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Eliminating the Suffering and Death Due to Cancer

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Study Offers Promise for Detecting Pancreatic Cancer

Using novel protein microarray technology, researchers have identified a panel of 10 protein biomarkers found in blood samples that proved highly accurate at detecting the existence of pancreatic cancer and identifying truly negative samples.

Several biomarker experts called the findings preliminary but promising. But there is still much work to be done before a commercially available test could reach the clinic, acknowledged the study's leader, Dr. Anna E. Lokshin of the University of Pittsburgh School of Medicine.

"We are still looking for more potential biomarkers in order to increase the sensitivity of this screening method to 100 percent," she said. "So far, these preliminary results are very encouraging, but we need to reach 100 percent accuracy before this test can be widely used."

Dr. Lokshin presented the study results on Monday in Boston at the American Association for Cancer Research's (AACR) Frontiers in Cancer Prevention Research meeting. The study was conducted in conjunction with researchers from Harvard and Northwestern Universities.

(continued on page 2)

Director's Update

What's Next for Cancer Stem Cells?

The concept of cancer stem cells has generated great excitement in the research community. These cells—the hallmark of which is resistance to therapy and the ability to self-renew and produce a differentiated population of daughter cells—have been identified in many solid and hematopoietic cancer types.

With the intention of supporting research in this new field, on November 1, we held the first NCI Stem Cell Mini-Retreat, where NCI and NIH researchers and extramural investigators gathered to learn from each other about the latest advances in stem cell research and to identify opportunities for collaboration that could significantly advance the field, expand translational opportunities, and leverage resources.

The implications of these cells for cancer treatment are enormous. Although relatively rare, with only about 1 out of 1,000 to 10,000 cells in any given tumor, their resistance to standard therapies and their proliferative potential make them a likely cause of many recurrences after seemingly curative treatment. Their plasticity and ability to survive a hostile environment through quiescence—the state of being dormant—are also thought to contribute to their metastatic potential.

(continued on page 2)

(Study continued from page 1)
The research team began with a panel of 44 biomarkers, which, as Dr. Lokshin explained, "represent the dialogue between the tumor and the body"—that is, proteins that are secreted by tumor cells, the vasculature that feeds the tumor, immune system cells, and cells in the tumor microenvironment generated as a result of a tumor's presence.

They then used a protein array system to analyze blood samples from 100 patients with both resectable and nonresectable pancreatic cancer, including some patients with early-stage disease, and a control group of 400 healthy participants. They found marked differences in the expression of many of these proteins in the patient samples compared with those from controls.

Using "our own, quite powerful algorithm," Dr. Lokshin said, they discovered a 10-biomarker panel that correctly identified 97 percent of patient samples. In addition, the panel's sensitivity and specificity—its ability to correctly identify a malignancy and rule out cancer—was 95 percent and 98 percent, respectively.

"Since the completion of this study, we have been able to reproduce these results in a blinded validation set, with strong diagnostic power, and 87 percent sensitivity and 98 percent specificity," Dr. Lokshin said.

Dr. Sudhir Srivastava, head of NCI's Early Detection Research Network (EDRN), which funded the study, lauded the team's work, but cautioned against reading too much into the results.

"We must narrow down the panel so it becomes more organ specific," he explained. While some of the biomarkers used in the study are expressed in pancreatic cancer, he noted, they are also overly expressed in other cancers, so there is a significant risk of "cross reactivity."

The results presented in Boston did show that the 10-biomarker panel specifically recognized patients with pancreatic cancer, but not patients with other cancers, including lung, esophageal, head and neck, ovarian, breast, endometrial, and melanoma.

The diagnostic platform used to test the samples also will need to be standardized, Dr. Srivastava added, and the refined biomarker panel tested in different patient cohorts to ensure that the results are reproducible from one site to the next.

Perhaps most important, he said, "it has to be tested on prospectively collected samples, so we can determine what kind of benefit you get in terms of lead time." In other words, can the test detect the disease early enough in its course that treatment will actually improve survival? The statistical algo-
(continued on page 7)

(Director's Update continued from page 1)
As I mentioned in a previous column, new insights into the role of these cells in tumorigenesis and metastasis make this an excellent time to accelerate study in this field. One of the primary goals of the November 1 retreat was to identify the immediate impediments to rapid progress in cancer stem cell research.

