit our website.**



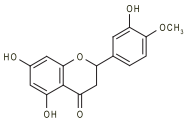
(±)-Hesperetin

[(±)-3′,5,7-Trihydroxy-4′-methoxyflavanone]

ALX-385-011-G001 1 g

Antioxidant flavonoid. Induces G1-phase cell cycle arrest. Anti-inflammatory. Suppresses NF-κB activation. Reduces cholesterol biosynthesis. Inhibits lipid peroxidation. Neuroprotective against neuronal oxidative damage.

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Lipid-lowering efficacy of hesperetin metabolites in high-cholesterol fed rats: H. K. Kim, et al.; Clin. Chim. Acta **327,** 129 (2003) ▪ Antioxidant and neuroprotective effects of hesperidin and its aglycone hesperetin: J. Cho; Arch. Pharm. Res. **29,** 699 (2006) ▪ Modulation of the age-related nuclear factor-kappaB (NF-kappaB) pathway by hesperetin: J.Y. Kim, et al.; Aging Cell **5,** 401 (2006) ▪ Hesperetin Induced G1-Phase Cell Cycle Arrest in Human Breast Cancer MCF-7 Cells: Involvement of CDK4 and p21: E.J. Choi; Nutr. Cancer **59,** 115 (2007)



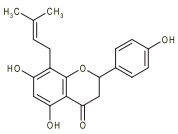
8-Isopentenylnaringenin

[8-Prenylnaringenin]

ALX-385-025-M005 5 mg

Isolated from hops *(Humulus lupulus L.)* Prenyl flavonoid. Phytoestrogen. Selective, non-steroidal estrogen receptor α (ERα) ligand. Potent inhibitor of angiogenesis *in vitro* and *in vivo*. Chemopreventive agent against cancer induced by heterocyclic amines.

LIT: Prenylflavonoids: a new class of non-steroidal phytoestrogen (Part 2). Estrogenic effects of 8-isopentenylnaringenin on bone metabolism: M. Miyamoto, et al.; Planta Med. **64,** 516 (1998) ▪ Identification of a potent phytoestrogen in hops (Humulus lupulus L.) and beer: S.R. Milligan, et al.; J. Clin. Endocrinol. Metab. **84,** 2249 (1999) ▪ The endocrine activities of 8-prenylnaringenin and related hop (Humulus lupulus L.) flavonoids: S.R. Milligan, et al.; J. Clin. Endocrinol. Metab. **85,** 4912 (2000) ▪ 8-prenylnaringenin, a novel phytoestrogen, inhibits angiogenesis in vitro and in vivo: M.S. Pepper, et al.; J. Cell Physiol. **199,** 98 (2004) ▪ 8-Prenylnaringenin, inhibits estrogen receptor-alpha mediated cell growth and induces apoptosis in MCF-7 breast cancer cells: E. Brunelli, et al.; J. Steroid Biochem. Mol. Biol. **107,** 140 (2007) ▪ **For a comprehensive bibliography please visit our website.**

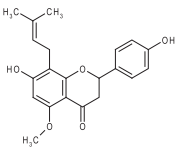


Isoxanthohumol

ALX-350-279-M001 1 mg

Synthetic. Prenylated flavonoid. Phytoestrogen. Induces apoptosis in mature adipocytes.

LIT: Xanthohumol and related prenylflavonoids from hops and beer: to your good health!: J.F. Stevens & J.E. Page; Phytochemistry **65,** 1317 (2004) ▪ The prenylflavonoid isoxanthohumol from hops (Humulus lupulus L.) is activated into the potent phytoestrogen 8-prenylnaringenin in vitro and in the human intestine: S. Possemiers, et al.; J. Nutr. **136,** 1862 (2006) ▪ Effect of xanthohumol and isoxanthohumol on 3T3-L1 cell apoptosis and adipogenesis: J.Y. Yang, et al.; Apoptosis **12,** 1953 (2007) ▪ **For a comprehensive bibliography please visit our website.**



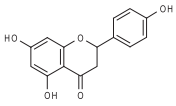
(±)-Naringenin

[(±)-4′,5,7-Trihydroxyflavanone]

ALX-385-010-G001 1 g

Antioxidant flavonoid. Has anti-inflammatory and antitumor properties. Induces apoptosis. Stimulates DNA repair following oxidative damage. Inhibits the activity of phosphoinositide 3-kinase (PI(3)K).

LIT: Naringenin inhibits phosphoinositide 3-kinase activity and glucose uptake in 3T3-L1 adipocytes: A. W. Harmon & Y. M. Patel; BBRC **305,** 229 (2003) ▪ The citrus flavonoid naringenin stimulates DNA repair in prostate cancer cells: K. Gao, et al.; J. Nutr. Biochem. **17,** 89 (2006) ▪ Naringenin-induced apoptosis via activation of NF-kappaB and necrosis involving the loss of ATP in human promyeloleukemia HL-60 cells: S. Kanno, et al.; Toxicol. Lett. **166,** 131 (2006) ▪ Inhibitory effect of naringenin chalcone on inflammatory changes in the interaction between adipocytes and macrophages: S. Hirai, et al.; Life Sci. **81,** 1272 (2007)



Silybin

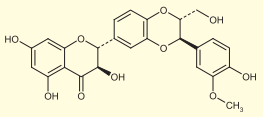
[Silibinin]

ALX-350-346-G001 1 g

ALX-350-346-G005 5 g

Originally isolated from *Silybum marianum*. Flavenoid. Anti-inflammatory, cytoprotective and anti-cancer compound. Shows chemopreventive effect against skin cancer. Inhibits mitogen-activated protein kinase (MAPK). Inhibits P-glycoprotein (Pgp)-mediated cellular efflux. Inhibits cytochrome P450 enzyme. Apoptosis inducer. Blocks the production of superoxide in Kupffer cells (EC_{50}=100μM). Antioxidant. Free radical scavenger. Radiation-protective agent.

LIT: The flavanolignan silybin and its hemisynthetic derivatives, a novel series of potential modulators of P-glycoprotein: M. Maitrejean, et al.; Bioorg. Med. Chem. Lett. **10,** 157 (2000) ▪ Silibinin upregulates the expression of cyclin-dependent kinase inhibitors and causes cell cycle arrest and apoptosis in human colon carcinoma HT-29 cells: C. Agarwal, et al.; Oncogene **22,** 8271 (2003) ▪ Silibinin protects against photocarcinogenesis via modulation of cell cycle regulators, mitogen-activated protein kinases, and Akt signaling: G. Mallikarjuna, et al.; Cancer Res. **64,** 6349 (2004) ▪ Silibinin impairs constitutively active TGFalpha-EGFR autocrine loop in advanced human prostate carcinoma cells: A. Tyagi, et al.; Pharm. Res. **Epub ahead of print,** (2008) ▪ **For a comprehensive bibliography please visit our website.**



(+)-Taxifolin

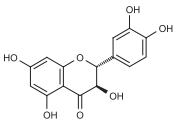
[(+)-Dihydroquercetin; (+)-3,3′,4′,5,7-Pentahydroxyflavanone; Taxifoliol; Distylin; Catechin hydrate]

ALX-385-018-M010 10 mg

ALX-385-018-M050 50 mg

Antioxidant flavonoid. Anti-inflammatory compound. Chemopreventive agent. Decreases hepatic lipid synthesis.

