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OncoLog

Dr. Paul Mansfield *specializes in the treatment of mucinous tumors of the appendix, a subset of which fill the abdomen with a sticky, gelatinous substance.*

Rare Tumors: Finding Common Ground

Faced with a lack of funding, data, and sometimes even effective therapies, M. D. Anderson specialists rely on their experience in the fight against seldom-seen cancers.

By Joe Munch

To combat common cancers, oncologists can draw from a wealth of resources, including readily available screening methods, a large body of literature to help guide treatment, and funding for preclinical and clinical studies.

Rare cancers, on the other hand, can be much more difficult. Patients with rare cancers often present with indistinct symptoms attributable to any number of other diseases, leading to misdiagnoses that can delay appropriate treatment and thus reduce the chance of cure. Finding enough patients to enroll in clinical trials can be an adventure in futility, making it difficult to learn more about the disease and effective treatments; literature that can be used to guide treatment is often scarce, if not nonexistent; and funding is not always easy to secure.

Yet despite such obstacles, physicians at The University of Texas M. D. Anderson Cancer Center are working together every day to improve the diagnosis and treatment of rare tumors. The institution treats a variety of very uncommon cancers, from tumor types that occur in only

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a few hundred patients in the United States per year (such as chordoma) to those that occur in a few thousand (such as mesothelioma). As those physicians can attest, what is learned from rare tumors—including the examples described below—advances the fight against not only uncommon cancers but all forms of the disease.

Rare tumors at M. D. Anderson: A snapshot

Pseudomyxoma peritonei

Paul Mansfield, M.D., a professor in M. D. Anderson's Department of Surgical Oncology, treats mucinous tumors of the appendix (MTAs), a subset of which are associated with pseudomyxoma peritonei (PMP) syndrome. PMP syndrome refers to the production of a sticky, gelatinous substance that, if left untreated, can fill a patient's abdominal cavity and lead to bowel obstruction and ultimately death. No reliable data are available on the annual incidence of MTA in the United States; however, Dr. Mansfield—who, with his colleagues, treated more than 80 new cases of MTA last year—puts the national number at anywhere between 300 and 1,000.

Because patients with an MTA exhibit typically vague symptoms, such as weight gain or abdominal pain, MTAs are usually discovered incidentally on computed tomography (CT) studies or during an unrelated surgery, such as a hernia repair or laparoscopic cholecystectomy. When an MTA is discovered, the path of treatment is not always clear, especially for physicians who are unfamiliar with the disease. For that reason, M. D. Anderson specialists recommend that patients with an MTA—and, in fact, most rare tumors—receive their initial treatment at a cancer center where uncommon cancers are seen with some regularity.

In general, MTA does not require urgent treatment; in fact, some patients can be treated with a "watch and wait" approach with close follow-up and surgical intervention only when the disease progresses. If surgery is required, Dr. Mansfield said, it can be "formidable"—and it is not a guarantee that the disease won't recur, depending on the nature of the tumor.

"Some patients describe it as the 'mother of all surgeries,'" Dr. Mansfield said. "It is both physically and emotionally demanding for a patient—not just the operation, but also the recovery, which can take many months."

During the surgery, an incision is made from the base of the sternum to the pubic bone. The mucin-producing tumor and mucin are removed, as are any organs adversely affected by the mucin, which may include the omentum, spleen, gallbladder, uterus, ovaries, right colon with the appendix, and other portions of the intestines. If the tumor is completely resected, surgeons wash the abdomen with a heated chemotherapy solution to kill residual cancer cells and lower the risk of recurrence. The entire operation usually takes 8–12 hours, and recovery can take 3 months or longer.

According to Dr. Mansfield, the operation has a steep learning curve. At most centers that have limited experience with the operation, the operative mortality rate is substantially higher because some complications may not be identified and managed as quickly as in centers that have substantial experience. "I think that in general, if you're managed at a center that sees a lot of a certain type of disease, particularly those requiring a high-end surgery, the survival outcomes are better," Dr. Mansfield said.

Malignant thymoma

Some 80–100 patients with malignant thymoma, a slow-growing mediastinal tumor that rarely metastasizes beyond the chest, are treated at M. D. Anderson each year. That's about 10% of the total number of patients diagnosed with malignant thymoma in the United States.

"There will be medical oncology fellows in my clinic who will rotate for a month and see three or four thymomas, and that will be more than they see for the rest of their careers," said Edward Kim, M.D., an assistant professor in the Department of Thoracic/Head and Neck Medical Oncology.

