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Cancer Stem Cells Detected in Colon Tumors

Two teams of researchers have detected cancer stem cells in tumors from patients with colon cancer. When transplanted into mice, the cancer stem cells were able to form tumors that resembled the originals in patients, while most tumor cells could not.

Colon cancer is the latest type of cancer linked to these rare cells, which were first found in acute myeloid leukemia in 1994 and more recently in breast and brain tumors. The findings appeared online in two studies in *Nature* November 19.

Some researchers believe cancer stem cells are the driving force behind many cancers and will be found in nearly all tumors as the technology for finding them improves. The new studies, from investigators in Canada and in Italy, support this view.

"Our findings say that colon tumors are initiated and driven by this rare fraction of cells," says Dr. John Dick of the University of Toronto, who led the Canadian team. He also led the team that discovered leukemia stem cells in 1994.

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Director's Update

All Ireland-NCI Consortium Rolls On

Approximately 2 years ago, in a special issue of the *NCI Cancer Bulletin*, there was a photo of Dr. Joe Harford, head of the NCI Office of International Affairs, with several dignitaries, holding a scale model of a new cancer research facility to be built in Belfast, Northern Ireland. About 2 weeks ago, I had the opportunity to tour the newly constructed facility, the Centre for Cancer Research and Cell Biology (CCRCB) on the campus of Queen's University Belfast.

The construction of this state-of-the-art facility, which is scheduled to be completely open early next year, could not have happened without the support of the Ireland-Northern Ireland-NCI Cancer Consortium, which is now entering its seventh year and is helping to transform cancer research and care across the island of Ireland.

My tour of the CCRCB was led by Professor Paddy Johnston, the center director, and coincided with my participation in the third All Ireland Cancer Conference and the signing of a new Memorandum of Understanding that will keep the consortium operating another 5 years.

The conference was invigorating and enlightening. For me, it highlighted the tremendous progress being made

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In the new study, he asked: Do all of the tumor cells in colon cancers have the same ability to initiate new tumors and sustain their growth? The answer turned out to be no—only a subset of the tumor cells that produce a surface protein called CD133 could initiate new tumors in mice.

The results suggest that colon cancer may be organized in the same hierarchical fashion as organs are, with stem cells giving rise to "progenitor" cells that give rise to more specialized cells, says Dr. Dick.

Like the normal stem cells that repopulate adult tissues, cancer stem cells may divide indefinitely while giving rise to the cell types of a tumor. For therapies to be effective, it thus appears likely that they will have to eradicate the cancer stem cells.

But these cells have developed ways to avoid being killed. For instance, the cells may enter a dormant phase as some leukemia cancer stem cells do, notes Dr. Dick.

The Italian team, led by Dr. Ruggero De Maria of the Istituto Superiore di Sanità in Rome, also used the protein CD133 as a marker for identifying potential cancer stem cells. About 2.5 percent of the colon tumor cells they tested were positive for CD133.

This protein appears to be present on many cancer stem cells, but not every cell that is positive for CD133 is a cancer stem cell. As a next step, the Italian researchers are testing additional markers that might lead them to individual cancer stem cells.

"We are also setting up a cancer stem cell bank from different tumors," says Dr. De Maria. "We hope that the availability of cultures of tumor-causing colon cancer cells may foster the development of more effective therapies."

The appearance of two independent studies with similar conclusions serves as "instant validation of the questions at hand," says Dr. Jeremy Rich of Duke University Medical Center, who was not involved in the research.

Last month, his team reported that cancer stem cells in the brains of patients with glioblastoma may be resistant to radiation. Some observations about the behavior of colon cancer stem cells appear strikingly similar to what has been seen in the brain, he notes.

"This really suggests that cancer biology is, at its core, more similar than dissimilar, and this has important implications for therapy," says Dr. Rich. ◆

By Edward R. Winstead

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on the island of Ireland to overhaul its cancer research and care infrastructure - progress in which the consortium had a heavy hand.