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Modulation of hepatic lipoprotein synthesis and secretion by taxifolin, a plant flavonoid: A. Theriault, et al.; J. Lipid Res. **41,** 1969 (2000) ▪ Prevention of macrophage adhesion molecule-1 (Mac-1)-dependent neutrophil firm adhesion by taxifolin through impairment of protein kinase-dependent NADPH oxidase activation and antagonism of G protein-mediated calcium influx: Y.H. Wang, et al.; Biochem. Pharmacol. **67,** 2251 (2004) ▪ The chemopreventive effect of taxifolin is exerted through ARE-dependent gene regulation: S.B. Lee, et al.; Biol. Pharm. Bull. **30,** 1074 (2007)



(±)-Taxifolin

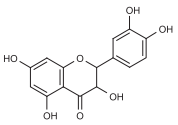
[(±)-Dihydroquercetin; (±)-3,3′,4′,5,7-Pentahydroxyflavanone; Taxifoliol; Distylin; Catechin hydrate]

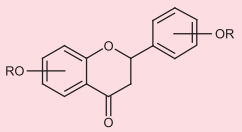
ALX-385-006-M010 10 mg

ALX-385-006-M050 50 mg

Antioxidant flavonoid.

LIT: Suppression of active oxygen-induced cytotoxicity by flavonoids: T. Nakayama, et al.; Biochem. Pharmacol. **45,** 265 (1993) ▪ Suppression of hydroperoxide-induced cytotoxicity by polyphenols: T. Nakayama; Cancer Res. **54,** 1991s (1994) ▪ Interaction of flavonoids with ascorbate and determination of their univalent redox potentials: a pulse radiolysis study: W. Bors, et al.; Free Radic. Biol. Med. **19,** 45 (1995) ▪ Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Modulation of hepatic lipoprotein synthesis and secretion by taxifolin, a plant flavonoid: A. Theriault, et al.; J. Lipid Res. **41,** 1969 (2000) ▪ Inhibitory activity of diacylglycerol acyltransferase (DGAT) and microsomal triglyceride transfer protein (MTP) by the flavonoid, taxifolin, in HepG2 cells: potential role in the regulation of apolipoprotein B secretionInhibitory activity of diacylglycero: A. Casaschi, et al.; Atherosclerosis **176,** 247 (2004)





Flavanones

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POLYPHENOLS

Flavonols

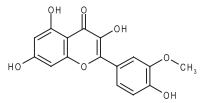
Isorhamnetin

[3-Methylquercetin; 3'-Methoxy-3,4',5,7-tetrahydroxyflavone]

ALX-385-024-M005 5 mg
ALX-385-024-M010 10 mg

Antiviral agent. Antioxidant. Antitumor compound. Apoptosis inducer.

LIT: Anti-tumor promoting activity of polyphenols from Cowania mexicana and Coleogyne ramosissima: H. Ito, et al.; Cancer Lett. **143,** 5 (1999) ▪ Inhibition of xanthine oxidase by flavonoids: A. Nagao, et al.; Biosci. Biotechnol. Biochem. **63,** 1787 (1999) ▪ Effects of intrinsic fluorescence and quenching on fluorescence-based screening of natural products: L. Zou, et al.; Phytomedicine **9,** 263 (2002) ▪ Antioxidant effects of isorhamnetin 3,7-di-O-beta-D-glucopyranoside isolated from mustard leaf (Brassica juncea) in rats with streptozotocin-induced diabetes: T. Yokozawa, et al.; J. Agric. Food Chem. **50,** 5490 (2002) ▪ Effect of five flavonoid compounds isolated from leaves of Diospyros kaki on stimulus-induced superoxide generation and tyrosyl phosphorylation of proteins in human neutrophils: G. Chen, et al.; Clin. Chim. Acta **326,** 169 (2002) ▪ Isorhamnetin prevent endothelial cell injuries from oxidized LDL via activation of p38MAPK: M. Bao & Y. Lou; Eur. J. Pharmacol. **547,** 22 (2006) ▪ The flavonoid component isorhamnetin in vitro inhibits proliferation and induces apoptosis in Eca-109 cells: G. Ma, et al.; Chem. Biol. Interact. **167,** 153 (2007)



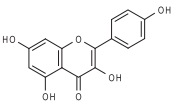
Kaempferol

[3,4',5,7-Tetrahydroxyflavone]

ALX-385-005-M010 10 mg
ALX-385-005-M050 50 mg

Antioxidant flavonoid. Apoptosis inducer. Reversible inhibitor of fatty acid synthase [FAS].

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Presence of fatty acid synthase inhibitors in the rhizome of Alpinia officinarum hance: B.H. Li & W.X. Tian; J. Enzyme Inhib. Med. Chem. **18,** 349 (2003) ▪ Pharmacological inhibitors of Fatty Acid Synthase (FASN)--catalyzed endogenous fatty acid biogenesis: a new family of anti-cancer agents?: R. Lupu & J. A. Menendez; Curr. Pharm. Biotechnol. **7,** 483 (2006)



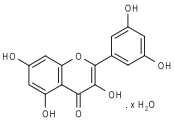
Morin

[2',3,4',5,7-Pentahydroxyflavone]

ALX-385-016-G001 1 g

Antioxidant flavonoid. Shows anti-proliferative and antitumor properties. Induces apoptosis. Induces cell cycle arrest at the G2/M phase. Anti-inflammatory compound. Suppresses NF-κB activation. Induces lipid peroxidation and DNA strand breaks.

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Lipid peroxidation and DNA damage induced by morin and naringenin in isolated rat liver nuclei: S. C. Sahu & G. C. Gray; Food Chem. Toxicol. **35,** 443 (1997) ▪ Morin inhibits the growth of human leukemia HL-60 cells via cell cycle arrest and induction of apoptosis through mitochondria dependent pathway: H.M. Kuo, et al.; Anticancer Res. **27,** 395 (2007) ▪ Morin (3,5,7,2',4'-Pentahydroxyflavone) abolishes nuclear factor-kappaB activation induced by various carcinogens and inflammatory stimuli, leading to suppression of nuclear factor-kappaB-regulated gene expression and up-regulation of apoptosis: S.K. Manna, et al.; Clin. Cancer Res. **13,** 2290 (2007)



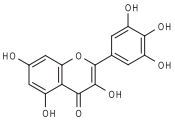
Myricetin

[3,3',4',5,5',7-Hexahydroxyflavone]

ALX-385-012-M010 10 mg
ALX-385-012-M050 50 mg

Antioxidant flavonoid. Has antitumor and chemopreventive properties. Anti-inflammatory. Inhibits NF-κB activation.