In the area of basic research, participants highlighted the need to accurately identify these rare cells. Much of this identification will come from elucidating specific cell markers and aberrantly expressed signaling pathways, both of which also have implications for targeted therapy.

Speakers also discussed the current challenges in isolating and growing these cells, which are difficult to maintain in culture, and the pressing need for appropriate models to test therapies both *in vitro* and *in vivo*.

In the area of treatment, the crux of the discussion revolved around one major question: By identifying and blocking specific cell-signaling pathways, is it possible to nullify the "stemness" of these cells, leaving them vulnerable to treatment?

This question highlights other challenges. For example, cancer stem cells often cycle into a quiescent state, requiring identification of a stimulus to activate them before treatment. The design of clinical trials in this field will need to identify new methods to evaluate the success of anticancer stem cell therapies. Clearly we have a lot of work ahead of us. The final question posed at the retreat asked what NCI would do next to promote the necessary research in this field.

We have been inspired by the success of the Trans-NIH Angiogenesis Research Program (TARP) in promoting collaborations between investigators from many different disciplines, and hope to soon launch a similar trans-NIH stem cell biology and embryogenesis initiative, to facilitate the exchange of knowledge and technology both intramurally and extramurally.

NCI is now beginning the process of planning a multi-day symposium, hopefully on an annual schedule, to launch this new initiative. This type of symposium has been very helpful for TARP, and will let investigators identify opportunities for funding, resource sharing, and potential for collaborations.

Though the field of cancer stem cells is new, it holds great promise, and NCI is committed to supporting new research in this area. ◆

Dr. John E. Niederhuber
Director, National Cancer Institute

Cancer Research Highlights

Brain Radiation Linked to Strokes in Childhood Cancer Survivors

Increased risk of stroke must now be added to the list of adverse late effects that are possible in survivors of childhood cancers who received high-dose cranial radiotherapy (CRT), according to new findings from the Childhood Cancer Survivors Study (CCSS) published online November 6 in the *Journal of Clinical Oncology*.

Lead author Dr. Daniel C. Bowers of the University of Texas Southwestern Medical Center at Dallas and colleagues used the longitudinal CCSS to assess risk of individuals treated as children for leukemia or brain tumors, compared with a control group of 3,846 siblings who did not have cancer as children.

Although strokes occurred in a small percentage of children surviving more than 5 years after treatment, the effect of CRT on this risk was significant. When radiation was directed at particular areas of the brain, the risk of stroke increased as the radiation dose increased. Chemotherapy had little effect on stroke risk in leukemia patients but more than doubled the risk in brain tumor patients who also had CRT.

The study found that childhood leukemia patients who received CRT were 6.4 times more likely to have a stroke than those in the control group, while brain tumor patients treated with CRT had a significantly larger risk of 29, compared with controls.

The authors conclude that this study "identifies a significantly increased incidence of stroke among long-term survivors of childhood leukemia and brain tumors. This study also identifies the use of CRT, in a dose-dependent fashion, as contributing to the increased risk of stroke, and justifies efforts to continue to reduce radiation doses among both leukemia and brain tumor treatment regimens whenever practical."

Public Awareness of HPV Link to Cervical Cancer Is Low

In 2005, before the approval of the human papillomavirus (HPV) vaccine, awareness among American women about HPV and its link to cervical cancer was low, according to an NCI study presented this week at the AACR Frontiers in Cancer Prevention meeting.

NCI scientists analyzed data collected from more than 3,000 women aged 18 to 75 who responded to the 2005 Health Information National Trends Survey (HINTS). The researchers found that only 40 percent had ever heard about HPV and less than half of those were aware of the virus' connection to cervical cancer. Awareness of HPV and cervical cancer was especially low among women who were older, less educated, or less exposed to health information.

Dr. Jasmin A. Tiro, an NCI Cancer Prevention Fellow who led the study, commented, "Our data also suggest that women learn about HPV after experiencing an abnormal Pap or positive HPV test. Clear, consistent information about HPV transmission, prevention, detection, and the link to cervical cancer needs to be provided before a woman becomes infected."

