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# Vitamin K3 inhibition of malignant murine cell growth and human tumor colony formation.

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## Abstract

To assess the antineoplastic potential of vitamin K compounds, the effects of vitamin K3 (menadione), vitamin K1 (phylloquinone), and warfarin on L1210 murine leukemia cell growth were studied in a flask culture system. When the cytotoxic potential of vitamin K3 was recognized, the effects of vitamin K3 on human tumor colony formation were studied in 34 tumor explants using a soft agar (clonogenic) assay system. Complete inhibition of L1210 growth in flask culture was achieved at concentrations of 200 micrograms/ml of warfarin, 75 micrograms/ml of vitamin K1, and 4 micrograms/ml of vitamin K3. Combined use of vitamin K and warfarin enhanced cytotoxicity because a concentration of 1 micrograms/ml of vitamin K3 together with 70 micrograms/ml of warfarin resulted in nearly complete inhibition of L1210 growth. Comparable inhibition of growth was seen against malignant murine cell lines in the soft agar assay system, where greater than 70% decrease in colony formation was seen with vitamin K3 at concentrations of 6.4 micrograms/ml for L1210 leukemia and 1 microgram/ml for HII4E hepatoma lines. Vitamin K3 was also cytotoxic in the same dosage range when tested in vitro against the 34 human tumor explants in the soft agar assay system. Tumor types evaluated included adenocarcinoma of the breast (16 patients), ovary (five), colon (two), stomach (two), kidney (two), and unknown primary (two); squamous cell carcinoma of the lung (two); melanoma (one), transitional cell carcinoma of the bladder (one); and hepatocellular carcinoma (one).(ABSTRACT TRUNCATED AT 250 WORDS)

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