CANCER RESEARCH INSTITUTE OF WEST TENNESSEE

CRI-FHU NEWSLETTER

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CRI BEGINS NEW SCHOOL YEAR

The Cancer Research Institute of West Tennessee (CRIWT) begins the new school year with nine students enrolled in the academic research programs.

These students include Kelly Green, Dale & Will Brooks, Stephanie Woodall, Melissa Ellis, Kevin Moses, Joe Deweese, Chris & Heather Meacham and Chad Khuns.

In addition, Ben Kachelman, a pre-med graduate, will be working in the lab for the next year. Also, he is performing collaborative work with the CRIWT in Pathology at UAB.

Emily McDuffee successfully defended her Ph.D. proposal in the Department of Molecular Biology and Anatomy at East Tennessee State University. She will continue to complete her Ph.D. research at the CRIWT over the next two years while serving as a faculty member in the Department of Biology.

The students are learning Good Laboratory Practices (GLP) in the areas of tissue culture, flow cytometry, image analysis, and immune assays.

Second Tissue Culture facility which is being used for short-term cultures and student training

As part of the student training, they are encouraged to spend one summer working at a different academic institution doing research. Will Brooks spent the summer with Dr. Tim Logan in chemistry at Florida State University. Dr. Logan will be on campus in the near future to discuss collaborative research and recruit students for the Ph.D. program in chemistry. His brother, Dale, did research at UT Memphis. Last year, we competed with five state universities for seven research positions. We were granted two of those, and Dale received the one for last year.

Rita McCain continues as our office manager and phlebotomist.

NEWS FROM OUR GRADUATES

This summer, John Bates, during a break from medical school, conducted research with our antibody against ovarian cancer. Over 50 cancers with normal ovary samples were stained with the antibody. Dr. Grizzle, Director of pathology for the laboratory, was very impressed with the results and John's work. We will publish this data in the near future. John and Mandy (Garett) married in June. Mandy did the tissue culture for the CRIWT for two years.

Jim Barr, our first graduate, is conducting research in the Department of Chemistry at the University of Nevada at Reno on nanoengines. He is using lasers to rotate molecules. During the past month, he published a paper in *Science* and was the Top Story in the *American Chemical Society Journal, Chemical & Engineering News*.

Inside this issue:

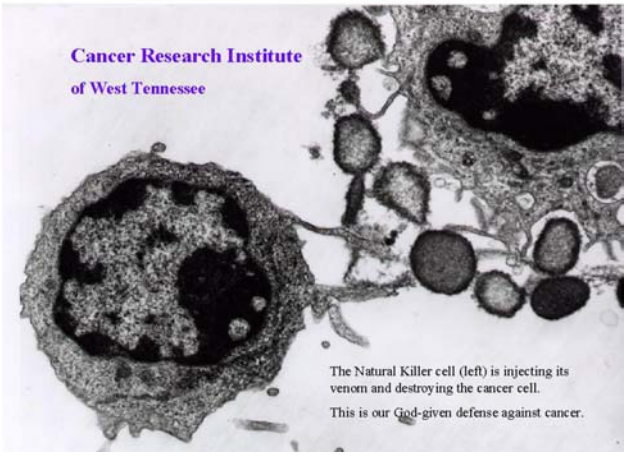
Special points of interest:

- Exciting new discoveries on cancer detection techniques (page 3)
- How can you stop a tumor from growing? The answer is on page 2.
- Our students have been very busy in research. Find out how they spent their summers on page 2.

NATURAL KILLER CELLS

Our God-given defense against cancer (and viral infections) involves immune surveillance. On a cell mediated level, the natural killer cell is the primary soldier that can bind to cancer (non-self) cells and destroy them by the release of specific toxins. They are released through the extended membranes. The figure illustrates the natural killer cells attacking a cancer cell by injecting its "venom" into the cancer cells and completely destroying it as shown by the membranes of the cancer cell forming aggregated spherical debris of what was once a viable cancer cell.