Media coverage and pharmaceutical marketing efforts for the HPV diagnostic test and the HPV vaccine "will likely increase awareness," Dr. Tiro predicted. "NCI is conducting studies to track the diffusion of knowledge to make sure that all women have accurate knowledge about HPV and how to prevent and detect cervical cancer early." Understanding HPV infection and its relationship to cervical cancer is needed to make appropriate, evidence-based health care choices among existing strategies, including the Pap test, HPV DNA test, and HPV vaccine, the researchers concluded.

New Therapeutic Targets Identified in Leukemia

A translocation between chromosomes 9 and 22, known as the Philadelphia chromosome, causes expression of a chimeric and constantly expressed form of the protein BCR-ABL. Aberrant expression of BCR-ABL in bone marrow cells leads to chronic myeloid leukemia (CML) and B cell acute lymphoblastic leukemia (B-ALL). The drug imatinib (Gleevec) inhibits BCR-ABL, and has become the standard of care for chronic-phase, Philadelphia chromosome-positive leukemias. However, imatinib cannot eliminate all leukemia cells expressing BCR-ABL, and many patients eventually develop resistance to the drug.

A new study published online November 7 in the *Proceedings of the National Academy of Sciences* shows that while imatinib inhibits BCR-ABL, it does not affect downstream proteins in the BCR-ABL signaling pathway called SRC kinases. Using

(continued on page 4)

(Highlights continued from page 3)
mouse models of CML and B-ALL, investigators from the Jackson Laboratory in Bar Harbor, Maine, determined that these SRC proteins may play an important part in the malignant transformation of cells in the bone marrow, contribute to disease progression, and allow leukemia cells to survive imatinib treatment until resistance develops. Treatment of mice with the drug dasatinib inhibited both BCR-ABL and SRC expression; this dual inhibition suppressed B-ALL and significantly prolonged survival of mice with CML. However, dasatinib was unable to completely kill residual leukemia cells.

The authors next identified sets of leukemia cells with stem-cell-like properties in mice with B-ALL and CML. These cells were not killed by either imatinib or dasatinib, and were capable of inducing leukemia when transplanted to healthy animals. While dasatinib may be effective in producing long-term remission, explained the authors, "identification of unknown pathways in CML stem cells will be critical for developing curative therapies for the disease."

Experimental Melanoma Drug Shows Early Promise

A drug containing parts of the diphtheria toxin may have benefited a small number of patients in the advanced stages of melanoma skin cancer. Five out of seven patients with stage IV disease experienced significant regression or stabilization of their tumors and the spread of cancer while taking the drug, according to preliminary findings from a phase II clinical trial.

The trial is testing the effectiveness of the experimental drug denileukin diftitox, also known as DAB(389)IL2 or ONTAK, for treating the deadly disease. The median life expectancy for patients with stage IV melanoma is normally about 8 months. All of the patients were still alive after 12 months. The two patients in whom the melanoma progressed were on a lower dose of the drug than the others.

The drug is thought to prompt the immune system to attack tumors by depleting a subset of regulatory T cells thought to directly suppress the activation of the antitumor T cells. Research in mice has suggested that if the regulatory T cells are depleted by targeting them with denileukin diftitox, then T cells in the immune system known as CD8+ T lymphocytes would be able to attack and kill melanoma cells.

Lead investigator Dr. Jason Chesney of the University of Louisville's Brown Cancer Center presented the preliminary findings November 9 at the Symposium on Molecular Targets and Cancer Therapeutics in Prague.

Oncolytic Virus Kills Malignant Glioma Cells

Canadian researchers have shown that an "oncolytic virus" they have developed is effective at infecting and killing malignant glioma cells, and targets the main tumor when administered intravenously. Oncolytic viruses are viruses that are engineered to infect and kill only cancer cells.

Dr. Peter Forsyth and colleagues of the University of Calgary tested the effects of recombinant vesicular stomatitis virus ($VSV^{\Delta M51}$), a mutant strain of vesicular stomatitis virus, on 14 human glioma cell lines, a glioma mouse model, and human tumor specimens. They also compared the effects of $VSV^{\Delta M51}$ with reovirus serotype 3, another oncolytic virus under investigation for the treatment of brain tumors, on human glioma cell lines.

