

Multiple Myeloma (MM) is a malignancy of plasma cells, specifically B-lymphocytes, which inhabit bone marrow resulting in osteolytic bone lesions and disease in the bone marrow (1). MM is a hematologic cancer, meaning it develops in the blood, and is the second most common hematologic malignancy next to non-Hodgkin's lymphoma (2). According to Kathy Giusti, MM patient and co-founder of the Multiple Myeloma Research Foundation, MM was 100% fatal in 1996 when she was diagnosed, the average life span was three years, and no drugs were being developed to treat the disease (3). In recent years, research for MM has been greatly increased and consequently the average life-span for MM patients has been lengthened. My grandfather was diagnosed with MM in the early 1990s and was given six weeks to three months to live without treatments. However, with new treatments being developed every year, he was able to live until April of 2001 from receiving the newest treatment and drugs from Duke University Medical Center. Currently, there are several new treatments becoming available two of which are Skeletal Targeted Radiotherapy (STR) and Arsenic Trioxide (ATO).

Skeletal Targeted Radiotherapy is a type of radiation specifically aimed at the skeleton. The scientific name of the drug is  $^{166}\text{Ho}$ -DOTMP which consists of two different components.  $^{166}\text{Ho}$  is a radioactive element which can destroy cells that are sensitive to radioactivity, such as myeloma cells. DOTMP is a chemical that collects in the bones. When the drug collects in the bones, cells will be exposed to  $^{166}\text{Ho}$  and will be killed. With the use of high-dosage chemotherapy in conjunction with STR, cancerous myeloma cells and bone marrow cells are destroyed. However, a common treatment in MM, autologous stem cell transplantation (SCT), will replace the healthy cells after the

malignancies are destroyed (4). NeoRx, an innovative therapeutic developer, has revolutionized STR and has conducted many clinical trials to determine the results of the new drug in MM patients. In conjunction with the Blood and Marrow Transplantation Center at the M. D. Anderson Cancer Center in Houston, Texas, NeoRx performed a study which reported a 90% 3-year survival rate for patients treated with STR compared to at 48-59% 3-year survival rate for patients treated with high-dosage chemotherapy and autologous SCT.

“From the results to date, we are pleased to see the antitumor activity of STR in myeloma confirmed by the high proportion of patients surviving at least 3 years,” said Roy Quartermaine, PhD, commercial manager, pharmaceutical technologies of The Dow Chemical Co (5).

The drug resulted rapid hematologic recovery (platelets and red and white blood cells) and low occurrence of the radiation in non-targeted organs such as the lungs and liver (6). Minor side-effects were seen in the bladder and kidneys, however, lesser treatments can be used to cure these problems.

Trisenox (arsenic trioxide or ATO) is intended for patients with recurring white blood cell cancers, including acute promyelocytic leukemia and multiple myeloma, after initially treatments such as high-dosage chemotherapy (7). Trisenox is being manufactured by Cell Therapeutics, Inc.

In the United States, clinical use of ATO was undermined by the development of cytotoxic chemotherapy in the 1970s and the concern of arsenic poisoning with long-term use. However, it has recently been shown that ATO holds promise in treating MM (8). A study done in Europe treated severe combined immunodeficient (SCID) mice,

implanted with human MM cells, with ATO upon recognition of tumor growth. Through the study, it was observed that ATO can hinder and control human MM cell growth in laboratory animals (9). ATO in combination with ascorbic acid (vitamin C) has also proven increased hindrance in cell growth (8). ATO induces apoptosis, programmed or natural cell death, through a mechanism that collapses the mitochondrial transmembrane of the cell by destroying its proteins (8, 10). ATO was also shown to reduce growth of malignant cells and induce antitumor activity.

With the current understanding of MM and how it works, it does not appear that any one treatment will be able to control MM permanently. However, with new medical treatments survival rates have been increased greatly. According to the Institute of Cancer Research, “patients younger than 70 can now expect a doubling of median survival to 5 years, a 20% chance of surviving longer than 10 years, and a 50% chance of attaining complete morphological and biochemical remission” (1). Future research in MM treatment is being targeted at converting the disease to a constant phase thus reducing the reproduction process of myeloma cells (8).

## Works Cited

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