Because malignant thymoma can microscopically infiltrate surrounding structures such as the pleura and pericardium, completely resecting the tumor can be difficult, especially in patients with late-stage disease. Several years ago, Dr. Kim reported a study aimed at improving tumor resectability in malignant thymoma patients. In the study,

Dr. Edward Kim *believes that the route to better treatment of thymoma, a slow-growing mediastinal tumor, is developing therapies that are effective against early-stage disease.*

patients were treated with induction chemotherapy (cyclophosphamide, doxorubicin, cisplatin, and prednisone) before undergoing thymoma resection and subsequent radiation therapy and consolidation chemotherapy. (Owing to the rarity of the disease, it took 10 years to enroll 22 patients in the study.) While rates of response to the induction chemotherapy were in line with those of previous studies, 5- and 7-year overall survival rates exceeded 90% and 70%, respectively, and were far higher than those previously reported for patients undergoing chemotherapy followed by tumor resection.

As for many rare cancers, the low incidence of and limited therapeutic options for small bowel adenocarcinoma cause major treatment obstacles, according to **Dr. Michael Overman.**

Dr. Kim attributes the higher survival rates to the complete surgical resection of the disease. Now, in part because of the study's findings, Dr. Kim believes that more physicians are treating their thymoma patients with chemotherapy before trying to resect the tumor.

"Even if you do a surgery up front that removes 99.9% of the thymoma, it's still not a complete resection. If you can do anything to shrink the tumor before surgery—or at least loosen its grip—the tumor comes off more like a glossy sticker than like a price tag."

That's not to say that resecting thymomas, even after effective chemotherapy, is easy. And unfortunately, malignant thymomas are commonly mistaken for lymphomas, which are treated with different methods. Lymphomas, often found at multiple sites throughout the body, tend to respond well to chemotherapy and radiation therapy but are not treated with surgical resection. According to Dr. Kim, obtaining enough biopsy tissue to pathologically confirm the tumor type is the key to avoiding this mix-up.

Dr. Kim believes that the route to better treatment is developing therapies that are effective against early-stage disease. He contrasts this with the strategy for lung cancer; because lung cancer patients typically present with metastatic, incurable disease, drug development has focused on advanced lung cancer.

"For thymoma," Dr. Kim said, "we should be thinking the opposite: How can we optimize treatment for those people who potentially have curable disease? And that requires a multidisciplinary approach."

Small bowel adenocarcinoma

About 6,100 people in the United States were diagnosed with cancer of the small intestine in 2008. Small bowel adenocarcinomas (SBAs) accounted for about 40% of those newly diagnosed cancers. While community physicians may see one or two SBAs in their careers, M. D. Anderson's Michael Overman, M.D., sees one or two of these tumors each month.

Dr. Overman, an assistant professor in the Department of Gastrointestinal Medical Oncology, became interested in treating SBA when he was a fellow at M. D. Anderson. Frustrated by the lack of data available to help guide therapy for his patients, he decided to initiate studies of various chemotherapy combinations that could be used to treat SBA. The findings from one of Dr. Overman's retrospective studies, for example, indicated that 5-fluorouracil combined with a platinum analogue is a promising therapy for SBA—not a conclusion easily reached, given the infrequency of the disease.

"Most people who come to M. D. Anderson have been diagnosed with a cancer and have an idea of what they're in for," Dr. Overman said. "But for rare cancers, such as SBA, patients may not have as much information because their doctors have told them that they've never seen anything like this disease."

Unfortunately, most patients with

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SBA do not find out they have the disease until it has metastasized, making long-term survival unlikely. (The mean overall survival duration with the optimal aggressive regimen for patients with advanced SBA is a little over 20 months.) Patients with SBA often have nonspecific symptoms such as abdominal discomfort, cramping, weight loss, and nausea, which often lead to SBA's being misdiagnosed as more common gastrointestinal conditions, such as irritable bowel syndrome.

"Whenever someone has abdominal discomfort or nausea, the last thing a physician suspects is small bowel cancer," Dr. Overman said. SBA is usually suspected only after symptoms persist and progress for months despite treatment for other potential causes.

In addition, evaluating the small intestine for disease is difficult. Even when SBA is present, gastrointestinal x-ray series or CT may not detect it. Capsule endoscopy (in which the patient swallows a tiny camera that photographs the small bowel as the capsule moves through the digestive tract) is a recent technology that has markedly aided the detection of tumors in the small bowel.