Since discovering the natural killer cell in 1971, Dr. Thornthwaite has continued to develop clinical applications for using a patient's own natural killer cells to help destroy tumors. Recent work at the CRI has concentrated on natural substances that stimulate the production of natural killer cells.



A natural killer cell "attacks" a cancer cell by injecting its "venom" into it.

STUDENT RESEARCH THIS SUMMER

During the summer of 2001, both Will and Dale Brooks were able to participate in undergraduate research programs at two universities. Joe Deweese also held an exciting internship position this summer.

Will worked at Florida State University under the supervision of Dr. Tim Logan. His research involved the FK506 Binding Protein. Will worked with two different types of fluorescence spectroscopy to determine various thermodynamic properties involved with the folding and unfolding of this protein.

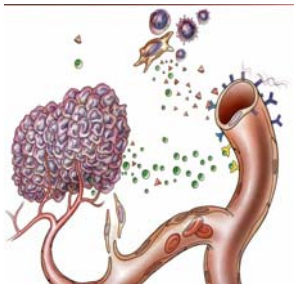
"Summer research opportunities are very important to undergraduates in order to explore new areas that would otherwise be inaccessible."

Dale spent his summer doing research for Dr. Goldowitz in a neuroanatomy lab at the University of Tennessee in Memphis. Dale was involved with the increasingly popular stem cell research. His research involved the search and identification of stem cells in mice brains.

Joe was able to work alongside Dr. Bert Thompson in Montgomery, AL at the Apologetics Press. He was able to research and write on various topics pertinent to Christian evidences today.

ANTI-ANGIOGENESIS

Solid tumor growth is accompanied by new blood vessel growth, or angiogenesis. Without nutritional support from the blood, tumor cells die and cannot grow or metastasize. Inhibition of this growth, antiangiogenesis, is the focus of much research today. Antiangiogenic agents that prohibit tumor vasculature are a significant part of clinical studies today. Our website, *cancer-protocol.com*, is focused on antiangiogenesis. One major angiogenic factor is copper. Tumors sequester copper for blood vessel formation. Cancer patients tend to have high copper levels. Reducing copper is antiangiogenic. Zinc is shown to help decrease copper levels in cancer patients. The copper:zinc ratio is high in cancer patients. Lowering this ratio is the goal of copper reduction therapy. We measure caeruloplasmin levels at the CRIWT. Caeruloplasmin is a copper-binding protein and thus is a reflection of copper levels in the serum. Copper reduction is a therapy that can be employed today to shrink tumors.



Antiangiogenesis can keep a tumor cell from growing and spreading.

NEW RESEARCH/TEACHING SPACE ADDED

The addition of approximately 2,200 sq . ft. of research and teaching space was completed in February. During the spring semester, we were able to setup, and this summer we started conducting our research. This addition was built under the supervision of Dr. Thornthwaite for less than $40 per sq. ft. We are thankful for the donations from Casey Funeral Homes and the Drone Foundation. With matching funds from FHU, this project was successful. Finally, we are thankful for the local businesses, students, and volunteer workers who helped in the construction and finishing phases.

This summer, we were able to connect through the school's internet network. This connection is very important for student education and the maintaining of our two sister Web sites: *cancerfoundation.com* and *cancerprotocol.com*.

Completed addition to the Cancer research Institute

Student Volunteers painting the CRIWT

The start of the addition to the CRI

CANCER RECOGNITION (CARE) TESTING

Emily McDuffee's Ph.D. research is involved in the detection and monitoring of a unique tumor protein discovered by Dr. Thornthwaite. The antibody binding site has been recently identified and sequenced. Emily's research is involved in the determination of how the antibody's response is immunoprotective against cancer patient sera. This research involves the measurement of the ability of patient's antibodies to be cytotoxic against cancer cells.

Also, she is developing methods to determine by light and transmission electron microscopy the location of this unique antigen.

We hope the data we are gathering will be confirmed shortly as a useful procedure for monitoring residual cancer and lead to a diagnostic test. However, much work must done before this test can be considered as a screening test for cancer.