The consortium's value, however, extends well beyond the success it has experienced in its short existence and its impact on patient care. It can serve as a model for countries that are committed to more aggressively addressing the public health burden of cancer. It's also an ideal example of the impact NCI is having beyond our country's borders.

Through the consortium, NCI has provided extensive training to clinicians and scientists from Ireland and Northern Ireland. More than 100 have participated in NCI's Cancer Prevention Summer Curriculum or NCI's 3-year Cancer Prevention Fellowship program. In addition, 16 nurses have been trained at NCI in clinical trials management and cancer care.

These nurses already are playing a crucial role in a revitalized clinical trials program on the island. Thanks to the efforts of the consortium's Clinical Trials Working Group, for instance, the All Ireland Clinical Trials Cooperative Group has been established, and it is actively collaborating with similar groups in Europe and the United States. In fact, several Irish patients are participating in a National Surgical Adjuvant Breast and Bowel Project-led phase III colorectal cancer treatment trial.

Also, the development of a national TELESYNERGY® program continues to progress. This integrated telecommunication system will allow clinicians at large medical centers to consult with and advise clinicians caring for patients in more remote parts of the country.

Meanwhile, work done by the consortium's Cancer Registries/ Epidemiology Working Group has led to collaborative studies using existing cancer registries in the north and south, including the FINBAR study, which is focused on the etiology of esophageal cancer and has already resulted in several published papers.

These efforts represent just a sampling of the consortium-related activities. It's almost impossible not to feel a tremendous sense of optimism from what's been accomplished to date. Perhaps most impressive to me has been the successful public smoking ban in Ireland and a similar forthcoming ban in Northern Ireland, both of which provide undeniable momentum toward reducing the burden of cancer.

As NCI forges ahead in our commitment to addressing the cancer burden worldwide, we can look to the All Ireland-NCI Consortium for proof that we should expect nothing less than progress on this front. ◆

Dr. John E. Niederhuber
Director, National Cancer Institute

Cancer Research Highlights

Eye-Sparing Method Effective for Ocular Melanoma Diagnosis

A study published online November 15 in *Ophthalmology* found that use of fine-needle aspiration biopsy of the eye was a generally safe and effective means to obtain cells for genetic analysis from patients with ocular melanoma to determine whether they are at risk for metastatic spread of the disease.

Each of 18 patients at the University of California, Los Angeles' Jules Stein Eye Institute had the needle biopsy done during surgery to implant a radioactive plaque in the affected eye for localized radiation, which is the standard treatment of choroidal melanoma. It has been shown that patients with mutations in chromosome 3 (monosomy 3) are at high risk for metastatic spread, which has a poor prognosis. Until now, the only method for obtaining tumor cells for such genetic analysis involved removing the eye.

The researchers reported that the needle biopsy technique "was diagnostic of choroidal melanoma in 14 of 18 cases and resulted in viable cell cultures for fluorescent *in situ* hybridization (FISH) analysis in 9 cases." The genetic analysis for monosomy 3 was positive in four of the nine cases. "These findings are consistent with reports in the literature of an approximately 50 percent rate of monosomy 3 in choroidal melanoma," they noted.

"In our series, we observed only one complication: a patient developed a mild self-limited vitreous hemorrhage," the researchers reported. Identification of ocular melanoma patients with a poor prognosis may allow for the detection of metastasis at an earlier stage and will help select those best suited for clinical trials on new treatments, they added.

Nanoparticles Successfully Deliver Drugs to Brain Tumors in Mice

In a new study from the University of Michigan published in the November 15 *Clinical Cancer Research*, investigators designed targeted nanoparticles that successfully carried a photodynamic therapy compound to brain tumors in a mouse model, bypassing the blood-brain barrier.

