Antiviral properties of curcumin

INTRODUCTION
Curcumin is the active component of the ancient herb from southern Asia, curcuma longa, also known as turmeric. In the 1970s, researchers began to scientifically prove the validity of the long standing use of turmeric in traditional Indian Ayurvedic medicine. For centuries, turmeric has been used to treat a variety of diseases including digestive disorders, skin diseases, arthritis, hepatic disorders, inflammations, and cardiovascular disease. Accumulating studies of curcumin and its bioconjugates show that this bright yellow colored root has significant anti-inflammatory, antimicrobial, antioxidant, anticarcinogenic, and more recently discovered antiviral properties.

CURCUMIN
Curcumin (diferuloylmethane) is the active chemical component isolated from the roots of turmeric plants, which are grown extensively throughout Asia. The root, called the rhizome, is used as a primary spice in curry powders, and has a long history in Ayurvedic and Chinese medicine. Curcumin exerts its healing effects via a variety of mechanisms that protect cells against death. A review by Strimpakos and Sharma in ‘Antioxidants and Redox Signaling’ describes clinical studies which show that curcumin is non-toxic, showing only minor gastrointestinal discomfort at high doses, and has direct anti-
inflammatory, antioxidant, antibacterial, and anticarcinogenic activities (See Reference 1). Curcumin affects these diverse pathologic processes by modulating cellular signal transduction pathways controlling cell growth and death.

MECHANISM OF ACTION
Active research is being done on curcumin’s anticancer and antiviral properties. At the time of writing this article, the US National Library of Medicine at the National Institute of Health lists 3596 scientific research papers on curcumin. A variety of cancers arise by specific virus-mediated genetic disruption. In addition to its numerous protective properties, curcumin also inhibits viral replication and infectivity. However, at higher concentrations, curcumin and its bioconjugates become toxic to cells, predominantly by inducing a biochemically induced process of cell death called apoptosis. According to a study by Kuttan, et al in ‘Advances in experimental medicine and biology’, this cytotoxic activity of curcumin can be used to inhibit proliferating tumor cells (See Reference 2). By inhibiting the movement of essential signaling proteins into the cell nucleus, curcumin decreases the expression of genes required for cell division. In cervical carcinoma, neuroblastoma, melanoma, and prostate cancer cells, curcumin is therefore able to inhibit tumor cells from proliferating and promotes their apoptotic death. Clinical trials of curcumin in patients with a variety of different cancers are underway.

VIRAL TARGETS
Curcumin exhibits antiviral activity against numerous viruses including human papillomavirus virus (HPV), influenza virus, Hepatitis B virus (HBV), Hepatitis C virus (HCV), adenovirus, coxsackievirus, and Herpes simplex 1 (HSV-1). As demonstrated by Divya, et al in ‘Molecular Carcinogenesis’, curcumin inhibits the expression of HPV proteins that are required for HPV-induced cervical carcinoma (See reference 3). In another study published in the Journal of Neuroimmune Pharmacology, neuronal cells were protected by curcumin from infection by the Japanese encephalitis virus, a deadly infection that primarily affects children (See reference 4). This antiviral activity may be mediated by curcumin’s ability to decrease reactive oxygen species, restore cell membrane integrity, and inhibit apoptosis of the neuronal cells. Another mechanism of action of this multi-functional chemical, published in FEBS Letters in 2010, demonstrates the direct inhibition of HCV viral replication by curcumin (See reference 5). Curcumin may therefore be useful in the treatment of patients with highly prevalent viral hepatitis, cirrhosis, and liver cancer. In clinical trials, curcumin however does not appear to be an effective agent against the human immunodeficiency virus (HIV).

Keep these potential antiviral effects in mind the next time you sprinkle some turmeric in your curry!
REFERENCES

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