LIT: Biological effects of myricetin: K. C. Ong & H. E. Khoo; Gen. Pharmacol. **29,** 121 (1997) ▪ Myricetin inhibits matrix metalloproteinase 2 protein expression and enzyme activity in colorectal carcinoma cells: C.H. Ko, et al.; Mol. Cancer Ther. **4,** 281 (2005) ▪ Mitochondrial-dependent, reactive oxygen species-independent apoptosis by myricetin: roles of protein kinase C, cytochrome c, and caspase cascade: C.H. Ko, et al.; Biochem. Pharmacol. **69,** 913 (2005) ▪ Myricetin is a novel natural inhibitor of neoplastic cell transformation and MEK1: K.W. Lee, et al.; Carcinogenesis **28,** 1918 (2007) ▪ **For a comprehensive bibliography please visit our website.**



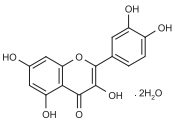
Quercetin . $2H_2O$

[3,3',4',5,7-Pentahydroxyflavone . $2H_2O$]

ALX-385-001-G005 5 g

Isolated from *Sophora japonica L.* Antioxidant flavonoid. Inhibitor of mitochondrial ATPase, cAMP- and cGMP-phosphodiesterases. Inhibitor of protein tyrosine kinases and protein kinase C (PKC). Induces apoptosis. Blocks cells at the G0/G1 interface. Activator of human deacetylase SIRT1. Reversible inhibitor of fatty acid synthase (FAS). Inhibits the production of the inflammatory mediators nitric oxide (NO), TNF-α and IL-12 in activated macrophages.

LIT: Molecular mechanisms in the antiproliferative action of quercetin: B. Csokay, et al.; Life Sci. **60,** 2157 (1997) ▪ Quercetin and anti-CD95(Fas/Apo1) enhance apoptosis in HPB-ALL cell line: M. Russo, et al.; FEBS Lett. **462,** 322 (1999) ▪ Small molecule activators of sirtuins extend Saccharomyces cerevisiae lifespan: K.T. Howitz, et al.; Nature **425,** 191 (2003) ▪ Inhibitory effects of the flavonoids isolated from Waltheria indica on the production of NO, TNF-alpha and IL-12 in activated macrophages: Y.K. Rao, et al.; Biol. Pharm. Bull. **28,** 912 (2005) ▪ Pharmacological inhibitors of Fatty Acid Synthase (FASN)--catalyzed endogenous fatty acid biogenesis: a new family of anti-cancer agents?: R. Lupu & J. A. Menendez; Curr. Pharm. Biotechnol. **7,** 483 (2006) ▪ Onions: a source of unique dietary flavonoids: R. Slimestad, et al.; J. Agric. Food Chem. **55,** 10067 (2007) ▪ **For a comprehensive bibliography please visit our website.**



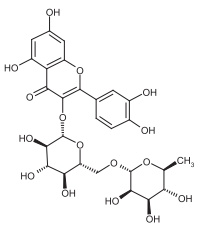
Rutin . $3H_2O$

[Quercetin-3-rutinoside . $3H_2O$; Vitamin P]

ALX-460-028-G005 5 g

Antioxidant flavonoid. Nitric oxide (NO) scavenger.

LIT: Flavonoids as scavengers of nitric oxide radical: S.A.B.E. Acker, et al.; BBRC **214,** 755 (1995) ▪ Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Antioxidant and chelating properties of flavonoids: L.G. Korkina and I.B. Afanas´ev; Adv. Pharmacol. **38,** 151 (1997) ▪ Antimicrobial activity of flavonoids: T. P. Cushnie & A. J. Lamb; Int. J. Antimicrob. Agents **26,** 343 (2005)

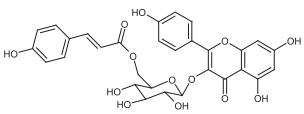


Tiliroside

ALX-350-305-M001 1 mg

Isolated from *Tilia sp.* Flavonoid which shows anti-complement, anti-inflammatory and free radical scavenger activity. Inhibits the production of the inflammatory mediators nitric oxide (NO), TNF-α and IL-12 in activated macrophages. Shows potent activity against d-GalN-induced cytotoxicity in hepatocytes. Cytotoxic against specific leukaemic cell lines. Inhibits LDL oxidation. Antibacterial and antifungal.

LIT: Anti-complement activity of tiliroside from the flower buds of Magnolia fargesii: K.Y. Jung, et al.; Biol. Pharm. Bull. **21,** 1077 (1998) ▪ Cytotoxic and antiproliferative effects of heptaacetyltiliroside on human leukemic cell lines: K. Dimas, et al.; Leuk. Res. **23,** 1021 (1999) ▪ Assessment of the anti-inflammatory activity and free radical scavenger activity of tiliroside: A. Sala, et al.; Eur. J. Pharmacol. **461,** 53 (2003) ▪ Inhibitory effects of the flavonoids isolated from Waltheria indica on the production of NO, TNF-alpha and IL-12 in activated macrophages: Y.K. Rao, et al.; Biol. Pharm. Bull. **28,** 912 (2005) ▪ Tiliroside and gnaphaliin inhibit human low density lipoprotein oxidation: G.R. Schinella, et al.; Fitoterapia **78,** 1 (2007) ▪ **For a comprehensive bibliography please visit our website.**



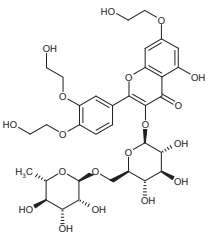
Trihydroxyethylrutin

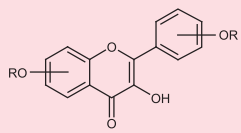
[Troxerutin]

ALX-385-030-G005 5 g
ALX-385-030-G025 25 g

Isolated from *Sophora japonica L.* Flavonoid derivative. Vaso- and cardioprotective agent used clinically to treat venous disorders. Inhibits platelet aggregation. Protects biomembranes and DNA against the deleterious effects of γ-radiation. Free radical scavenger. Antioxidant.

LIT: Antiaggregatory effects of flavonoids in vivo and their influence on lipoxygenase and cyclooxygenase in vitro: J. Swies, et al.; Pol. J. Pharmacol. Pharm. **36,** 455 (1984) ▪ Free radical scavenging and skin penetration of troxerutin and vitamin derivatives: M. Kessler, et al.; J. Dermatolog. Treat. **13,** 133 (2002) ▪ Radioprotection of normal tissues in tumor-bearing mice by troxerutin: D.K. Maurya, et al.; J. Radiat. Res. **45,** 221 (2004) ▪ Protection of cellular DNA from gamma-radiation-induced damages and enhancement in DNA repair by troxerutin: D.K. Maurya, et al.; Mol. Cell. Biochem. **280,** 57 (2005) ▪ **For a comprehensive bibliography please visit our website.**





Flavonols

Flavanols

Catechins

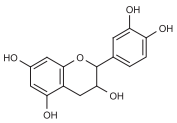
(±)-Catechin

[(±)-3,3',4',5,7-Flavanpentol]

ALX-385-002-G001 1 g

Antioxidant flavonoid. Free radical scavenger. Has chemopreventive and antitumor properties.