The researchers designed the nanoparticles to bind to the cell-surface protein F3 because previous studies had shown that substances bound to this protein are taken up by cancer cells and their associated blood vessels. The nanoparticles were engineered to carry the photodynamic therapy drug Photofrin, which reacts with oxygen in the presence of light to form toxic compounds. The addition of a magnetic resonance imaging compound to the nanoparticles allowed the investigators to directly observe destruction of tumor tissue and blood vessels.

In vitro experiments showed that nanoparticles targeted to F3 were successfully taken up by cancer cells, and 4 hours of incubation with the nanoparticles caused the death of 90 percent of cells in culture when combined with exposure to laser light (to activate the encapsulated Photofrin). Nontargeted nanoparticles did not cause cell death under the same conditions.

Investigators then tested the nanoparticles in a mouse model of glioma, the most common type of brain tumor. Mice with xenograft tumors receiving targeted nanoparticles and laser exposure survived significantly longer than mice receiving either nontargeted nanoparticles or free Photofrin with laser exposure. Two out of five animals receiving the targeted nanoparticles remained disease free 6 months after treatment.

Targeted nanoparticles could potentially circumvent many problems with systemic delivery of photodynamic drugs, explained the authors, including damage to normal tissue and long-lasting skin sensitivity to light.

Risks Identified for New Solid Cancer after Stem Cell Transplants

Older patients who receive a stem cell transplant for blood cancer are at increased risk of developing a new solid cancer years after the transplant and patients who receive stem cells from a female donor are at even higher risk, according to a study in the November 27 online issue of *Cancer*.

The study was performed by the Leukemia/Bone Marrow Transplantation Program of British Columbia, which operates out of Vancouver General Hospital. Records were analyzed for 926 patients who had been treated at the hospital with allogeneic stem cell transplantation between 1985 and 2003. The median age of these patients was 39 years, ranging from 12 to 65 years.

The analysis showed that 10-year risk of recurrence-related mortality was 27 percent. Twenty-eight patients—

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all of whom received myeloablative preparation prior to their transplant—developed a total of 30 solid tumors after their procedure, most often in the skin, lungs, and mouth. The cumulative incidence in the study group of developing a second solid cancer 10 years after the initial treatment was 3.1 percent, nearly twice that of the general population in British Columbia.

Those younger than 40 had a second-cancer risk of 1.9 percent, versus 4.6 percent for those over 40. The sex of the stem cell donor was also a significant risk factor: 4.6 percent for female donors and 1.8 percent for male donors. "This observation [of donor sex and cancer recurrence] has not been reported previously in the literature," the authors wrote, "and its explanation is uncertain."

Study Suggests Survival Benefit for Tamoxifen-Anastrozole Combo

A meta-analysis that combined data from three randomized clinical trials indicates that, for postmenopausal women with hormone-sensitive early-stage breast cancer, switching to the aromatase inhibitor anastrozole (Arimidex) for adjuvant treatment after 2 to 3 years on tamoxifen significantly improves overall survival.

Each trial had compared a group of women who took tamoxifen for 5 years with a group who, after 2 to 3 years on tamoxifen, had switched to anastrozole for 2 years. Switching resulted in fewer cases of local or metastatic recurrence of disease and fewer cancer deaths. With the exception of bone fracture risk, it also had a better safety profile.

The question for researchers conducting the meta-analysis was whether improved event-free survival from the tamoxifen-anastrozole combination translated into better overall survival. The meta-analysis revealed that patients whose treatment included a switch to anastrozole after 2 to 3 years of tamoxifen had a 29 percent improvement in overall survival.

"A lot of people have been waiting to see whether aromatase inhibitors will show a survival advantage, and I think these data will assure them that 5 years of tamoxifen is no longer the standard of care," said the study's leader, Dr. Walter Jonat, of the University of Kiel in Germany, in a news release. "The best treatment for women with hormone-sensitive early-stage breast cancer should include an aromatase inhibitor."

