

Title – The Effects of Curcumin on Aspergillus, and the minimum dosage required to prevent or inhibit Aspergillosis in immunocompromised individuals.

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Abstract: Aspergillosis is a disease that affects about 5 to 7 million people worldwide. It is caused by a filamentous fungi called Aspergillus. This disease is generally spread when a person with a weakened immune system inhales these fungal spores, and the patients have symptoms like wheezing, coughing up blood, chest pains, etc. Aspergillus is an opportunistic fungi that grows on lung tissue, destroying the integrity of the tissue to perform its physiological functions. Patients who undergo invasive procedures like surgeries or chemotherapy have a weakened immune system, which makes them susceptible to invasive aspergillosis. This kind could spread to the kidney or brain tissues, which could also lead to death. Antifungal drugs like Itraconazole are used for certain forms of the fungus; however, amphotericin B is used for other strains of the

fungi that are most common. Amphotericin B has many side effects like nausea, vomiting, muscle pain or weakness, uneven heart rate, weight loss, loss of appetite, skin reactions, seizures, etc. The drug is lipid based, and can interact with the cell wall of the fungi. However, many strains of *Aspergillus* are not susceptible to it. Studies have shown that curcumin, which is a major component of White turmeric (*Curcuma longa*), is mainly a volatile oil which can also interact with the cell wall of bacteria and fungi. This naturally occurring compound is non-toxic to human cells. Acetone or hexane extracts of curcumin obtained via steam distillation exhibits antimicrobial properties. These properties were observed via Agar well diffusion and Broth Dilution methods. Using membrane permeability assays in in-vitro testing of the gram positive bacteria (*E. faecalis*) and gram negative bacteria (*E. Coli*) has shown that curcumin causes leakages through the cell wall of the organisms. The cell wall of bacteria constitute of peptidoglycans, which constitute of disaccharides and amino acids. The cell wall of *Aspergillus* constitutes of Chitin, β -linked glucan, lipids and proteins. Since, the cell walls of both organisms are similar, further research can be focused on the efficacy of curcumin's ability to interact with the fungi's cell wall and cause leakages by using the same membrane permeability assays as a method to test it. The Minimum Inhibitory Concentration (MIC) tests of turmeric's effects on fungus was observed to be 1–1.5% (v/v) over a period of 21 days. Studies can be performed to see whether the results improve if turmeric is administered in the whole form or in a gel based form. The difference between the effects of White turmeric and Yellow turmeric on fungus can be studied using the broth dilution method. Mice infected with particular stains of *Aspergillus* can be fed turmeric capsules, or administered a gel form, to study the effects of it on mice, in order to observe its speed and efficiency of inhibiting the infection. This type of testing would also help determine which strain is most susceptible to curcumin, and the minimum dosage required for

precautionary and inhibitory measures in an adult who is either suffering from the disease or susceptible to it.

Christian worldview integration: The Bible provides truth about the inception of sickness and death, and how it was a result of one man's sin. Man's spiritual death led to his physical death and decline. The story in Genesis shows that death, in any form, was not in God's will for man. However, Romans 5: 17 states, "For if, by the trespass of the one man, death reigned through that one man, how much more will those who receive God's abundant provision of grace and of the gift of righteousness reign in life through the one man, Jesus Christ!" This verse shows God's redemptive plan for mankind, and how He chooses to redeem everything that was stolen because of sin. The Greek word "sozo" has been translated in the New Testament as "saved", "healed", "delivered", or "whole". Thus, when we believe in Him we are "saved" (saved, healed, and delivered). In a world, where many suffer from diseases, and even succumb to death; one might wonder how God looks at the situation, and whether it is His will to heal. Christ is the perfect representation of the Father, and on many occasions stated that He only did the will of the Father. Matthew 4: 23 states, "Jesus went throughout Galilee, teaching in their synagogues, proclaiming the good news of the kingdom, and healing every disease and sickness among the people". This verse shows that Christ did not ignore the physical needs of man, but rather chose to meet them all. Thus, the Bible shows that it is God's will to heal, and Christians are to represent that loving heart of God. Throughout the Scripture, God emphasizes on taking care of one's body. In the Old Testament He gave His people dietary laws, and instructed them on what they should and should not consume. The Creator's healing nature is seen in his creation. God has blessed the earth with many plants and minerals that are sources of natural

healing. It was His intention that human beings would benefit from its medicinal properties, and live wholesome lives. This perspective causes our research to be aimed at understanding how we can make better use of the natural resources He has provided us with. Knowing that God cares about man's health, gives us the confidence that His wisdom and guidance will be in our endeavor in fulfilling His will. In pursuing health and wholeness, as Christians, our actions send the message of God's love towards mankind, and that he cares about whatever concerns us. In doing so we impact our culture for Christ, and share the good news.