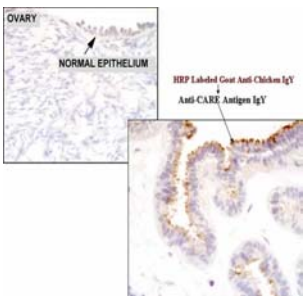
"The CARE test encompasses for the first time the measurement of both the cancer protein and the patients' antibody response against it"

Emily pipeting the final step in the assay for the CARE Antibody in patient sera.

UAB TUMOR STAINING TECHNIQUE IN DEVELOPMENT

A new tumor staining technique is being developed in cooperation with a laboratory at UAB. Dr. William Grizzle is director of the laboratory at UAB that is working on this technique. The technique utilizes adenocarcinoma antibodies to identify a specific protein found in tumors. This antibody is the same one being used in the Cancer Recognition (CARE) Test.

John Bates, an FHU and CRI alumnus, has done work on the project for Dr. Grizzle. He is currently developing a paper to be published that discusses in greater detail the staining technique. Ben Kachelman, our research assistant at the CRI, recently visited with John and Dr. Grizzle's lab to learn the technique. Hopefully, this will enable us to reproduce the technique at the CRI in the future. We anxiously anticipate the future uses of this histological staining technique.



Ovarian tumor epithelium: new technique (right) old technique (left)

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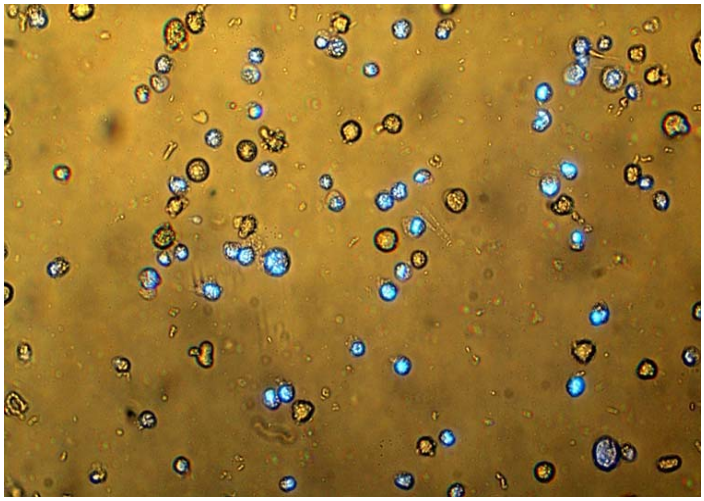
CANCER RESEARCH INSTITUTE
Of West Tennessee

The mission of the Cancer Research Institute of West Tennessee is to address two areas of cancer care that are often neglected — individualized cancer management and counseling of patients after therapy. Your support for cancer research on the campus of Freed-Hardeman University will directly fund significant research in the war on cancer. Furthermore, you will provide an opportunity for our science students to conduct significant cancer research which will give them laboratory experience for their scientific and medical careers.

CELL VIABILITY ASSAY

At the CRIWT, we are culturing a leukemic cell-line, K-562. We take some of these cells and place them in hot water for varying lenghts of time (15 min, 20 min, 25 min, 30 min, etc.). At the end of each interval of time we evaluate the number of live cells vs. dead cells. Cell viability is reference to the number of cells alive. As the incubation time increases, the cell viability will decrease. How do you know which cells are alive and which are dead? We use a couple of stains. One stain is called trypan blue. Only dead cells absorb trypan blue and thus, under a microscope, dead cells are blue and live cells are translucent. Another method that we use is to stain the cells with DAPI. DAPI will be absorbed by the dead cells. We can look at cells under a microscope and photograph the cells. This gives us an indication of cell viability. Why is this important? To ascertain if a certain treatment works on killing tumor cells, one would have to assess the effectiveness of the treatment. Does it kill the cells? If so, how effective is it at killing the cells? What effect does it have on cell viability? The answers to these questions are important in determining the effectiveness of some chemotherapeutic drugs and antibodies.



K-562 leukemic cells are stained with DAPI under a microscope.. Only dead cells absorb the DAPI stain and fluoresce with a blue glow. The live cells are clear. Counting both allows us to determine cell viability.