The results of the study, released early online by *The Lancet Oncology* on November 17, reinforce recommendations from several professional oncology groups with regard to the treatment of this patient population. They also reflect what is already happening in clinical practice, explained Dr. Jennifer Eng-Wong of the NCI Center for Cancer Research (CCR) Medical Oncology Branch.

"Most clinicians are incorporating aromatase inhibitors into treatment," she said, "either starting adjuvant therapy with them or switching to them after 2 to 3 years of tamoxifen." ◆

FDA Update

FDA Expands Use of Herceptin for Early-Stage Breast Cancer After Primary Therapy

On November 15, the FDA expanded the approved use of trastuzumab (Herceptin) for the treatment of HER2-positive breast cancer after lumpectomy or mastectomy.

Trastuzumab is a targeted therapy against the HER2 protein on cancer cells. When an excessive amount of HER2 protein is present, it causes cancer cells to grow more rapidly and standard chemotherapy may be less effective. In 1998, the FDA approved trastuzumab for the treatment of metastatic breast cancer. This approval expands its use to women with cancer only in the breast or lymph nodes which has been removed with surgery. Additional information about trastuzumab is available at http://www.cancer.gov/cancertopics/druginfo/fda-trastuzumab.

The two studies leading to this new approved indication were conducted by the NCI-sponsored Cooperative Groups, a multicenter clinical trials group. Patients in both trials received standard chemotherapy after surgery for breast cancer; approximately half the patients were also given trastuzumab. The results from both trials, which included information on nearly 4,000 women, were combined and analyzed in 2005.

Due to positive results, NCI ended the studies early. The results showed that women who received trastuzumab combined with chemotherapy had fewer relapses for up to 3 years after surgery. The estimated 3-year disease-free rates were 87 percent in women receiving trastuzumab and chemotherapy and 75 percent in those receiving chemotherapy alone. It is too soon to know whether trastuzumab combined with chemotherapy will increase the cure rate or lower the risk of death from breast cancer. ◆

Spotlight

Giving Cancer an Energy Blackout

In the 1920s, the German researcher Dr. Otto Warburg discovered that cancer cells rely heavily on a process known as glycolysis to produce energy.

Dr. Warburg, a Nobel Prize winner, also found that cancer cells did this even when there was sufficient oxygen available for a far more efficient, oxygen-dependent energy-production process used by many normal cells, called oxidative phosphorylation. The paradox came to be known as the "Warburg effect."

Dr. Warburg believed that this "aerobic glycolysis" was at the root of cancer development, but his theory never caught on.

Over the last decade, however, there has been a resurgence of interest in learning more about cancer cell metabolism—how cancer cells produce energy and use it to grow and divide.

Cancer cell metabolism hasn't traditionally been "considered as part of the cancer problem," says Dr. Craig Thompson, scientific director at the Abramson Family Cancer Research Institute. But the renewed interest in it, he believes, "gives us a number of new avenues to investigate to see whether it can be exploited for therapeutic benefit."

And Dr. Thompson isn't the only one. A growing cadre of researchers is now delving deep into cancer cells' energy-production machinery, with the hope of finding effective ways to short-circuit it.

Tumor cells' glucose problem

The renewed focus on energy production and Warburg's discoveries from 80 years ago is an ideal case in point.

"More and more, multiple groups are looking at the molecular mechanisms behind the Warburg effect, because it's consistently observed in tumor cells," says Dr. Peng Huang, an associate professor of molecular pathology at the University of Texas M.D. Anderson Cancer Center. "Certainly, in both cell culture and animal models, we see the cancer cells' increased dependence on glycolysis."

Both glycolysis and oxidative phosphorylation begin with the ingestion of glucose by a cell. The difference resides in how the cell transforms that raw material into energy—in the form of a complex molecule called ATP—and the efficiency with which it does it. Oxidative phosphorylation can produce as much as 18 times more ATP per molecule of glucose than glycolysis.

