

**Author:** Le Zhang

Currently, Multiple myeloma is the second most common hematological malignancy in the U.S. and constitutes 1% of all cancers. With conventional treatment, median survival is 3–4 years, which may be extended to 5–7 years or longer with advanced treatments [1]. Recent research indicated that an increased osteoclasts (OCs) activity [2] is often associated with multiple myeloma (MM) and decreased activity of osteoblasts (OBs) contributes to osteolytic lesions in MM. Normally, OCs and OBs are in proportion to maintain a balance. Once the balance of the proportion of OCs and OBs is broken, the lesions occur.

**Results:** A multi-scale agent-based multiple myeloma model is developed to simulate the proliferation, migration and death of OBs and OCs. And then, the model is employed to investigate how the two commonly used drugs for MM mediate the growths of MM to return the balance between OCs and OBs.

**Conclusions:** The simulated results demonstrated that these optimal uses of these three drugs not only can restore the balance between OCs and OBs, but also can kill multiple myeloma cells. Drug synergism analysis suggested restoring the balance between osteoblasts and osteoclasts can significantly increase the drug efficacy against tumor cells.