(continued on page 7)

Funding Opportunities

Understanding and Promoting Health Literacy

Announcement Number: PAR-07-019
Letter of Intent Receipt Dates: April 24 and Dec. 24, 2007; Aug. 22, 2008; April 24, 2009; and Dec. 24, 2010.
Application Receipt Dates: May 24, 2007; Jan. 24 and Sept. 24, 2008; May 25, 2009; and Jan. 25, 2010.

This is a renewal of PAR-06-132 and will use the R03 award mechanism. For more information, see http://cri.nci.nih.gov/4abst.cfm?initiativeparfa_id=3551. Inquiries: Dr. Sabra F. Woolley—sabra_woolley@nih.gov

Image-Guided Cancer Interventions

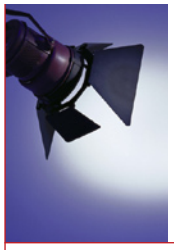
Announcement Number: PA-07-041
Application Receipt Dates: Dec. 1, 2006; April 1, Aug. 1, and Dec. 1, 2007; April 1, Aug. 1, and Dec. 1, 2008; April 1 and Aug. 1, 2009.

This is a renewal of PA-06-031 and will use the R41 and R42 award mechanisms. For more information, see http://cri.nci.nih.gov/4abst.cfm?initiativeparfa_id=3553. Inquiries: Dr. Keyvan Farahani—farahank@mail.nih.gov; Dr. Laurence P. Clark—lclarke@mail.nih.gov

Image-Guided Cancer Interventions

Announcement Number: PA-07-042
Application Receipt Dates: Dec. 1, 2006; April 1, Aug. 1, and Dec. 1, 2007; April 1, Aug. 1, and Dec. 1, 2008; April 1 and Aug. 1, 2009.

This is a renewal of PA-06-032 and will use the R43 and R44 award mechanisms. For more information, see http://cri.nci.nih.gov/4abst.cfm?initiativeparfa_id=3554. Inquiries: Dr. Keyvan Farahani—farahank@mail.nih.gov; Dr. Laurence P. Clarke—lclarke@mail.nih.gov ◆



Spotlight

Targeting Cancer and Monitoring the Heart

A surprise no one wants during the final stage of a clinical trial is to learn that a cancer drug can cause heart failure. But that is exactly what happened with the breast cancer drug trastuzumab (Herceptin).

The preclinical work and early phase I trials did not turn up any signs of cardiac side effects. Yet, as so often happens, a rare toxicity—in this case congestive heart failure—was discovered when more people took the drug.

Heart failure was first reported in the late 1990s during the definitive trials involving women with metastatic breast cancer, and it occurred most often in women also taking doxorubicin. All subsequent trials have included careful cardiac monitoring.

Today, the risks are measured against the enormous potential benefits. Trastuzumab has helped many women with HER2-positive breast cancer survive their disease and, when used in the adjuvant setting, it reduces the risk of recurrence by half.

"We have to be very cautious in administering the drug, and we have to be very cautious in not administering it, because the benefits for some patients are astonishing," says Dr. Daniel Hayes, director of the Breast Oncology Program at the University of Michigan Comprehensive Cancer Center.

This assessment may apply to other "targeted" cancer therapies as well. Drugs such as bevacizumab (Avastin), sunitinib (Sutent), imatinib (Gleevec), and dasatinib (Sprycel) are effective but may slightly increase the risk of heart failure, and this has raised concerns.

In articles and at scientific meetings, oncologists and cardiologists have called for rigorous evaluations of cardiac side effects early in drug development, and for careful monitoring of cardiac health throughout clinical testing.

"We need to be vigilant for toxicities, and any emerging toxicities need to be balanced with the benefit that's seen for these drugs," says Dr. Walter Stadler of the University of Chicago, who treats prostate and kidney cancers.

The emergence of targeted drugs, he suggests, may force clinicians to relearn treatments for a new set of toxicities, such as hypertension, that previously had not been relevant.

What has changed, of course, are the targets. Unlike traditional chemotherapy drugs, these therapies mainly inhibit proteins involved in angiogenesis—the growth of blood vessels—and proteins that transmit signals within cells called tyrosine kinases.

Virtually all of the proteins are present in both normal cells and cancer cells.