This inefficiency leads tumor cells that are reliant on glycolysis to take up a tremendous amount of glucose. This reliance forms the basis for the now widespread use of PET scans that involve the glucose analog FDG for the detection of a number of different cancer types.

Researchers like Drs. Huang and Thompson believe tumor cells' addiction to glycolysis might represent a bona fide Achilles heel: Disrupt glycolysis and tumor cells won't be able to produce enough energy to survive. Data from laboratory and animal model studies support this belief.

But the question remains: Why do tumor cells rely on a less efficient energy-production process when they don't have to?

"It's still a matter of debate," says Dr. Huang.

Several theories have been proposed to explain this. One suggests that genetic mutations have damaged the tumor cells' mitochondria, where oxidative phosphorylation takes place, so the cell switches to an alternative energy-production pathway. Another argues that it's an adaptation that gives the cell a survival advantage once a tumor becomes larger and oxygen—but not necessarily glucose—becomes far less abundant.

Dr. Thompson admits that it's complicated and requires more intensive study.

"We need to look more closely at issues like which signaling pathways tumor cells are using when they just want to survive for the day, or if they want to engage in growth and proliferation," he says.

Mucking up the machinery

Efforts to exploit this potential tumor cell weakness are moving ahead full steam, with glycolytic inhibitors already in human clinical trials or headed in that direction.

One company, Threshold Pharmaceuticals, has based its entire therapeutic enterprise on what they call "metabolic targeting." Two of its products are currently in clinical trials, including 2DG, a glucose analog

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being investigated in combination with docetaxel in a phase I trial.

Because tumor cells are so hungry for glucose—particularly those that are in hypoxic regions of a tumor and are more likely to be resistant to standard chemotherapy agents—2DG is readily taken up by tumor cells, says the scientist who developed it, Dr. Ted Lampidis.

Once inside, explains Dr. Lampidis, a professor of cell biology at the University of Miami Sylvester Cancer Center, the agent competes with regular glucose to be synthesized into ATP. However, because of the slight difference in 2DG's makeup compared with glucose, that synthesis never happens, starving the cell of energy.

"We've made tremendous progress from developing the concept of 2DG to getting it into the clinic," he says. "I see now that there's a real possibility it's going to work."

The phase I trial is almost complete and plans are under way to launch a phase II trial.

Another agent, 3-BrPA, completely eradicated large, highly glycolytic tumors in one animal model and markedly shrank similar tumors in another model. The agent's target, explains Dr. Peter Pedersen, a professor of biological chemistry at the Johns Hopkins University School of Medicine—who along with Dr. Young Ko, is moving it through preclinical studies—is an enzyme called hexokinase that is bound to the surface of mitochondria but plays a key role in both glycolysis and oxidative phosphorylation. Dr. Ko, who discovered the agent's potent anticancer activity, calls 3-BrPA a "total energy blocker."

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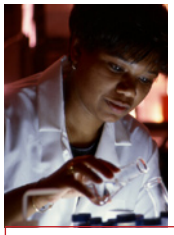

Featured Clinical Trial

Zactima for Recurrent or Progressive Brain Tumors

Name of the Trial
Phase I/II Study of ZD6474 in Patients with Recurrent High-Grade or Progressive Low-Grade Gliomas. See the protocol summary at http://www.cancer.gov/clinicaltrials/NCI-06-C-0063.

Principal Investigator
Dr. Howard Fine, NCI CCR

Dr. Howard Fine

Why This Trial Is Important
Malignant glioma, the most common type of brain tumor, relies on the formation of new blood vessels to maintain its growth and to invade nearby tissue. Consequently, researchers are exploring the use of antiangiogenic agents—drugs that stop the growth of new blood vessels—to treat malignant gliomas.

A new drug called Zactima (ZD6474) targets both blood vessel growth and tumor cells themselves. "It binds to two key molecular targets, one on the tumor (EGFR) and one on blood vessels (VEGFR)," explained Dr. Fine. This disrupts cell-signaling pathways that the cancer cells need to grow and survive. Other drugs for malignant glioma may bind to one or the other of these targets, said Dr. Fine, but "we hope hitting them both together will increase [antitumor] activity."