Furthermore, treatment options for SBA are limited—while chemotherapy can be used to shrink the tumor, and intestinal bypass surgery can be performed after the involved bowel is surgically removed, resection of the tumor itself is difficult.

According to Dr. Overman, the key to improving treatment for SBA patients is collaboration among many different centers. Even so, Dr. Overman said, "The problem is that it's a rare cancer, so not every institution is going to have somebody who is interested in that cancer."

Making strides through quicksand

"The reason we make big strides in certain types of cancers is that we have a good understanding of the disease's mechanisms," Dr. Overman said. "So clearly, to make inroads into a cancer, we really need to do more laboratory-based research, but lab-based research requires funding."

Obtaining funding for rare tumors can be a problem—"horrendous," as one researcher put it. Government agencies like the U.S. National Institutes of Health tend to fund research that will have the biggest effect across the population, and so common cancers tend to receive the most funding. Pharmaceutical companies tend to fund research only if it is likely to be profitable; if only a few hundred cases of a disease are identified each year, interest in funding research for that disease is generally nonexistent. Researchers of rare tumor types often must rely on donations, which can be few and far between.

The lack of funding can stifle important research into potentially effective therapies for rare cancers. And medical insurers are not inclined to pay for drugs that have not been proven to work.

"So you end up in this Catch-22," Dr. Overman said. "You're limited in trying to use the new drugs that are effective for other cancers, and then, you're limited in exploring new drugs for the rare tumor type."

Take bevacizumab (Avastin), for example. Although bevacizumab has been used successfully to treat lung, breast, and colon cancers, among others, few insurance companies will pay for its use in treating SBA. An oncologist like Dr. Overman might point to his positive experience in treating colon cancer patients with bevacizumab to justify its potential use in patients with SBA, but that is not enough to convince an insurance company to pay for an expensive drug whose effectiveness in treating SBA has not been tested in clinical trials.

"We may have some experience here with certain drugs that we've tried, but convincing insurance companies to do something when there is limited published data is difficult," Dr. Overman said. "Often, we have to get involved by providing letters to insurance companies explaining our rationale to get them to pay for drugs for a rare tumor type."

M. D. Anderson has mechanisms in place that enable faculty to pursue research without external funding. However, even unfunded clinical studies

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Neuroendocrine T

As oncologists reconsider the new clinical trials may lead to

By Joe Munch

"There is an old saying in medicine," says James Yao, M.D., an associate professor in M. D. Anderson's Department of Gastrointestinal Medical Oncology: "'When you hear hoofbeats, think horse, not zebra.'"

But in the realm of cancer care, Dr. Yao has his ears perked for zebras—and there may be more of them than once thought. Dr. Yao specializes in treating neuroendocrine tumors (NETs), a group of tumors that includes carcinoid tumors, islet cell tumors, medullary thyroid carcinomas, and pheochromocytomas, all of which arise from hormone-releasing cells in the body. Although most NETs are slow-growing and more indolent than tumors arising from the epithelium, some NETs can be highly malignant and resistant to therapy.

NETs were once believed to be extremely uncommon. However, said Dr. Yao, "There are data suggesting that these tumors are not nearly as rare as people think." For example, in two large autopsy series of more than 15,000 people each, carcinoid tumors were found in about 1% of the people. Another autopsy series examined the occurrence of islet cell tumors, which form in the pancreas. "Islet cell tumors were once thought to be exceedingly rare, with an incidence in the range of 2–3 cases per million per year in the United States," Dr. Yao said, "but if you look at the autopsy series, you'll find an incidence of about 1 in 1,000 cases."

To examine the prognostic factors for and the epidemiology of NETs, Dr. Yao and his colleagues identified NETs from the Surveillance, Epidemiology,

e Tumors

he prevalence of these rare tumors, to improved treatment approaches.

Dr. James Yao *is hopeful that expanded clinical research in neuroendocrine tumors —which may not be nearly as rare as historically thought—will generate new data to guide treatment.*

and End Results Program registries and used associated population data for incidence and prevalence analysis. What they found was surprising: the annual age-adjusted incidence of NETs increased significantly over time, from about 1 in 100,000 in 1973 to more than 5 in 100,000 in 2004. Furthermore, the researchers found that, owing to the tendency of patients to live a long time with slow-growing NETs even after the disease has metastasized, the prevalence of NETs was steadily increasing as well.

Dr. Yao said, "If you look at prevalence within the realm of gastrointestinal neoplasms, neuroendocrine tumors are second only to colon cancer. They are actually more common than stomach cancer, pancreatic cancer, esophageal cancer, and hepatobiliary tumors."