LIT: Flavonoids as anticancer agents: structure-activity relationship study: M. Lopez-Lazaro; Curr. Med. Chem. Anticancer Agents **2,** 691 (2002) ▪ In vitro biological properties of flavonoid conjugates found in vivo: G. Williamson, et al.; Free Radic. Res. **39,** 457 (2005) ▪ (+)-Catechin prevents ultraviolet B-induced human keratinocyte death via inhibition of JNK phosphorylation: W.B. Wu, et al.; Life Sci. **79,** 801 (2006) ▪ Antispasmodic, bronchodilator and vasodilator activities of (+)-catechin, a naturally occurring flavonoid: M.N. Ghayur, et al.; Arch. Pharm. Res. **30,** 970 (2007) ▪ **For a comprehensive bibliography please visit our website.**



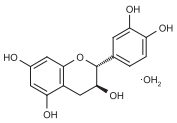
(+)-Catechin . monohydrate

[(+)-3,3',4',5,7-Flavanpentol]

ALX-385-017-G001 1 g

Antioxidant flavonoid. Free radical scavenger. Has chemopreventive and antitumor properties.

LIT: see ALX-385-002.



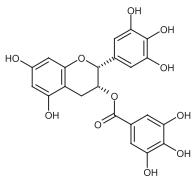
(-)-Epigallocatechin gallate

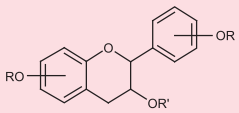
ALX-270-263-M010 10 mg

ALX-270-263-M050 50 mg

Isolated from green tea. Antitumor reagent. Antioxidant. Protects cells from lipid peroxidation and DNA damage. Inhibits inducible nitric oxide synthase (iNOS; NOS II). Chemopreventive anticancer agent. Inhibits MAP kinase signalling. Inhibits angiogenesis. Inhibits telomerase and DNA methyltransferase. Anti-inflammatory.

LIT: Targeting multiple signaling pathways by green tea polyphenol (-)-epigallocatechin-3-gallate: N. Khan, et al.; Cancer Res. **66,** 2500 (2006) ▪ Cancer preventive mechanisms of the green tea polyphenol (-)-epigallocatechin-3-gallate: L. Chen and H.Y. Zhang; Molecules **12,** 946 (2007) ▪ **For a comprehensive bibliography please visit our website.**





Catechins

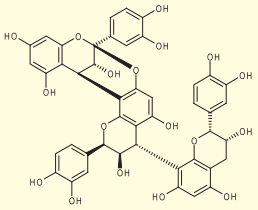
Proanthocyanidins

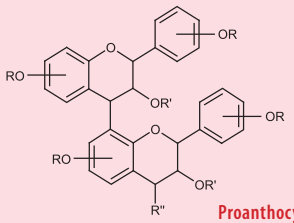
Cinnamtannin B-1

ALX-350-365-M005 5 mg

Isolated from *Laurus nobilis L.* Potent antioxidant. Protective agent against oxidative stress and apoptosis in human platelets.

LIT: Cinnamtannin B-1 from bay wood exhibits antiapoptotic effects in human platelets: A. Bouaziz, et al.; Apoptosis **12,** 489 (2007) ▪ **For a comprehensive bibliography please visit our website.**





Proanthocyanidins

Anthocyanidins

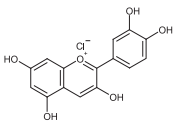
Cyanidin chloride

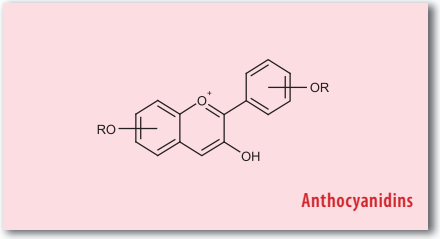
ALX-385-003-M010 10 mg

ALX-385-003-M050 50 mg

Antioxidant flavonoid. Nitric oxide (NO) scavenger.

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Dietary flavonoids: bioavailability, metabolic effects, and safety: J.A. Ross & C.M. Kasum; Annu. Rev. Nutr. **22,** 19 (2002) ▪ Cyanidins: metabolism and biological properties: F. Galvano, et al.; J. Nutr. Biochem. **15,** 2 (2004) ▪ **For a comprehensive bibliography please visit our website.**





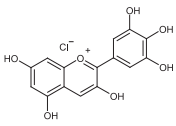
Anthocyanidins

Delphinidin chloride (high purity)

ALX-385-028-M010 10 mg

Anthocyanidin with antioxidant effect. Shown to inhibit angiogenesis and endothelial cell apoptosis by stimulating nitric oxide (NO) production.

LIT: Delphinidin and cyanidin inhibit PDGF(AB)-induced VEGF release in vascular smooth muscle cells by preventing activation of p38 MAPK and JNK: M.H. Oak, et al.; Br. J. Pharmacol. **149,** 283 (2006) ▪ **For a comprehensive bibliography please visit our website.**

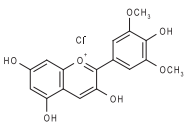


Malvidin chloride

ALX-385-013-M010 10 mg

Antioxidant flavonoid. Antitumour compound. Induces cell cycle arrest in the G2/M-phase.

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Biological activities of malvidin, a red wine anthocyanidin: J. Fritz, et al.; Mol. Nutr. Food Res. **50,** 390 (2006)



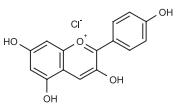
Pelargonidin chloride

[3,4',5,7-Tetrahydroxyflavylium chloride]

ALX-385-014-M005 5 mg

Antioxidant flavonoid. Nitric oxide scavenger.

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Antioxidant activities of pomegranate fruit extract and its anthocyanidins: delphinidin, cyanidin, and pelargonidin: Y. Noda, et al.; J. Agric. Food Chem. **50,** 166 (2002) ▪ Antigenotoxic effects of the phytoestrogen pelargonidin chloride and the polyphenol chlorogenic acid: S.K. Abraham, et al.; Mol. Nutr. Food Res. **51,** 880 (2007) ▪ **For a comprehensive bibliography please visit our website.**

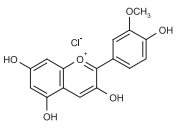


Peonidin chloride

ALX-385-015-M005 5 mg

Antioxidant flavonoid. Shows anti-inflammatory and chemopreventive properties.

LIT: Structure-antioxidant activity relationships of flavonoids and phenolic acids: C.A. Rice-Evans, et al.; Free Radical Biol. & Med. **20,** 933 (1996) ▪ Peonidin inhibits phorbol-ester-induced COX-2 expression and transformation in JB6 P+ cells by blocking phosphorylation of ERK-1 and -2: J.Y. Kwon, et al.; Ann. N. Y. Acad. Sci. **1095,** 513 (2007)



POLYPHENOLS

Chalcones

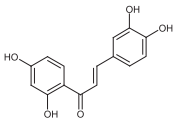
Butein

[2',3,4,4'-Tetrahydroxychalcone]

ALX-350-246-M010 10 mg

Plant polyphenol. Specific tyrosine kinase inhibitor. Potent antioxidant and anti-inflammatory agent. Inhibits glutathione reductase and rat liver glutathione S-transferase. Activator of human deacetylase SIRT1. Inhibits aromatase, showing chemopreventive properties. Directly inhibits IKK.