Many patients with malignant glioma take a type of drug called an enzyme-inducing anti-epileptic drug (EIAED) to help control cancer-induced seizures. Patients taking EIAEDs need higher doses of Zactima because EIAEDs cause Zactima to be processed faster by the body. The phase I part of this trial will determine the dose of Zactima required for patients taking EIAEDs. The phase II part will enroll patients not taking EIAEDs, and will look at Zactima's antitumor activity.

Preliminary results of the trial have been promising, said Dr. Fine. "We've already seen signs of significant biologic activity and some tumor shrinkage. Though not in every patient, we're definitely seeing some very profound effects."

Who Can Join This Trial
Ninety-four patients with recurrent or progressive high-grade glioma who have had prior surgery and radiation therapy will be enrolled in the trial. Patients with low-grade glioma or infiltrative brain stem glioma may be eligible for the phase I part of the trial. See the list of eligibility criteria at http://www.cancer.gov/clinicaltrials/NCI-06-C-0063.

Study Site and Contact Information
The study is taking place at the NIH Clinical Center in Bethesda, Md. For more information, call the NCI Clinical Studies Support Center at 1-888-NCI-1937. The toll-free call is completely confidential. ◆

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

Notes

NIH Grants Must Be Submitted Electronically

For the February 5, 2007, R01 receipt date and beyond, NIH will require electronic application submission for all R01 applications. This change will involve the simultaneous shift from the long-used PHS 398 application form to a transagency Standard Form 424 Research and Related Application Form. For more information on electronic submission of applications, go to http://era.nih.gov/ElectronicReceipt/.

Investigators should work with their central grants offices to learn how their institutions are handling the changes. Training sessions will be held on December 5 from 9:00 a.m.–12:00 p.m. and from 1:00–4:00 p.m. in the Natcher Conference Center on the NIH campus. The sessions will be webcast at http://era.nih.gov/training/esub_120506/ and will be archived for later viewing at http://videocast.nih.gov/default.asp. Additional training resources are available at http://era.nih.gov/ElectronicReceipt/training.htm.

CCR Grand Rounds

December 5: Dr. J. Silvio Gutkind, Chief, Oral and Pharyngeal Cancer Branch, National Institute of Dental and Craniofacial Research, NIH. "Head and Neck Cancer and Signaling Networks: Novel Mechanism-Based Therapies."

December 12: Dr. Mark Cushman, Professor of Medicinal Chemistry, Department of Medicinal Chemistry and Molecular Pharmacology, Purdue University; and Dr. Yves Pommier, Chief, Laboratory of Molecular Pharmacology, CCR, NCI. "Synthesis and Evaluation of Indenoisoquinoline Non-Camptothecin Topoisomerase I Inhibitors: an NCI Intra- and Extra-mural Partnership."

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. ◆

AMA to Hold Meetings at Smoke-Free Sites

At its semiannual policy making meeting on November 13, the American Medical Association (AMA) adopted a policy that calls for all AMA meetings and conferences to be held in communities and states that have enacted comprehensive legislation requiring smoke-free worksites and public places, including restaurants and bars. The AMA also called on other medical organizations to adopt similar policies.

Earlier this year, NCI adopted a smoke-free meeting site policy, which will take effect on January 1, 2007, requiring that all meetings and conferences organized or primarily sponsored by NCI be held in a state, county, city, or town that has adopted a comprehensive smoke-free policy.

