

PROGRESS IN CANCER TREATMENT

Loboda T., *student JIC – 601,*
Horobchenko N. G., *EL adviser*

The problem of cancer is being discussed in innumerable papers from all parts of the world because cancer still continues to be the first among human diseases.

AIM: to introduce the ways that are likely to be considered the most effective in treating oncological diseases nowadays.

MATERIALS and METHODS. Cancer or carcinoma, as it is often called, is a malignant tumor which arises from the epithelial cells. A tumor is a mass of new tissue which grows independently from its surrounding structures. A malignant tumor is made up of connective tissue enclosing epithelial cells. Some tumors remain localized, others rapidly invade healthy tissue and metastasize leading to early death. The incidence of carcinomas comprises 90% of all malignant tumors. The symptoms being vague or absent at an early stage, cancer is a very dangerous disease for life.

Scientists have found an intense characteristic of stem and progenitor cells that may trigger initiation and progression of cancerous tumors. In a study published in the December 2005 issue of the *Journal Cancer Cell*, a group of researchers from Columbia University Medical Center reported that stem and progenitor cells are vulnerable to a certain error during cell division that can result in serious chromosomal defects. This susceptibility may explain how a tumor-initiating cell, also known as a cancer stem cell, arises from a normal cell. It may also clarify how a cancer stem cell acquires further mutations that increase tumor malignancy. The researchers discovered that stem and progenitor cells are deficient in this safeguard and will divide even if the chromosomes are entangled. All three cell types evaluated by the researchers – mouse embryonic stem cells, mouse neural progenitor cells, and human bone marrow progenitor cells – attempted cell division with entangled chromosomes. Study of laboratory mice has shown that exposure to artificial light at night stimulated the growth of human breast tumors by suppressing the levels of melatonin. In contrast, extended periods of darkness at night greatly showed the growth of the tumors. These results help explain why women who work night shifts have a higher rate of breast cancer than other women. In advanced industrial

countries such as the United States, it provides a new explanation for the epidemic rise in breast cancer incidence.

"We know that many tumors are largely dependent on a nutrient called linoleic acid, an essential fatty acid, in order to grow," observed lead author David Black, a neuroendocrinologist from the Bassett Research Institute. "Melatonin interferes with the tumor's ability to use linoleic acid as a growth signal, which causes tumor metabolism and growth activity to shut down". To test this hypothesis the researchers injected human breast cancer cells into laboratory mice. After these cells developed into cancerous tumors, the tumors were implanted into female rats where they could continue to grow. The researchers took blood samples from 12 healthy volunteers under three different conditions: during the daytime, during the night following two hours of complete darkness, and during the night following 90 minutes of exposure to bright fluorescent light. These blood samples were then pumped directly through the developing tumors. The melatonin rich blood collected from subjects while in total darkness severely slowed the growth of tumors. These results are due to a direct effect of the melatonin on the cancer cells. The melatonin is clearly suppressing tumor development and growth. In contrast, tests with the melatonin-depleted blood from light-exposed subjects stimulated tumor growth.

Nonsurgical cancer therapy that kills tumors but leaves healthy surrounding tissue intact could soon become available for patients. These recent study's results ultimately become reality. The Los Alamos National Laboratory Trident laser group, working with researchers from the University of Nevada, Reno has succeeded in concentration the intensity of a laser-driver carbon ion beam into a narrow range. This study supports earlier studies led by the University of Nevada that found much higher quality laser proton beams from laser acceleration as opposed to traditional particle acceleration.

CONCLUSION: progress made in cancer research and treatment is a result of success in biochemistry, molecular biology, genetics, immunology and virology. Experimental studies have proved that viruses of animal species may produce malignant tumors in other animals. The cancer control program includes both social and medical measures. There are many specialized treatment, prevention and research centers where surgery, radiation and chemotherapy are used.