The genetic similarity between normal cells and cancer cells all but guarantees that interventions will have some effects in normal tissues, according to Dr. Gabriel Hortobagyi, who chairs the Department of Breast Medical Oncology at the University of Texas M.D. Anderson Cancer Center.

"None of these targeted agents has a single and absolutely specific activity, and that clarification needs to go out to the public and to our colleagues in medicine," says Dr. Hortobagyi, who is also president of the American Society of Clinical Oncology (ASCO).

"We have been talking about these drugs as though they have no toxicities at all," he continues. "In this exciting time of targeted therapies, we need to be clear that we still don't have free lunches."

People in the field are aware of the problem, and most clinical trials are looking for signs of heart failure, notes Dr. Sandra M. Swain, an investigator in NCI's Medical Oncology Branch who is planning breast cancer clinical trials.

Candidates for the drugs are routinely screened for health conditions that increase the risk of cardiac toxicities, such as diabetes and high blood pressure.

Most cases of heart failure caused by trastuzumab are treatable, but the long-term consequences for patients who experience heart failure are not known. Nor is it known how long patients treated for heart failure will need to take heart medications.

Another common question is whether all tyrosine kinase inhibitors have cardiac toxicities. No one knows the answer, but some experts say that each drug has different targets and will need to be evaluated individually.

"We have to do the studies to understand targeted drugs better so we can

(Spotlight continued on page 6)

(Spotlight continued from page 5)
treat patients in a safe way," says Dr. Arthur Feldman, a cardiologist and chair of the Department of Medicine at Jefferson Medical College. "Right now we don't have the data."

To get answers, oncologists need to reach out "pretty aggressively" to cardiologists and involve them early in clinical trials as a way to ensure that the right kinds of cardiac evaluations are done in these patients, he says.

In this spirit of cooperation, cardiologists and oncologists recently met in Houston to discuss ways to eliminate cardiovascular disease as a barrier to treatment for cancer. Chemotherapy was the focus, but targeted drugs were discussed.

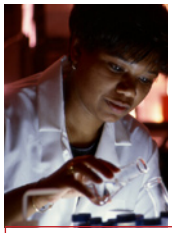
"We think the future looks really bright for these drugs, but the way we deliver them is going to require teamwork," says co-organizer Dr. Jean-Bernard Durand of the Cardiomyopathy Service at M.D. Anderson.

"Good medical management with drugs already approved by the FDA for heart failure may solve a number of these issues," he adds.

The meeting was the first initiative of CONQUER (Cardiology Oncology International Quest to Educate and Research Heart Failure). The presidents of ASCO and the Heart Failure Society of America both participated.

"The issues of efficacy and toxicity go hand in hand," says Dr. Hortobagyi. "The best we can do is to assume that toxicities are going to occur and take all of the proper precautions without slowing down progress." ◆

By Edward R. Winstead



Featured Clinical Trial

Treatment Based on Colorectal Tumor Protein Level

Name of the Trial
Phase II Study of Treatment Selection Based upon Tumor Thymidylate Synthase Expression in Previously Untreated Patients with Metastatic Colorectal Cancer (ECOG-E4203). See the protocol summary at http://cancer.gov/clinicaltrials/ECOG-E4203.

Principal Investigators
Dr. Neal J. Meropol and Dr. Jean Grem, Eastern Cooperative Oncology Group

Dr. Neal Meropol

Why This Trial Is Important
A number of treatments for metastatic colorectal cancer have been approved over the past few years, but doctors want to determine which treatments will work best in individual patients.

The drug fluorouracil (5-FU) is often used to treat colorectal cancer; however, previous clinical studies suggest that tumors with a high level of the protein thymidylate synthase (TS) are more likely to be resistant to 5-FU treatment.

In this trial, researchers will measure the level of TS in the tumors of patients with metastatic colorectal cancer. Patients whose tumors show a low level of TS will be treated with combination chemotherapy consisting of 5-FU, leucovorin calcium, and oxaliplatin (the so-called "FOLFOX" regimen) plus the monoclonal antibody bevacizumab. Patients whose tumors show a high level of TS will be treated either with the same drug combination plus bevacizumab or with an investigational combination of the drugs oxaliplatin and irinotecan plus bevacizumab. Researchers want to determine whether replacing 5-FU and leucovorin calcium with irinotecan will lead to better response rates and survival in these patients.