DNA Sequencing Centers to Examine Cancer

On November 20, the National Human Genome Research Institute (NHGRI) announced the selection of three large-scale genetic sequencing centers, strengthening efforts to use the power of DNA sequencing to unlock the genomic secrets of human diseases. All three sequencing centers will devote a significant part of their efforts to The Cancer Genome Atlas (TCGA) Pilot Project, a joint initiative of NCI and NHGRI, which is testing the feasibility of a large-scale, systematic approach to identify important genomic changes involved in cancer. The three centers are the Broad Institute of the Massachusetts Institute of Technology and Harvard University; Washington University Genome Sequencing Center, Washington University School of Medicine; and the Human Genome Sequencing Center, Baylor College of Medicine. ◆

NCI Funding Opportunities

For a complete listing of current NCI funding opportunities, please go to the HTML version of today's *NCI Cancer Bulletin* at http://www.cancer.gov/ncicancerbulletin/NCI_Cancer_Bulletin_112806/page9 ◆

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Most recently, they've been investigating 3-BrPA's effect on different cancer cell lines.

"Once inside [the tumor cell], it's like a Trojan horse," Dr. Pedersen explains. "You see dissipation of ATP very quickly. But if you do the same thing to a hepatocyte [an important and abundant liver cell], for example, it hardly has any effect."

A number of companies have approached Dr. Petersen's lab about taking 3-BrPA into clinical trials. ◆

By Carmen Phillips

Community Update

End-of-Life Training Program on the Web is a Big Success

A continuing medical education module on "The Last Hours of Living: Practical Advice for Clinicians," available on the Medscape Web site, has proven to be of enormous interest and benefit to health care professionals.

During the first 2 months of the program, more than 52,000 unique physicians, nurses, and other health care professionals read over 326,000 pages of content, averaging almost 6 pages per visitor. More than 10,000 individuals completed the program and received credit, including more than 6,000 nurses. Participants encompassed a wide range of specialties including oncology, cardiology, primary care, critical care, neurology, and surgery.

"We are extremely pleased with the high level of interest in this program," noted Dr. Susan B. Yox, Medscape editorial director. "Providing high-quality care at the end of life is vital, but many health professionals don't feel fully prepared to do this. Activities like 'Last Hours of Living' are a big step forward in increasing awareness and understanding."

The module is part of EPEC-O (Education in Palliative and End-of-Life Care in Oncology), a comprehensive train-the-trainer curriculum developed specifically for cancer care practitioners. The curriculum was developed, with funding from NCI's Office of Education and Special Initiatives (OESI), by the EPEC project team based at Northwestern University, with partnership support from the American Society for Clinical Oncology (ASCO) and the Lance Armstrong Foundation.

OESI and Medscape explored the feasibility of offering EPEC-O content at Medscape.com to reach a broad audience of health care practitioners, explained Dr. Cheryl Arenella with OESI's Professional Education and Research Dissemination Branch. "The first module to be piloted—'The Last Hours of Living'—was selected after Medscape asked its audience to prioritize areas of need."

The initial response was "truly beyond our greatest expectations," said OESI Director Lenora Johnson. Some of the comments from Medscape users included: "I feel this will be a great education tool for the medical teams that do encounter a dying patient and help them to become more involved in the process" and "A very well-presented program that emphasizes the importance of including family/care givers."

OESI has two other dissemination projects centered around the EPEC-O curriculum. They are collaborating with the Indian Health Service (IHS) to present the curriculum throughout their medical care system using a combination of seminars and CD-ROM self-learning format. The first IHS seminar will be held in January 2007 and is approved for physician and nursing continuing education credit hours.

OESI is further exploring and evaluating dissemination channels for cancer care content. As such, OESI is partnering with ASCO to produce and publicize a CD-ROM-based training format for EPEC-O that will offer continuing education credits to clinicians inside and outside the oncology community. The target audiences include:

- Physicians, nurse practitioners, and physician assistants (particularly those working in oncology, hospice, palliative care, family medicine, general medicine, and geriatrics);
- Training program directors (including family practice residencies and oncology, palliative medicine, and geriatric fellowships);
- Oncology and palliative care nurses;
- Oncology social workers; and
- Therapists treating patients 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.