The Synergistic Effect of Imatinib and Allicin: A Potential Therapeutic for BCR-ABL1-positive Leukemia

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Imatinib is a drug commonly used for the treatment of BCR-ABL1-positive leukemia. However, imatinib-resistant cells often develop after treatment, causing therapeutic failure. My previous research has shown that allicin, an active component in garlic, triggers erythroid differentiation and reduces cell number in K562 BCR-ABL1-positive leukemia cells. The purpose of this experiment was to examine the combinational effect of imatinib and allicin on K562 leukemia cells. An MTT assay was performed to determine cell viability after treating cells with imatinib and/or allicin. Both imatinib and allicin had dose-dependent effects on cell viability, but no significant synergy was observed on day 3. However, on day 6, the combination of allicin with a low dose of imatinib resulted in less viable cells. Wright-Giemsa stainings showed that both imatinib and allicin treatment caused erythroid differentiation. To identify the molecular mechanisms of imatinib and allicin's actions, RNA was isolated from treated cells and cDNA was synthesized to perform Real-Time qPCR. The results demonstrated that both imatinib and allicin increased the expression of alpha-globin, gamma-globin, and glycophorin A, which are erythroid differentiation markers. A low dose of imatinib caused a significant decrease of p21, which would result in uncontrolled cell cycle progression. Interestingly, the combinational treatment blocked imatinib-mediated p21 decrease and prevented the emergence of imatinib-resistant cells. Taken together, imatinib and allicin have a synergistic effect on blocking leukemia cell expansion as they enhance erythroid differentiation and cause cell cycle arrest. The combination of imatinib and allicin could be a potential therapeutic for BCR-ABL1-positive leukemia.

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