In 2000, 197 new patients with NETs were treated at M. D. Anderson; by 2007, that number had more than doubled, to more than 450. According to Dr. Yao, more patients with NETs are coming to M. D. Anderson because of the availability of clinical trials.

Currently, the main goal of therapy for NETs is to control hormonal symptoms and tumor growth. NETs should be surgically resected if possible, but there are no data supporting adjuvant therapy, and there is no established standard of post-resection follow-up.

"For many decades now, the management of these diseases has been based on small case series and anecdotal data," Dr. Yao said. "Our main interest is to generate data in terms of how to manage these patients, and that would involve some almost unprecedented efforts in this area, such as doing clinical trials that involve hundreds to thousands of patients."

Such trials have already started. Nearly 300 patients are being enrolled in a phase III trial of bevacizumab (Avastin) for NETs, and nearly 1,000 patients are being enrolled in several ongoing clinical studies of RAD001 (everolimus), a mammalian target of rapamycin inhibitor.

"We're really deeply involved with generating reliable data for the management of these patients," Dr. Yao said. "That's one of the reasons we've put in a significant effort in terms of raising awareness of the disease by doing these epidemiological studies and really showing that the disease is not nearly as rare as people thought." ●

For more information, contact Dr. Yao at 713-792-2828.

Further reading

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Clinical Trials for Neuroendocrine Tumors

Exploratory Study of Avastin (Bevacizumab) and RAD001 (Everolimus) in Advanced Low- or Intermediate-Grade Neuroendocrine Carcinoma. Principal investigator (PI): James Yao, M.D. The primary goal of this clinical research study is to learn how bevacizumab and everolimus may affect the flow of blood to tumors. Another goal is to learn whether a combination of everolimus and bevacizumab can shrink or slow the growth of advanced low- or intermediate-grade neuroendocrine carcinoma.

A Randomized, Double-Blind, Placebo-Controlled, Multicenter Phase III Study in Patients with Advanced Carcinoid Tumors Receiving Sandostatin LAR Depot and RAD001 10 mg/d or Sandostatin LAR Depot and Placebo. PI: Dr. Yao. The goal of this clinical research study is to learn whether everolimus can help control disease in patients with advanced carcinoid tumors.

A Randomized Double-Blind Phase III Study of RAD001 10 mg/d plus Best Supportive Care Versus Placebo plus Best Supportive Care in the Treatment of Patients with Advanced Pancreatic Neuroendocrine Tumors. PI: Dr. Yao. The goal of this clinical research study is to learn whether everolimus can slow the growth of advanced pancreatic neuroendocrine tumors.

Phase III Prospective Randomized Comparison of Depot Octreotide plus Interferon Alpha Versus Depot Octreotide plus Bevacizumab in Advanced, Poor Prognosis Carcinoid Patients. PI: Dr. Yao. The goal of this clinical research study is to determine the effectiveness of bevacizumab-octreotide and interferon-octreotide combinations for carcinoid tumors. ●

For more information on trials at M. D. Anderson, visit www.clinicaltrials.org.

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require patients, and the majority of patients treated for rare tumors at M. D. Anderson live hundreds if not thousands of miles away. For many of these patients, traveling to M. D. Anderson to receive treatment, let alone to participate in a clinical trial, can be difficult and expensive.

"Even the people who come to see us in a referral setting may not be able to participate in a clinical trial, because they would have to get the drug here and be here more frequently than they would if they were getting therapy back home," Dr. Overman said.

While some new treatments can be designed to accommodate patients coming from afar—say, by administering a chemotherapy regimen that can be given every 4 weeks instead of one requiring weekly administration, or by working with the patient's hometown physician to give certain therapies there—for rare tumors, experience matters, especially when making initial decisions about treatment.

Multiple ways forward

For most oncologists, rare cancers are among the smallest blips on their radar screens. The larger blips—e.g., colon, breast, prostate, and lung cancers—tend to garner the most attention. Yet studying rare cancers may give essential clues about treating more prevalent cancers.

"You gain a lot of insight by studying rare cancers, because their biologic mechanisms seem to be more homogeneous than those of the more common cancers," Dr. Overman said, referring to the opinions put forth by Fadi Braiteh, M.D., a medical oncology and hematology fellow, and Razelle Kurzrock, M.D., chair of the Department of Investigational Cancer Therapeutics.