LIT: Butein, a specific protein tyrosine kinase inhibitor: E.-B. Yang, et al.; BBRC **245,** 435 (1998) ▪ The plant polyphenol butein inhibits testosterone-induced proliferation in breast cancer cells expressing aromatase: Y. Wang, et al.; Life Sci. **77,** 39 (2005) ▪ Butein, a tetrahydroxychalcone, inhibits nuclear factor (NF)-kappaB and NF-kappaB-regulated gene expression through direct inhibition of IkappaBalpha kinase beta on cysteine 179 residue: M.K. Pandey, et al.; J. Biol. Chem. **282,** 17340 (2007) ▪ **For a comprehensive bibliography please visit our website.**

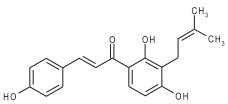


Isobavachalcone

ALX-350-145-M001 1 mg

Isolated from plant *Psoralea corylifolia*. Inhibits platelet aggregation. Inhibitor of Epstein-Barr virus early antigen (EBV-EA) induction. Potent inhibitor of MMP-2. Displays DNA strand-scission (cleaving) activity. Shows antifungal activity.

LIT: Antioxidative components of Psoralea corylifolia (Leguminosae): H. Haraguchi, et al.; Phytother. Res. **16,** 539 (2002) ▪ Inhibition of matrix metalloproteinase-2 secretion by chalcones from the twigs of Dorstenia barteri Bureau.: B. Ngameni, et al.; Arkivoc **ix,** 91 (2007) ▪ **For a comprehensive bibliography please visit our website.**

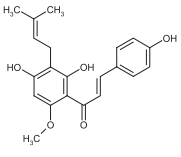


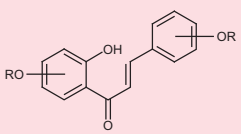
Xanthohumol

ALX-350-280-M005 5 mg

Isolated from hops *(Humulus lupulus)*. Potent inhibitor of diacylglycerol acetyltransferase [DGAT]. Inhibits DNA polymerase and induces cell differentiation. Has antiproliferative and cytotoxic effects in human cancer cell lines. Inhibits human P450 enzymes. Induces quinone reductase. Inhibits the expression of HIF-1α and VEGF under hypoxic conditions. Induces apoptosis in mature adipocytes.

LIT: Xanthohumol and related prenylflavonoids from hops and beer: to your good health!: J.F. Stevens & J.E. Page; Phytochemistry **65,** 1317 (2004) ▪ Effect of xanthohumol and isoxanthohumol on 3T3-L1 cell apoptosis and adipogenesis: J.Y. Yang, et al.; Apoptosis **12,** 1953 (2007) ▪ **For a comprehensive bibliography please visit our website.**





Chalcones

Curcumin

Curcuminoids, a group of phenolic compounds isolated from the roots of *Curcuma longa (Zingiberacae)*, exhibit a variety of beneficial effects on health and events that help in preventing certain diseases. A majority of these studies were carried out with curcumin (diferuloylmethane), which is a major curcuminoid. The traditional uses of curcuminoids in folk medicine are multiple and some of these therapeutic effects have been confirmed by scientific research. As a result of extensive research on the therapeutic properties of curcumin, some understanding on the cellular, molecular and biochemical mechanisms of action of curcumin is emerging (Figure). Curcumin has been shown to attack multiple molecular targets including growth factors and receptors, transcription factors, cytokines, enzymes and genes regulating apoptosis. The nuclear transcription factor NF-κB is a key molecular target of curcumin. Curcumin inhibits the degradation of IκBα and subsequently inactivates NF-κB. NF-κB is crucial to innate and adaptive immunity and plays an important role in inflammation, apoptosis, angiogenesis, autoimmune diseases and cancer.

Curcumin (high purity)

[1,7-*bis*(4-Hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione; Diferuloylmethane]

ALX-350-028-M010 10 mg
ALX-350-028-M050 50 mg
ALX-350-028-M250 250 mg

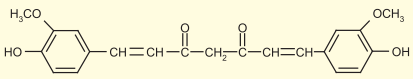
CAS NUMBER: 458-37-7

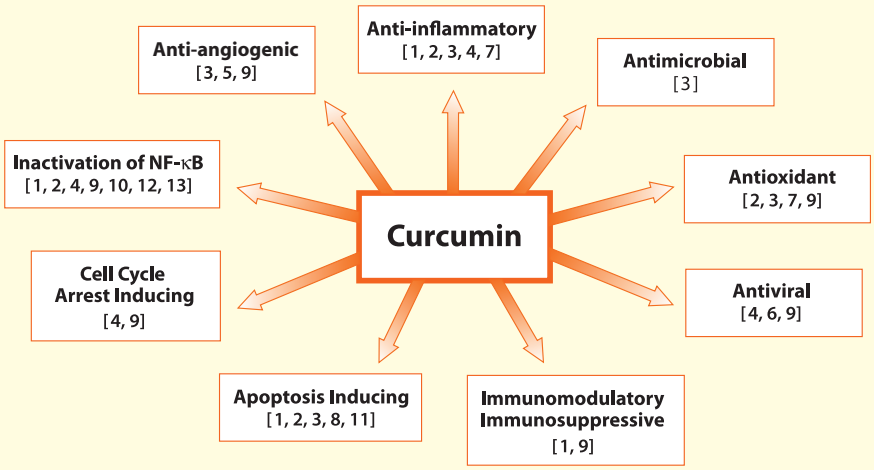
SOURCE/HOST: Isolated from turmeric *(Curcuma longa)*.

PURITY: ≥98.5% (Note: This highly purified product does not contain 30-40% bioactive impurities)

SOLUBILITY: Soluble in acetic acid or 100% ethanol.

LIT: For a comprehensive bibliography please visit our website.





LIT: [1] „Spicing up" of the immune system by curcumin: G.C. Jagetia & B.B. Aggarwal; J. Clin. Immunol. **27,** 19 (2007) ▪ **[2]** Multiple molecular targets in cancer chemoprevention by curcumin: R.L. Thangapazham, et al.; AAPS J. **8,** E443 (2006) ▪ **[3]** Multiple biological activities of curcumin: R.K. Maheseari, et al.; Life Sci. **78,** 2081 (2006) ▪ **[4]** Biological properties of curcumin - cellular and molecular mechanisms of action: B. Joe, et al.; Crit. Rev. Food Sci. Nutr. **44,** 97 (2004) ▪ **[5]** Curcumin as an inhibitor of angiogenesis: S.S. Bhandarkar & J.L. Arbiser; Adv. Exp. Med. Biol. **595,** 185 (2007) ▪ **[6]** Modulation of transcription factors by curcumin: S. Shishodia, et al.; Adv. Exp. Med. Biol. **595,** 127 (2007) ▪ **[7]** Antioxidant and anti-inflammatory properties of curcumin; V.P. Menon & A.R. Sudherr; Adv. Exp. Med. Biol. **595,** 105 (2007) ▪ **[8]** Induction of apoptosis by curcumin and its implications for cancer therapy: D. Karunagaran, et al.; Curr. Cancer Drug Targets **5,** 117 (2005) ▪ **[9]** Curcumin - biological and medicinal properties: B.B. Aggarwal, et al.; Tumeric: The genus Curcuma, 297 (2006) ▪ **[10]** Modulation of human multidrug-resistance MDR-1 gene by natural curcuminoids: P. Limtrakul, et al.; BMC Cancer **4,** 1 (2006) ▪ **[11]** Curcumin induces pro-apoptotic endoplasmic reticulum stress in human leukemia HL-60 cells: H.O. Pae, et al.; BBRC **353,** 1040 (2007) ▪ **[12]** Activation of transcription factor NF-kappaB is suppressed by curcumin (diferuloylmethane): S. Singh & B.B. Aggarwal; J. Biol. Chem. **270,** 24995 (1995) ▪ **[13]** Molecular targets of curcumin: J.K. Lin; Adv. Exp. Med. Biol. **595,** 227 (2007)

FIGURE: Cellular, Molecular & Biochemical Actions of Curcumin.

