androgenic, or antiandrogenic effects of ecdysterone and inokosterone were observed in rats [23–25], indicating that these insect molting substances of plant origin apparently have no pharmacological effects in mammals. The only observed biological effect of ecdysterone and inokosterone was the suppression of hyperglycemia induced by glucagon in rats [23–25]. Oral administration of a mixture of ecdysterone and inokosterone at a daily dose to rats of 0.2–2 g/kg for 35 days did not produce any toxic effects [23].

Oleanolic acid was effective in the prevention of experimental liver damage induced by carbon tetrachloride (CCl_4) in rats. Treatment with oleanolic acid markedly reduced the elevation of serum glutamic-pyruvic transaminase (GPT) and liver triglyceride levels in rats intoxicated with CCl_4. The degeneration and necrosis of liver cells induced by CCl_4 were significantly diminished with oleanolic acid treatment. Moreover, the glycogen content in the liver cells of the treated rats was increased, and the damaged mitochondrial and endoplasmic structures of liver cells were restored [26].

A number of esters, amides, or mixed amides of oleanolic acid were synthesized and tested for antiulcer activity. 3-Hemisuccinato-oleanolic acid morpholinide, 3-hemisuccinato-oleanolic acid isopropylamide, and the mixed amide from oleanolic acid and succinic acid were the most active compounds in this series and were more effective than the known antiulcer agent carbenoxolone [27].

In addition, oleanolic acid inhibited the activation of Epstein-Barr virus induced by the tumor promotor 12-*O*-tetradecanoylphorbol 13-acetate (TPA) and the tumor promoting activity of TPA in mice. The inhibitory activity of oleanolic acid on tumor promotion by TPA was comparable to that of the known tumor promotion inhibitor retinoic acid [28].

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