In an editorial published recently in the journal *Molecular Cancer Therapeutics*, Drs. Braiteh and Kurzrock noted that progress in rare cancer treatment, when it is made, seems to grow by leaps and bounds, while progress against more common cancers tends to happen much more slowly. The authors hypothesized that "the pathophysiologic basis for a tumor being rare is one and the same as the reason that it may ultimately be so treatable." In other words, if a tumor like SBA—which has many of the same characteristics as colon cancer, yet is nearly 50 times less common—is rare because it arises only from a single genetic aberration, it should be easy to treat with a single therapy. Colon cancer, on the other hand, can arise from many different aberrations and must be approached with many different therapies, making it more difficult to treat than SBA.

> **"The pathophysiologic basis for a tumor being rare is one and the same as the reason that it may ultimately be so treatable."**
>
> **– Drs. Fadi Braiteh and Razelle Kurzrock, writing in the journal *Molecular Cancer Therapeutics***

Dr. Overman said, "If you understand the rare tumor types, if you can focus in and find the abnormality that's occurring, you can then focus on treating that abnormality in the more common cancers with more heterogeneous processes."

For Dr. Kim's part, the way forward may include looking to viable cell lines and using mouse models that mimic malignant thymoma to study drugs that could potentially be used to treat malignant thymoma in humans.

Dr. Kim's discovery of a potential mouse model for malignant thymoma was serendipitous. In another laboratory at M. D. Anderson, Renata Pasqualini, Ph.D., and Wadih Arap, M.D., Ph.D., professors in the Department of Genitourinary Medical Oncology, found that the mice they were experimenting on were dying of asphyxiation caused by growing thymuses. Drs. Pasqualini and Arap agreed to let Dr. Kim and his colleagues study the mice to determine whether the mice were developing malignant thymomas. Dr. Kim noted that the enlarged mice thymuses did indeed exhibit some malignant characteristics. While research in the mouse model is still in its infancy, Dr. Kim remains cautiously optimistic and looks forward to the prospect of testing novel chemotherapy agents in the model.

"We like to use laboratory science to help guide our clinical science, but when not much laboratory information is available, it is very difficult to choose which drugs will be effective in patients," Dr. Kim said. "Oftentimes when treating rare tumors, we're basically guessing which agents are going to work. If we can develop better laboratory models for testing additional drugs, that may help us narrow down what will work in patients." ●

For more information, contact Dr. Kim at 713-792-6363, Dr. Mansfield at 713-794-5499, or Dr. Overman at 713-745-4317. M. D. Anderson was recently designated as a Blue Distinction Center for Complex and Rare Cancers by Blue Cross and Blue Shield.

Further reading

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HOUSE•CALL

How You Can Help a Seriously Ill Friend

When a friend is seriously ill, what are some practical things that well-wishers can do? It's a question that many of us struggle to answer. We sought advice from a group of experts on the topic—the Anderson Network, an organization of cancer survivors who volunteer their support for cancer patients and caregivers.

Here is a small sample of the suggestions offered by Network members:

Listen—really listen—to the patient. Over and over again, Network members told us this: "It is really important for a patient to be able to tell others how they are feeling without being fearful. Friends who can listen and not feel sorry for the patient are wonderful," one wrote. Sometimes patients don't want to overwhelm their spouses or immediate family with their fears and concerns, and a good friend can "reassure the person that you will be there for them whenever they feel a need to just have a good cry."

"Don't feel that you have to 'make it all right,'" wrote another. "Sometimes patients are so overwhelmed by the circumstances that they just need to talk or vent about the situation." Another advised, "Let a patient know that it is OK to feel fear, anger, sadness, or whatever."

Offer help with day-to-day needs. This could include bringing dinner or other food to the patient's family, doing yard work, cleaning the house, walking the dog, picking up prescriptions at the drug store, taking out the trash, or driving the patient to a doctor's appointment. Ask if you can write a letter, make a phone call, send an e-mail, or help with unfinished business. Several Network members said they appreciated a well-wisher's help in gathering information about their illness. "My sister-in-law," wrote one, "was our research department, untiringly Google-ing information about the disease and treatment options."

You can also offer to give the patient's caretaker a break, perhaps by sitting with the patient while the caretaker has a shower or goes out for a meal. Remember the patient's children, too. Perhaps you could baby-sit, take the children for a fun outing, help them with school assignments, or drive them to the hospital for a visit.

If you offer food, you don't have to make it yourself. Several Network members said they appreciated receiving gift cards to restaurants as well as store-prepared cookies, cake, crackers, cheese, deli meat, and fruit.