Stilbenoids

Resveratrol

Resveratrol, a polyphenol from red wine, has been the subject of intense interest due to a range of unique biological properties. These include antioxidant, anti-thrombogenic, anti-inflammatory, cardioprotective, neuroprotective, and cancer preventive and therapeutic activities. Recent results provide interesting insights into the effect of this compound on the life span of yeast and mammals. Resveratrol activates the NAD-dependent deacetylase SIRT1 (SIR2 in yeast). SIRT1 is a principal modulator of pathways downstream of calorie restriction that produce beneficial effects on glucose homeostasis, insulin sensitivity and lifespan. SIRT1 activation is a promising new therapeutic approach for treating age-related diseases such as type 2 diabetes.

LIT: Small molecule activators of sirtuins extend Saccharomyces cerevisiae lifespan: K.T. Howitz, et al.; Nature **425,** 191 (2003) ▪ Resveratrol improves health and survival of mice on a high-calorie diet: J.A. Baur, et al.; Nature **444,** 337 (2006) ▪ Chemoprevention by resveratrol: molecular mechanisms and therapeutic potential: S. Shankar, et al.; Front. Biosci. **12,** 4839 (2007) ▪ The effect of resveratrol on a cell model of human aging: M. Stefani, et al.; Ann. N. Y. Acad. Sci. **1114,** 407 (2007) ▪ Resveratrol as an antioxidant and pro-oxidant agent: mechanisms and clinical implications: C.A. de la Lastra and I. Villegas; Biochem. Soc. Trans. **35,** 1156 (2007)

Resveratrol

[*trans*-3,4′,5-Trihydroxystilbene]

ALX-270-125-M050	50 mg
ALX-270-125-M100	100 mg
ALX-270-125-M250	250 mg

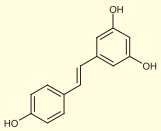
CAS NUMBER: 501-36-0

SOURCE/HOST: Isolated from *Polygonum cuspidatum.*

PURITY: ≥98%

SOLUBILITY: Soluble in DMSO, 100% ethanol or dimethyl formamide; slightly soluble in PBS.

LIT: Cancer chemopreventive activity of resveratrol, a natural product derived from grapes: M. Jang, et al.; Science **275,** 218 (1997) ▪ Resveratrol protects against 4-HNE induced oxidative stress and apoptosis in Swiss 3T3 fibroblasts: O. Kutuk, et al.; Biofactors **20,** 1 (2004) ▪ Resveratrol, a polyphenol found in grapes, suppresses oxidative damage and stimulates apoptosis during early colonic inflammation in rats: A.R. Martin, et al.; Biochem. Pharmacol. **67,** 1399 (2004) ▪ Resveratrol interferes with AKT activity and triggers apoptosis in human uterine cancer cells: E. Sexton, et al.; Mol. Cancer **5,** 45 (2006) ▪ **For a comprehensive bibliography please visit our website.**



SIRT1 Inhibitors

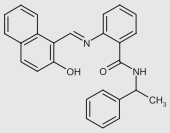
Sirtinol

[2-[(2-Hydroxynaphthalen-1-yl-methylene)amino]-N-(1-phenethyl)benzamide]

ALX-270-308-M001	1 mg
ALX-270-308-M005	5 mg

Specific cell permeable inhibitor of the sirtuin family of NAD-dependent deacetylases (ySir2: IC_{50}=48µM; hSIRT1: IC_{50}=131µM; hSIRT2: IC_{50}=58µM) with no effect on human HDAC1. Reported to inhibit Sir2p transcriptional silencing activity *in vivo* (IC_{50}=25µM) and NAD-dependent histone deacetylase activity of purified recombinant yeast Sir2p (IC_{50}=70µM) and hSIRT2 (IC_{50}=40µM) *in vitro*.

LIT: Identification of a class of small molecule inhibitors of the sirtuin family of NAD-dependent deacetylases by phenotypic screening: C.M. Grozinger, et al.; J. Biol. Chem. **276,** 38837 (2001) ▪ Human telomeric position effect is determined by chromosomal context and telomeric chromatin integrity: C.E. Koering, et al.; EMBO Rep. **3,** 1055 (2002) ▪ Design, synthesis, and biological evaluation of sirtinol analogues as class III histone/protein deacetylase (Sirtuin) inhibitors: A. Mai, et al.; J. Med. Chem. **48,** 7789 (2005) ▪ Sirt1 inhibitor, Sirtinol, induces senescence-like growth arrest with attenuated Ras-MAPK signaling in human cancer cells: H. Ota, et al.; Oncogene **25,** 176 (2006)

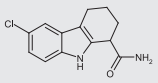


6-Chloro-2,3,4,9-tetrahydro-1*H*-carbazole-1-carboxamide

ALX-270-437-M001 1 mg

Potent cell permeable and metabolically stable specific inhibitor of hSIRT1 (IC_{50}=98nM *in vivo* / IC_{50}=38nM *in vitro*; compared to hSIRT2: IC_{50}=19µM and hSIRT3: IC_{50}=48µM) with no effect on human histone deacetylases (HDACs) class I and class II, nor NAD glycohydrolase (IC_{50}>100µg). Inhibits the deacetylation of p53 (IC_{50}=1µM).

LIT: Discovery of indoles as potent and selective inhibitors of the deacetylase SIRT1: A.D. Napper, et al.; J. Med. Chem. **48,** 8045 (2005)

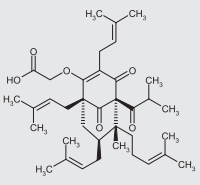


Aristoforin

ALX-350-129-M001 1 mg

Stable and water-soluble derivative of hyperforin (Prod. No. ALX-350-097) inducing apoptosis. Antitumor agent. Inhibits sirtuins.

