International Journal of Scientific & Engineering Research, Volume 6, Issue 8, August-2015
ISSN 2229-5518

4.1 Ineffectiveness of freshly extracted allicin against majority of tested bacteria species

The freshly extracted allicin did not live up to the postulations made at the beginning of this study. Although it undoubtedly has some antibacterial effect, it was not to the extent expected. There could be many possible reasons for this result. As stated above, allicin freshly extracted in a laboratory has varying quality. The quality depends on the extraction method; if mistakes were made during extraction, then naturally the quality will suffer. If the concentration of allicin compared to other compounds is low, then the purity of allicin will decrease exponentially. As mentioned previously, allicin has a short half-life; therefore, some may have dissipated before being introduced into the bacteria. Lastly, when infusing the sample discs, some of the allicin may have spilled out of the disc. This could possibly lead to false results regarding ZOI. To prevent some of these issues in the future, many improvements can be implemented. Instead of crushing the garlic with a mortar and pistle to make a garlic paste, it can be blended to ensure complete obliteration of the cellular structure of garlic. The purity of allicin can be checked using mass spectroscopy. By using this technique, the chances of using allicin of a weak concentration is reduced. A last step would be [illegible] pure [illegible] that was extracted through a patented and sophisticated extraction procedure. This step should be used as a last resort as an objective of this study was to examine the antibacterial properties of freshly crushed garlic; however, for trials for future medical applications, this may be a viable option to increase the importance of the potency of allicin.

4.2 Mutagenesis in *P. aeruginosa*

As predicted, mutagenesis was most probably induced in a sample of *P. aeruginosa*. The disparity between the control and the mutated samples was significant enough to reach the conclusion that *P. aeruginosa* mutated to become resistant to allicin, although which specific genes caused this mutation is yet to be determined. Samples from this have been preserved, so that an in-depth examination of the genetic structure of *P. aeruginosa* can be done in the future. An interesting occurrence during this portion of the study was that the bacteria had a much higher sensitivity to allicin in this experiment than in the first trials at the beginning of the study. A possible reason for this is that even though allicin was extracted in a similar method, some variable changed when TLC was not used to create a more pure or potent form of allicin. Nevertheless, the results showed strong evidence that allicin had an inhibitory effect on *P. aeruginosa* and that the bacteria can be mutated to form resistance

4.3 Future directions

In the future, as antibiotic-resistance increases, allicin will become an important part in the treatment of bacterial infections and diseases. Although not truly effective in its freshly extracted form, pure allicin will perhaps be effective against many bacterial species. In fact, studies have been done in which allicin and an antibiotic have been combined to form a very potent antibacterial medication. [8] Studies such as this show that there is room for improvement and innovation regarding allicin in the field of biotechnology. In terms of this study, by examining the mutated strain of *P. aeruginosa*, the mode of action for the antibacterial effect of allicin may be elucidated. In the future, allicin can hopefully be used against both antibiotic-receptive and antibiotic-resistant bacterial illnesses. By creating a new pharmaceutical product made out of a natural source, the human microbiome will be a healthier and better functioning body.

ACKNOWLEDGMENTS

Author R.K. would like to sincerely thank Dr. Eric Anderson as well as Mr. Ian Davison, and Ms. Becca Nickle of East Carolina University for the help, guidance, and inspiration given through the complex process of scientific experimentation. R.K would also like to thank the Summer Ventures in Science and Mathematics program, a state-funded summer research program of the University of North Carolina System administered by the North Carolina School of Science and Mathematics, for funding this study.

REFERENCES

[1] [illegible] Biljana [illegible] Bauer, and [illegible] Svetlana Cekovska. "Extracts from the history and medicinal properties of garlic." Pharmacognosy reviews 4.7 (2010): 106-110.

[2] [illegible] Peirre Lossain Kouakou, and Ali Gorji. "Garlic: a review of potential therapeutic effects." Avicenna Journal of Phytomedicine 4.1 (2014): 1-14.

[3] "What Is Allicin?" AllicinFacts. Natural Health Publications Limited, n.d. Web. 13 July 2015.

[4] "Future of Allicin." AllicinFacts. Natural Health Publications Limited, n.d. Web. 13 July 2015.

[5] Ankri, Serge, and David Mirelman. "Antimicrobial properties of allicin from garlic." Microbes and infection 1.2 (1999): 125-129.

[6] Williams, David Michael, and Chandra Mohan Pant. PROCESS FOR THE PRODUCTION OF ALLICIN. Neem Biotech Ltd., assignee. Patent 7,179,632. 20 Feb. 2007. Print.

[7] Leng, Bing-Feng, et al. "Allicin Reduces the Production of Alpha-Toxin by Staphylococcus aureus." Molecules 16.9 (2011): 7958-7968.

[8] Cai, Yun, et al. "Antibacterial activity of allicin alone and in combination with Beta-lactams against Staphylococcus spp. and Pseudomonas aeruginosa." The Journal of antibiotics 60.5 (2007): 335-338.

[9] Mills, Ben. Cysteine-to-allicin-2D-skeletal.png. 2007. Photograph. Wikimedia Commons. Web. 17 Jul 2015. <https://commons.wikimedia.org/wiki/File:Cysteine-to-allicin-2D-skeletal.png>.