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Conceptual Paper

Is Yellow Yellow (Curcumin) Really a Dirty Fellow?

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Turmeric, the powdered rhizome obtained from the herb Curcuma longa (family Zingiberaceae) has a very long history and is common household name particularly in Asian continent. It has been used as a traditional medicine for a wide variety of disorders for ages. Like every Indian, I am also very much familiar to the Turmeric. I remember, in my childhood; my mother used to put a pinch of turmeric on the cuts, or any wound and to my wonder, I witnessed the healing too! This plant gives us a compound called "Curcumin", a yellow-orange colored chemical, which has created hype in the scientific fraternity to explore myriad of applications in the medicine. Since the first report on curcumin published in the Nature in the year 1949 for its antimicrobial activity [1], there has been surge in the research and development on the curcumin to investigate its clinical efficacy. Pubmed reports, more than 11,000 publications, while curcumin resource database (CRDB) developed in India based at IIT, Guwahati also provides similar data with more than 1000 patents until 2016. There are more than 100 clinical trials at all stages (ongoing, completed, recruiting, etc.) [2]. This suggests the intensity of work happening on the usefulness of Curcumin in different clinical conditions. There is a long list of clinical conditions, in which Curcumin has shown promising effects for instance cancer, cardiovascular diseases, Alzheimer's disease, arthritis, GI disorders, and diabetes to name few [3]. Collectively, this yellow-orange compound called Curcumin is establishing its root deep in the science as a panacea. Therefore, it will be of less surprise to us, if we see several products in the market sold as a nutritional/dietary supplement.

Despite immense research, we are far from reaching the reality to see Curcumin as a panacea. This is mostly, because of the accumulation of ever-increasing evidences questioning the safety and efficacy of Curcumin. Therefore, this short review focuses on what is dragging Curcumin behind in science. There are handful of reports, which wonderfully explains various shortcomings associated with Curcumin [4,5]. Curcumin, the so-called wonder drug, is extremely unstable, reactive and possesses erroneous pharmacokinetics after oral administration (bioavailability < 1%). Curcumin is practically insoluble in water and neutral pH at room temperature (1 - 10 µg/mL) with the calculated log p value of 2.3 - 3.2. Curcumin has been found to degrade rapidly in neutral and alkaline pH with a very short half-life ranging from 20 minutes, which changes to 7.2 - 10 minutes upon heating at 37ºC. These properties indicate the very first disqualification of curcumin at physiological conditions, which is holding curcumin back to become a panacea. In addition, it is photo-reactive and forms chemical colloidal aggregates under common biochemical assay conditions [4]. It has recently been classified as PAINS (pan assay interference compounds), which reacts with the multiple biological targets and show false activity rather than specific target as well as an invalid metabolic panacea (IMPS). All these parameters suggest curcumin a poor lead candidate [4]. Nevertheless, curcumin was taken to the *in-vivo* studies by overlooking physicochemical properties, not surprisingly, very minute amount of curcumin was detected, even after administration of a large dose (e.g. 12 g/day) (as observed in several clinical trials). If curcumin is absorbing in such a low quantity, obviously, it will not be available for distribution to specific organs at appropriate levels. Due to highly reactive structure, the dose of curcumin absorbed will be highly metabolized by the both phase I and phase II mechanisms with final elimination as the glucuronide and sulfate conjugates in urine [4]. It is also been claimed in the literature that, the possible therapeutic effect of the curcumin may have aroused from its toxic effects. This is the reason Curcumin is not on the list of FDA's GRAS (generally regarded as safe) list. DolCas (a US base company) applied for GRAS status, on which FDA responded that they have no questions at this time point and approved it for intended conditions of use (in food and food products) at 20 mg/serving. However, FDA did not give any affirmation about curcuminoids GRAS status under 21 CFR 170.35.

Although there are several reasons to hold back on curcumin, inquisitive researchers are still finding solutions to get this stingy molecule in the right path. With the advent of chemical modifications and nanotherapeutics, several publications and patents have demonstrated improvement in its bioavailability and stability. Positive outcomes from such reports are overwhelming, and being optimistic, hoping a good news from curcumin in the years to come would not be inexpedient.

Bibliography

1. Schraufstatter E and Bernt H. "Antimicrobial action of Curcumin and related compounds". *Nature* 164.4167 (1949): 457.

2. https://clinicaltrials.gov

3. Gupta SC., *et al*. "Therapeutic Roles of Curcumin: Lessons Learned from Clinical Trials". *AAPS Journal* 15.1 (2013): 195-218.

4. Nelson KM., *et al*. "The Essential Medicinal Chemistry of Curcumin". *Journal of Medicinal Chemistry* 60.5 (2017): 1620-1637.

5. Burgos-Moro´n E., *et al*. "The dark side of curcumin". *International Journal of Cancer* 126.7 (2010): 1771-1775.

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