"As the array of treatments for metastatic colorectal cancer expands, it's important to match specific treatments with those patients who are most likely to benefit from them," said Dr. Meropol. "This is the first national study for patients with metastatic colorectal cancer to prospectively assign treatment based on the molecular characteristics of the tumor."

Who Can Join This Trial
Researchers will enroll 246 patients with metastatic or locally recurrent colorectal cancer. See the list of eligibility criteria at http://www.cancer.gov/clinicaltrials/ECOG-E4203. This clinical trial is eligible for special Medicare coverage.

Study Sites and Contact Information
Study sites in the United States are recruiting patients for this trial. See the list of study contacts at http://cancer.gov/clinicaltrials or call NCI's Cancer Information Service at 1-800-4-CANCER (1-800-422-6237) for more information. The toll-free call is confidential. ◆

An archive of "Featured Clinical Trial" columns is available at http://cancer.gov/clinicaltrials/ft-all-featured-trials.

Notes

President's Cancer Panel Examines Cancer Risk

The President's Cancer Panel is holding a series of meetings on "Promoting Healthy Lifestyles to Reduce the Risk of Cancer." The second meeting in the series was held October 23 in Lexington, Ky. Panelists presented testimony on the effect of tobacco and environmental tobacco smoke on cancer risk and on effective programs and policies to combat the problem throughout the United States.

The next meeting will take place on December 5 in Portland, Ore., where the Panel will hear testimony on how obesity, physical activity, and nutrition affect cancer risk.

Meetings of the President's Cancer Panel are free, open to the public, and require no registration. More information is available online about the Panel and these meetings at http://pcp.cancer.gov.

Great American Smokeout Promotes Smoking Cessation

On November 16, the American Cancer Society's Great American Smokeout will challenge people to quit smoking and raise awareness about different methods of smoking cessation. For more than 30 years, the Smokeout has been a signature national event encouraging individuals to give up cigarettes. Events are held across the country on the third Thursday of November, including rallies, parades, stunts, quitting information, and "cold turkey" menu items in schools, workplaces, main streets, and legislative halls.

An estimated 46 million adults in the United States currently smoke, and about half will die prematurely from smoking. Cigarette smoking causes 87 percent of lung cancer deaths. Information on the Smokeout is available at http://www.cancer.org/docroot/PED/ped_10_4.asp. Information about quitting smoking is available at www.smokefree.gov.

NCI Scientists Recognized for HPV Vaccine Development

On November 16, Drs. Douglas Lowy and John Schiller of the Laboratory of Cellular Oncology in NCI's Center for Cancer Research will receive the David Workman Memorial Award from the Samuel Waxman Cancer Research Foundation of Mount Sinai Medical Center in New York City. The scientists are being honored for their research, which resulted in the clinical development of a vaccine for human papillomavirus (HPV). The David Workman Memorial Award recognizes the application of science for the development of a new treatment for a poorly treatable form of cancer.

Pancreatic Cancer Awareness in November

On September 25, the U.S. House of Representatives passed a resolution designating November as Pancreatic Cancer Awareness Month. Information on pancreatic cancer can be found at http://www.cancer.gov/cancertopics/types/pancreatic. ◆

(Study continued from page 2)

rithms used to analyze the data must also be validated, he added.

"The validation steps will be crucial to determine whether these initial exciting results hold up," said Dr. Teri Brentnall, a researcher at the University of Washington Medical Center, who also is doing work in this area. ◆

By Carmen Phillips, with additional reporting by Heather Maisey

CCR Grand Rounds

November 21: Dr. Donald P. Bottaro, Senior Scientist, Urologic Oncology Branch, Center for Cancer Research, NCI. "The Role of Hepatocyte Growth Factor Signaling in Renal Cancer."

November 28: Dr. Kenneth W. Kinzler, Professor of Oncology, The Sidney Kimmel Comprehensive Cancer Center, Johns Hopkins University School of Medicine. "Cancer Genomes: Discovery and Applications."