LIT: Aristoforin, a novel stable derivative of hyperforin, is a potent anticancer agent: M. Gartner, et al.; Chembiochem. **6,** 171 (2005) ▪ Phloroglucinol Derivatives Guttiferone G, Aristoforin, and Hyperforin: Inhibitors of Human Sirtuins SIRT1 and SIRT2: C. Gey, et al.; Angew. Chem. Int. Ed. Engl. **46,** 5219 (2007)



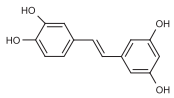
Piceatannol

[3,4,3′,5′-Tetrahydroxy-*trans*-stilbene]

ALX-270-202-M001	1 mg
ALX-270-202-M005	5 mg
ALX-270-202-M010	10 mg
ALX-270-202-M050	50 mg

Synthetic. Originally isolated from *Euphorbia lagascae.* Selective protein tyrosine kinase Syk inhibitor. Activator of human deacetylase SIRT1.

LIT: Synthesis and evaluation of stilbene and dihydrostilbene derivatives as potential anticancer agents that inhibit tubulin polymerization: M. Cushman, et al.; J. Med. Chem. **34,** 2579 (1991) ▪ Piceatannol, a stilbene phytochemical, inhibits mitochondrial F0F1-ATPase activity by targeting the F1 complex: J. Zheng & V.D. Ramirez; BBRC **261,** 499 (1999) ▪ Microarray analysis of piceatannol-induced changes in gene expression in human gastric cancer cells : D. Jeoung, et al.; Biotechnology Lett. **24,** 463 (2002) ▪ **For a comprehensive bibliography please visit our website.**



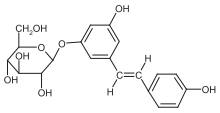
Polydatin

[Piceid; Resveratrol-3β-mono-D-glucoside]

ALX-350-114-M010 10 mg

Isolated from *Polygonum cuspidatum.* Platelet aggregation inhibitor. Shows multiple effects on vascular smooth muscle cells, myocardial cells, endothelial cells and white blood cells after shock. May inhibit phospholipase A2. Inhibits the expression of various cell adhesion molecules.

LIT: Effect of polydatin on phospholipase A2 in lung tissues in rats with endotoxic shock: S.Y. Shu, et al.; Chin. J. Traumatol. **7,** 239 (2004) ▪ Involvement of cell adhesion molecules in polydatin protection of brain tissues from ischemia-reperfusion injury: Y. Cheng, et al.; Brain Res. **1110,** 193 (2006) ▪ **For a comprehensive bibliography please visit our website.**



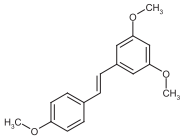
trans-3,4′,5-Trimethoxy-stilbene

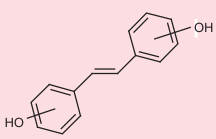
[Trimethoxy-resveratrol; MR-3]

ALX-350-345-M025	25 mg
ALX-350-345-M100	100 mg

Analog of resveratrol (Prod. No. ALX-270-125). Shows powerful anti-angiogenic activity. Inhibits proliferation, sprouting, collagen gel invasion and morphogenesis of endothelial cells.

LIT: Antiangiogenic and vascular-targeting activity of the microtubule-destabilizing trans-resveratrol derivative 3,5,4′-trimethoxystilbene: M. Belleri, et al.; Mol. Pharmacol. **67,** 1451 (2005) ▪ Synthesis and biological properties of new stilbene derivatives of resveratrol as new selective aryl hydrocarbon modulators: P. de Medina, et al.; J. Med. Chem. **48,** 287 (2005) ▪ Antitumor activity of 3,5,4′-trimethoxystilbene in COLO 205 cells and xenografts in SCID mice: M.H. Pan, et al.; Mol. Carcinog. **47,** 184 (2008) ▪ **For a comprehensive bibliography please visit our website.**





Stilbenoids

POLYPHENOLS

Phenolic Acids

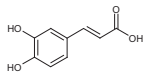
Caffeic acid

[3-(3,4-Dihydroxyphenyl)-2-propenoic acid]

ALX-270-231-M250 250 mg
ALX-270-231-G001 1 g

Synthetic. Shows antitumor, antiviral, antioxidant and anti-inflammatory effects. Inhibitor of 5- and 12-lipoxygenase (LO).

LIT: Caffeic acid is a selective inhibitor for leukotriene biosynthesis: Y. Koshihara, et al.; Biochim. Biophys. Acta **792,** 92 (1984) ▪ Caffeic acid derivatives: in vitro and in vivo anti-inflammatory properties: F.M. da Cunha, et al.; Free Radic. Res. **38,** 1241 (2004) ▪ Novel and therapeutic effect of caffeic acid and caffeic acid phenyl ester on hepatocarcinoma cells: complete regression of hepatoma growth and metastasis by dual mechanism: T.W. Chung, et al.; FASEB J. **18,** 1670 (2004) ▪ Anti-HIV activities of natural antioxidant caffeic acid derivatives: toward an antiviral supplementation diet: F. Bailly & P. Cotelle; Curr. Med. Chem. **12,** 1811 (2005) ▪ **For a comprehensive bibliography please visit our website.**



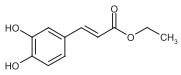
Caffeic acid ethyl ester

[CAEE; Ethyl caffeate]

ALX-270-480-M050 50 mg
ALX-270-480-M250 250 mg

Synthetic. Shows anti-carcinogenic, anti-inflammatory and immunomodulatory properties. Suppresses lipopolysaccharide (LPS)-induced nitric oxide (NO) production (IC_{50}=5.5µg/ml). Potent and specific inhibitor of NF-κB and its downstream inflammatory mediators inducible nitric oxide synthase (iNOS; NOS II), prostaglandin E2 (PGE2) and cyclooxygenase-2 (COX-2). Prevents DNA single-strand breaks caused by H_2O_2.

LIT: Ethyl caffeate suppresses NF-kappaB activation and its downstream inflammatory mediators, iNOS, COX-2, and PGE2 in vitro or in mouse skin: Y.M. Chiang, et al.; Br. J. Pharmacol. **146,** 352 (2005) ▪ Drastic effect of several caffeic acid derivatives on the induction of heme oxygenase-1 expression revealed by quantitative real-time RT-PCR: K. Suzuki, et al.; Biofactors **28,** 151 (2006) ▪ Antitumor activity of some natural flavonoids and synthetic derivatives on various human and murine cancer cell lines: M. Cardenas, et al.; Bioorg. Med. Chem. **14,** 2966 (2006) ▪ **For a comprehensive bibliography please visit our website.**



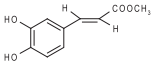
Caffeic acid methyl ester

[Methyl caffeate]

ALX-350-226-M050 50 mg

Synthetic. Inhibitor of ornithine decarboxylase and protein tyrosine kinases. Has a strong inhibitory effect on human platelet aggregation. Shows antioxidant, antiproliferative and cytotoxic properties.

