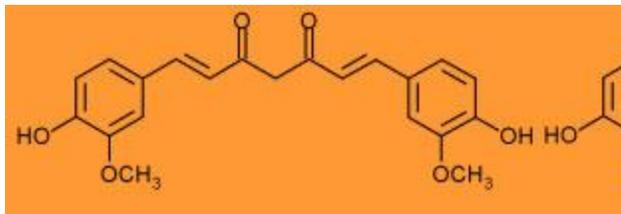


## Modern Science on Turmeric

Turmeric may contain well over a hundred chemical species, most of these originating from the oil part of turmeric. A complete analysis of all these constituents has not so far been undertaken. However, the major and characteristic component of turmeric is the curcumin.

Curcumin exists as a mixture of the keto- and enol tautomeric forms, their relative composition dependent on the pH of the medium.



Keto Form of Curcumin

Enol Form of Curcumin

Research on curcumin is exploding with more than 2000 reports presently available. This is because of an extremely wide array of biological activities exhibited by the molecule. Curcumin acts on multiple targets and at multiple levels. The number of transcription factors and signaling pathways modulated by curcumin is, indeed, bewildering<sup>1,2</sup>. Curcumin has demonstrated benefit for most, if not all, chronic diseases afflicting mankind.

It is an antioxidant that can effectively scavenge oxygen- and nitrogen free radicals.

It is a complete anti-inflammatory modulating all the agents involved in the complex process of inflammation, including cytokines, chemokines, adhesion molecules, growth factors and transcription factors such as NF- $\kappa$ B and AP-1, and a large number of kinases, notably the MAP kinases p38 and JNK. It is an inhibitor of histone acetyltransferases<sup>3,4</sup> thereby preventing the transcription of inflammatory genes.

In heart disease, curcumin can affect all the steps believed to be involved in the pathologic process of atherosclerosis. In diabetes, it can potentially reverse insulin resistance, the first clinically relevant feature of the disease. Further, it can sensitize insulin by inducing the transcription factor PPAR $\gamma$ , similar to thiazolidinediones currently used for this purpose.

Curcumin can be shown to be the only agent who can effectively address all the multiple factors involved in Alzheimer's disease and rheumatoid arthritis. As an anticancer agent, it is a chemopreventive, affects cell cycle progression and transformation, causes apoptosis of malignant cells through more than one mechanism, prevents angiogenesis and metastasis, and is effective even against drug-resistant cancers. Whereas the present day cancer drugs are specific for one type of cancer, curcumin has been shown in preclinical studies to be effective against virtually all forms of human cancers. While common chemotherapeutic agents cause serious side effects, curcumin produces none. While the common anticancer drugs are immuno-suppressors, curcumin is an immuno-restorer<sup>5,6</sup>.

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