

**Title** – The Effects of Curcumin on *Aspergillus flavus*, an opportunistic fungus that causes Invasive Aspergillosis.

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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*. *Aspergillus* is an opportunistic fungus that grows on lung tissue, destroying the integrity of the cells to perform its physiological functions. Patients that undergo invasive procedures like surgery or chemotherapy, or have a weakened immune system, are susceptible to aspergillosis. Aspergillosis could also progress to its invasive form, which could spread to the kidney and brain tissue, and often leads to death. An antifungal drug called amphotericin B is used for strains of the fungus like *A. flavus* and *A. fumigatus* that are most common. Amphotericin B has many side effects like vomiting, muscle pain or weakness, uneven heart rate, skin reactions, seizures, and kidney failure. 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, a major component of *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. The cell wall of *Aspergillus*

constitutes of Chitin,  $\beta$ -linked glucan, lipids and proteins. Since, the cell walls of both organisms are similar; this research is 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. In this study, the Minimum Inhibitory Concentration (MIC) tests of curcumin's effects on fungus has shown that 50 $\mu$ M and 100 $\mu$ M solutions have been active against aspergillus spores at concentrations as high as  $1 \times 10^7$  CFU. These tests were performed in comparison with thymol and eucalyptol, which are natural compounds that are common antifungals.

**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.