Be specific. "Don't tell the caretaker, 'Call me if you need help.' Try saying something like, 'Tell me the daily routine for the kids so I can determine what part of it I can take over,'" a Network member advised. Another said that after her own experience in the hospital, "I vowed that if one of my friends was really ill, I would call the family on Sunday night and ask, 'What's on the agenda this week, and how can I help?'"

Better yet, organize a group of helpers. One Network member said that everyone in her daughter's office signed up to bring the family a meal on a specific night. A neighborhood group designated a "point person" to schedule help—preparing meals, running errands, giving rides—for another patient. "My best advice," another Network member wrote, "is to help the person or their family get organized. A book such as *Share the Care* or a Website such as www.lotsahelpinghands.com can help people set up care teams. The coordinators can figure out what needs to be done and then distribute those needs among a group of people."

Call before you visit. While Network members appreciated others' support and good wishes, several said there were days when they were too ill or tired for visitors or when they could tolerate only short visits.

Be positive. "Help us laugh and take our minds off of our illness," one Network member wrote. Never tell stories about people who died recently from the same disease. "Gifts of inspirational books by folks who survived their illness and other impossible odds were a source of great encouragement," another Network member said. Others said they found encouraging cards and handwritten notes especially comforting.

Remember they're more than patients. Treat an ill friend normally, the way you always have, Network members said. Don't act like he or she "has the plague." A sick person, another wrote, "is the same person he or she was before the diagnosis."

Stay in touch. Remember that a serious illness can be a long battle. Stick with patients for the long haul, not just when they're first diagnosed. Seven years into her battle with breast cancer, one Network member wrote, only one support group continues to send her cards and notes of encouragement on a regular basis. "I am always looking for people to appreciate the mental toughness it takes to deal with cancer," another member wrote. "It is a tough fight and one I will relentlessly keep on fighting." ●

An expanded version of this House Call is available online at www.mdanderson.org/oncolog.

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IN BRIEF

Gene Therapy Shows Promise for Pediatric Bone Cancer

In a recent study, M. D. Anderson researchers found evidence in a mouse model that gene therapy delivered to tumors via stem cells might prove effective against pediatric bone cancers.

The authors reported significantly inhibiting tumor growth by delivering the antiangiogenic interleukin-12 (IL-12) gene to Ewing sarcoma tumors in mice. Such targeted delivery of cancer therapy theoretically avoids most of the side effects caused by treatments that also affect healthy tissue. Current therapies for pediatric bone cancers such as Ewing sarcoma include surgery, chemotherapy, and radiation, all of which cause major side effects.

The group, led by Eugenie Kleinerman, M.D., professor and head of M. D. Anderson's Division of Pediatrics, had previously used IL-12 to treat Ewing sarcoma and osteosarcoma successfully in the lab by preventing the blood vessel growth that supports a tumor. Following earlier findings published by Dr. Kleinerman's group that some bone marrow cells are attracted to tumors, the researchers decided to use such cells as gene therapy vectors. The researchers reasoned that bone marrow stem cells that are attracted to sarcomas specifically promise a new, less toxic way to carry IL-12 to the tumors.

Dr. Kleinerman's group, which included Xiaoping Duan, M.D., Hui Guan, Ph.D., and Ying Cao, Ph.D., transfected the IL-12 gene into bone marrow mesenchymal stem cells (MSCs) from mice using adenoviral vectors and then injected the MSCs into mice with Ewing sarcoma. Dr. Kleinerman's team found that injecting IL-12–bearing cells indeed halted tumor growth without damaging normal tissue, and she is hopeful that this therapeutic approach can be used to treat a variety of cancers.

> Injecting IL-12–bearing cells in mice with Ewing sarcoma halted tumor growth without damaging normal tissue.

"There is a great need for new therapeutic approaches for Ewing sarcoma patients, especially those whose disease has relapsed or those who have metastases," Dr. Kleinerman said.

The study was funded by the National Institutes of Health and published in *Cancer*.

Laurence Cooper, M.D., Ph.D., associate professor and head of the Cell Therapy Program in the Children's Cancer Hospital at M. D. Anderson, is working to standardize the production of gene therapy cell lines for clinical testing. ●

Physicians: To refer a patient or learn more about M. D. Anderson, please contact the Office of Physician Relations at 713-792-2202, 1-800-252-0502, or www.mdanderson.org/departments/physrelations.

Patients: To refer yourself to M. D. Anderson or learn more about our services, please call 1-877-632-6789 or visit www.mdanderson.org.

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