

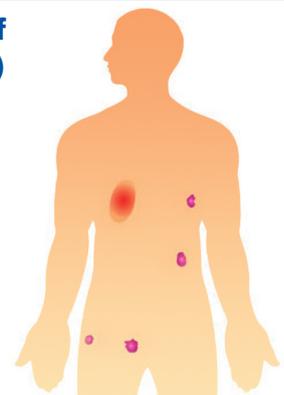
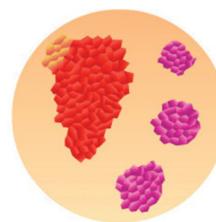


Sarcomas are cancerous growths that develop in the cells of the connective tissue. Primary cancers that develop in the soft connective tissues, such as in the muscles, nerves, blood vessels and fat cells, are called soft tissue sarcomas. Osseous sarcomas develop in hard connective tissue such as in the bones and cartilage. Connective tissue is abundantly present everywhere in the body, and soft tissue sarcomas can therefore occur anywhere. However, the most common locations for soft tissue sarcomas are in the arms and legs, followed by the organs in the abdominal cavity.

# Benefits of Micronutrients in Sarcomas affecting Adults

Although there are more than 50 types of sarcomas, the more common adult sarcomas are liposarcoma (originating from the fat cells), fibrosarcoma (originating from fibroblasts which are the cells that make the collagen meshwork), chondrosarcoma (originating from the cartilage), and leiomyosarcoma (originating from the muscle cells). Fibrosarcoma and liposarcoma are the most common types of sarcomas in adults and are most commonly treated with surgery followed by chemotherapy and/or radiation. However even with these aggressive approaches, almost half of the sarcomas in adults are resistant to such treatments and they spread to other organs. After the cancer starts spreading (metastasis), only 50% of sarcoma patients may live beyond 5 years.

**Schematic Diagram of Sarcoma Tumors (left) and their occurrence in the body (right).**



Sarcomas are cancerous tumors of the bone or soft connective tissue, such as cartilage, muscle or fat cells. They can occur anywhere in the body. Micronutrients are effective in supporting the inhibiting of the spread of sarcoma cells.

## Benefits of Micronutrients in Sarcomas affecting Adults

The spread of cancer depends on the ability of cancer cells to destroy the surrounding connective tissue with the help of matrix metalloproteinase enzymes (MMPs). The action of MMPs depends on the presence of the amino acid lysine, and specific proteins and hormones secreted by the surrounding connective tissue cells. Substances such as tumor necrosis factor (TNF- $\alpha$ ), epidermal growth factor (EGF), and other cytokines control the activity of MMP enzymes secreted by the cancer cells. Therefore, we investigated the effects of micronutrients on various natural compounds that affect MMP enzymes in different types of sarcoma cells commonly affecting adults<sup>1</sup>. In all the cell lines we studied, a micronutrient combination containing vitamin C, lysine, proline, green tea extract and others inhibited MMP secretion. We also compared the effects of green tea extract with doxycycline on MMP inhibition. Both of these substances equally inhibited MMP secretion in all sarcoma cell lines but, contrary to doxycycline, the green tea extract was not toxic to the cells.

In a separate study, we examined the effects of a micronutrient combination on a different type of enzyme, urokinase plasminogen activators (u-PA), which are also involved in metastasis<sup>2</sup>. In this study, the micronutrients inhibited secretion of both u-PA and the MMPs, and increased secretion

of MMP inhibitors (TIMP-2) in fibrosarcoma, chondrosarcoma, liposarcoma and uterine leiomyosarcoma cells.

**The increased levels of MMPs and u-PA enzymes are associated with tumor growth, cancer progression and metastasis, all of which reduce the overall survival of sarcoma patients. Optimum amounts of synergistic micronutrients help in maintaining the strength and stability of the connective tissue. Our results show that micronutrients reduce the secretion of MMP and u-PA enzymes in all sarcoma cell lines without any adverse effects, thus suggesting their possible use in patient management.**

1. M.W. Roomi, et al., *In vitro modulation of MMP-2 and MMP-9 in adult human sarcoma cell lines by cytokines, inducers, and inhibitors*, *International Journal of Oncology* 43: 1787-1798, 2013

2. M.W. Roomi, et al., *Modulation of u-PA, MMPs and their inhibitors by a novel nutrient mixture in adult human sarcoma cell lines*, *International Journal of Oncology* 43: 39-49, 2013

## Important Health Information for All

This information is provided to you courtesy of the Dr. Rath Research Institute. Led by two former colleagues of two-time Nobel Laureate Linus Pauling († 1994) this Institute has become a leader in the breakthrough of natural health research in the field of cancer, cardiovascular disease and other common diseases. The Institute is a 100% subsidiary of the non-profit Dr. Rath Foundation.

The groundbreaking nature of this research poses a threat to the multi-billion dollar pharmaceutical "business with disease." It is no surprise that over the years the drug lobby has attacked Dr. Rath and his research team in an attempt to silence this message. To no avail. During this battle, Dr. Rath has become an internationally renowned advocate for natural health saying, "Never in the history of medicine have researchers been so ferociously attacked for their discoveries. It reminds us that health is not given to us voluntarily, but we need to fight for it."

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