CCR Grand Rounds are held 8:30 to 9:30 a.m. at the NIH campus in Bethesda, Md., in the Clinical Center's Lipsett Amphitheater. ◆

(Highlights continued from page 4)

The study, published in the November 1 *Journal of the National Cancer Institute*, found that all 14 glioma cell lines were susceptible to infection and killing by $VSV^{\Delta M51}$, while only 12 of the lines were susceptible to infection and killing by reovirus serotype 3. Neither $VSV^{\Delta M51}$ nor reovirus serotype 3 had an effect on the normal cell lines. Mice that received live $VSV^{\Delta M51}$ intravenously had improved survival compared with mice that received dead $VSV^{\Delta M51}$ intravenously. The virus also infected both multifocal glioma cells and invasive glioma cells.

The ideal oncolytic virus for cancer "should have effective delivery into multiple sites within the tumor, evade innate and acquired immune responses, produce rapid viral replication, spread within the tumor, and infect multifocal tumors," the authors wrote. "This is precisely what we found using the attenuated live virus we constructed ($VSV^{\Delta M51}$)." ◆

Community Update

Innovative e-Health Products Enhance Communication

From video games for children with cancer to Internet search engines for physicians, innovative e-health communication products are being developed with support from NCI's Multimedia Technology and Health Communication Small Business Innovation Research and Technology Transfer Research Grant (SBIR/STTR) program.

"When the program started, the products were primarily videos," says Connie Dresser, program director. "Products now include interactive CD-ROMs, Web-based educational and training resources, communication systems, wireless technology products, and radio programs targeted to both consumers and health care professionals.

"The products cover a wide range of topics, with tobacco prevention and cessation products currently taking up a third of the portfolio," Ms. Dresser continues. "All of the products are cancer related, but grantees are encouraged to develop models that can be used for other chronic diseases."

Housed in the Health Communication and Informatics Research Branch in the Division of Cancer Control and Population Sciences (DCCPS), the program has produced about 84 e-health products since 1992, and Ms. Dresser estimates that 60 percent of them have been brought to market. Many products have received awards, including World Wide Web Health Awards, Eddie Awards for Educational Technology, and Technology Games Awards. A video for men diagnosed with prostate cancer aired on PBS–TV and was nominated for an Emmy award.

DCCPS develops categories for SBIR/STTR grant applications annually to address gaps in e-health research. In 2006, the program focused on collaborations with public health professionals to promote positive dietary changes, programs to enhance people's awareness of their responsibility for preventing or managing chronic diseases, systems for capturing family health histories, and wireless technologies for collecting and integrating patient informatics.

"This SBIR program includes requirements designed to offer the best chance for a product's success, including rigorous review and evaluation processes," says Ms. Dresser. "While follow-up of products isn't a requirement, we feel it's important to monitor commercial success after the grant is ended to let grantees and contractors know that NCI expects the companies to succeed." ◆

Products Funded through the SBIR/STTR Program

Products for Health Care Professionals

Cancer Pain Decision Support System: Wireless program for personal digital assistants that provides an algorithmic approach to pain management

Palliative Care Training Program for Caregivers: Multimedia program focusing on improving function, managing symptoms, and enhancing quality of life

Healia: Internet search engine designed to help physicians quickly find peer-reviewed cancer information

Products for the Public

LifeSign for Nicotine Patch: Hand-held computer that provides a 4-week structured approach to reducing smoking; designed as a companion to the nicotine patch

Kidz with Leukemia: A Space Adventure: CD-ROM with audio and video, three-dimensional graphics, animation, puzzles, and games; separate modules for 4- to 6-year-olds and 7- to 11-year-olds

@neWorld: Virtual community for children undergoing cancer treatment, enabling them to make contact and play games with other children with cancer ◆

The *NCI Cancer Bulletin* is produced by the National Cancer Institute (NCI). NCI, which was established in 1937, leads the national effort to eliminate the suffering and death due to cancer. Through basic, clinical, and population-based biomedical research and training, NCI conducts and supports research that will lead to a future in which we can identify the environmental and genetic causes of cancer, prevent cancer before it starts, identify cancers that do develop at the earliest stage, eliminate cancers through innovative treatment interventions, and biologically control those cancers that we cannot eliminate so they become manageable, chronic diseases.

For more information on cancer, call 1-800-4-CANCER or visit http://www.cancer.gov. Contact the *NCI Cancer Bulletin* staff at ncicancerbulletin@mail.nih.gov.