**Luteolin**

**Anticancer Actions**
Recent reviews on the diverse benefits of luteolin suggest that the flavone exhibits anti-inflammatory and anticarcinogenic properties, not all of which can be attributed to its antioxidant activity. By protecting against carcinogenic stimuli, luteolin is believed to have the capacity, in vitro and in vivo, to delay or inhibit cancer cell development, suppress tumor proliferation, induce cell cycle arrest, and spur apoptosis through intrinsic and extrinsic signaling pathways. Interestingly, some epidemiologic evidence points to an inverse relationship between luteolin consumption and the risk of developing some types of cancer (Molecules 2008;13:2628-51).

In a recent review of the distribution and biologic activities of luteolin, López-Lázaro and coworkers preclinical studies of the flavone, which have demonstrated that it has wide-ranging pharmacologic activities, particularly anticancer, anti-inflammatory, antimicrobial, and antioxidant properties. Significant in the chemopreventive and chemotherapeutic potential is suggested by the capacity of luteolin to block angiogenesis, induce apoptosis, prevent carcinogenesis in animal models, decrease tumor growth in vivo, and sensitize tumor cells to the cytotoxic impact of other anticancer drugs. López-Lázaro also noted a wide range of potential mechanisms of action for the various biologic activities of luteolin (Mini Rev. Med. Chem. 2009;9:31-59). In fact, luteolin has been found to sensitize cancer cells to induced cytotoxicity by inhibiting cell survival pathways (e.g., phosphatidylinositol 3-kinase, nuclear factor kappa B, and X-linked inhibitor of apoptosis protein), and by promoting apoptosis pathways, leading to, for example, the induction of tumor suppressor p53 (Curr. Cancer Drug Targets 2008:8:634-46).

Seelinger et al. compared the anticarcinogenic effects of luteolin to those of other flavonoids, and found that luteolin was typically the most effective, inhibiting tumor cell proliferation with the highest number of hydroxyl groups in the B ring, was shown to have the most potent antioxidant activity as ascertained using the DPPH method and the xanthine/xanthine oxidase system. The authors also noted that in association with the relative antioxidant strength of the flavonoids, the compounds dose-dependently suppressed collagenase activity and MMP expression. They concluded that flavonoids with a higher number of hydroxyl groups may be the most effective at preventing UV-induced cutaneous aging (Arch. Pharm. Res. 2007;30:290-8).

**Prostaglandin Inhibitor**
In a 2008 study, Papaliodis et al. investigated the effect of flavonoids on niacin-induced flush in a rat model, and sought to determine whether prostaglandin D2 (PGD2) or 5-hydroxytryptamine (5-HT) were involved.

The researchers recorded three skin temperature measurements from each ear for each time point immediately before intraperitoneal injection with either niacin or a flavonoid (quercetin or luteolin). They then measured temperature every 10 minutes for 1 hour. Ear temperature was increased by niacin to a maximum of 1.9 plus or minus 0.2 °C at 45 minutes. Quercetin and luteolin administered intraperitoneally 45 minutes before niacin blocked the niacin effect by 96% and 88%, respectively, while aspirin inhibited the niacin effect by 30%. Plasma PGD2 and 5-HT were increased twofold by niacin, while luteolin suppressed plasma PGD2 and 5-HT by 100% and 67%, respectively, and aspirin lowered only PGD2 (by 86%).

The investigators concluded that the increased skin temperature in rats caused by niacin is linked to increases in PGD2 and 5-HT, and that luteolin may be the most suitable inhibitor of niacin-induced flush because it suppresses both mediators (Br. J. Pharmacol. 2008;153:1382-7). Currently, luteolin is included as a minor ingredient in some nutritional and herbal supplements.

**Conclusion**

Much more research is necessary to ascertain whether the bioactive properties of luteolin can be readily harnessed for applications at dermatology and other medical conditions. Currently, the preponderance of evidence suggests that this flavonoid is at least as promising as its fellow flavonoid quercetin.

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