LIT: Effect of caffeic acid esters on carcinogen-induced mutagenicity and human colon adenocarcinoma cell growth: C.V. Rao, et al.; Chem. Biol. Interactions **84,** 277 (1992) ▪ Anti-platelet effect of the constituents isolated from the barks and fruits of Magnolia obovata: M.K. Pyo, et al.; Arch. Pharm. Res. **25,** 325 (2002) ▪ Phenolic acid derivatives with potential anticancer properties--a structure-activity relationship study. Part 1: methyl, propyl and octyl esters of caffeic and gallic acids: S.M. Fiuza, et al.; Bioorg. Med. Chem. **12,** 3581 (2004) ▪ **For a comprehensive bibliography please visit our website.**



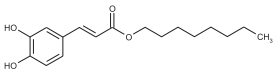
Caffeic acid n-octyl ester

[n-Octylcaffeate]

ALX-350-278-M005 5 mg
ALX-350-278-M025 25 mg

More potent analog than CAPE (Prod. No. ALX-270-244). Suppressor of inducible nitric oxide synthase (iNOS; NOS II). Induces apoptosis.

LIT: Mechanism of toxicity of esters of caffeic and dihydrocaffeic acids: B. Etzenhouser, et al.; Bioorg. Med. Chem. **9,** 199 (2001) ▪ A novel antioxidant, octyl caffeate, suppression of LPS/IFN-gamma-induced inducible nitric oxide synthase gene expression in rat aortic smooth muscle cells: G. Hsiao, et al.; Biochem. Pharmacol. **65,** 1383 (2003) ▪ Caffeic acid derivatives: in vitro and in vivo anti-inflammatory properties: F.M. da Cunha, et al.; Free Radic. Res. **38,** 1241 (2004) ▪ Octylcaffeate induced apoptosis in human leukemia U937 cells: M. Ujibe, et al.; Biol. Pharm. Bull. **28,** 2338 (2005)



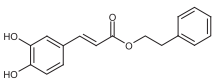
Caffeic acid phenylethyl ester

[CAPE; Phenethyl caffeiate; Caffeic acid phenethyl ester]

ALX-270-244-M010 10 mg
ALX-270-244-M050 50 mg

Synthetic. Active component of propolis from honeybee hives, known to have anti-mitogenic, anti-carcinogenic, anti-inflammatory, and immunomodulatory properties. Potent and specific inhibitor of NF-κB activation, induced by TNF-α, PMA (Prod. No. ALX-445-004) and other inflammatory agents. Exhibits inhibitory activity against HIV-1 integrase (IC_{50}=7µM). Suppresses lipid peroxidation and inhibits ornithine decarboxylase, protein tyrosine kinase and lipoxygenase activities. Induces apoptosis.

LIT: Hydroxylated aromatic inhibitors of HIV-1 integrase: T.R. Burke Jr., et al.; J. Med. Chem. **38,** 4171 (1995) ▪ Caffeic acid phenethyl ester is a potent and specific inhibitor of activation of nuclear transcription factor NF-kappa B: K. Natarajan, et al.; PNAS **93,** 9090 (1996) ▪ Caffeic acid phenethyl ester induces leukocyte apoptosis, modulates nuclear factor-kappa B and suppresses acute inflammation: Z. Orban, et al.; Neuroimmunomodulation **7,** 99 (2000) ▪ Caffeic acid phenethyl ester inhibits T-cell activation by targeting both nuclear factor of activated T-cells and NF-kappaB transcription factors: N. Marquez, et al.; J. Pharmacol. Exp. Ther. **308,** 993 (2004) ▪ Caffeic acid derivatives: in vitro and in vivo anti-inflammatory properties: F.M. da Cunha, et al.; Free Radic. Res. **38,** 1241 (2004) ▪ Drastic effect of several caffeic acid derivatives on the induction of heme oxygenase-1 expression revealed by quantitative real-time RT-PCR: K. Suzuki, et al.; Biofactors **28,** 151 (2006) ▪ **For a comprehensive bibliography please visit our website.**



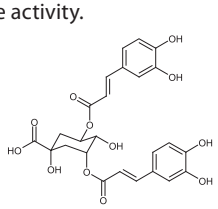
3,5-Di-O-caffeoylquinic acid

[3,5-CQA; Isochlorogenic acid]

ALX-350-320-M001 1 mg
ALX-350-320-M005 5 mg

Isolated from *Cynara scolymus.* Antioxidant. Shows antiproliferative activity.

LIT: In vitro antioxidative effects and tyrosinase inhibitory activities of seven hydroxycinnamoyl derivatives in green coffee beans: K. Iwai, et al.; J. Agric. Food Chem. **52,** 4893 (2004) ▪ **For a comprehensive bibliography please visit our website.**



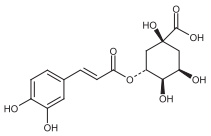
Chlorogenic acid

[3-O-Caffeoylquinic acid; Heriguard; NSC 407296]

ALX-350-353-M500 500 mg
ALX-350-353-G001 1 g

Analog of caffeic acid (Prod. No. ALX-270-231). Shows antioxidant, analgesic, antipyretic and chemopreventive activity. Inhibits Bcr-Abl tyrosine kinase and triggers MAP kinases p38–dependent apoptosis. Inhibitor of the tumor promoting activity of phorbol esters.

LIT: Inhibition of activator protein-1, NF-kappaB, and MAPKs and induction of phase 2 detoxifying enzyme activity by chlorogenic acid: R. Feng, et al.; J. Biol. Chem. **280,** 27888 (2005) ▪ Inhibition of DNA methylation by caffeic acid and chlorogenic acid, two common catechol-containing coffee polyphenols: W.J. Lee & B.T. Zhu; Carcinogenesis **27,** 269 (2006) ▪ **For a comprehensive bibliography please visit our website.**



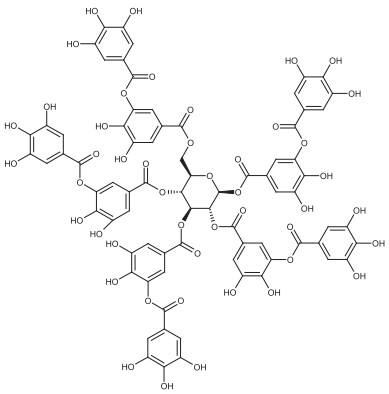
Gallotannin

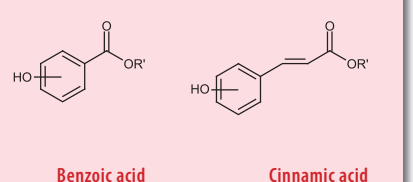
[Tannic acid]

ALX-270-418-G001 1 g

Inhibitor of poly(ADP-ribose) glycohydrolase (PARG). Inhibitor of endothelial nitric oxide synthase (eNOS; NOS III) and weak inhibitor of inducible (iNOS; NOS II) and neuronal nitric oxide synthase (nNOS; NOS I). Induces cyclooxygenase-2 (COX-2) expression. Free radical scavenger.

LIT: Inhibition of poly(ADP-ribose) glycohydrolase by gallotannin selectively up-regulates expression of proinflammatory genes: E. Rapizzi, et al.; Mol. Pharmacol. **66,** 890 (2004) ▪ The efficacy of protective effects of tannic acid, gallic acid, ellagic acid, and propyl gallate against hydrogen peroxide-induced oxidative stress and DNA damages in IMR-90 cells: C.H. Chen, et al.; Mol. Nutr. Food Res. **51,** 962 (2007) ▪ **For a comprehensive bibliography please visit our website.**





Widest Panel of Caffeic acid Esters!