OncoLog
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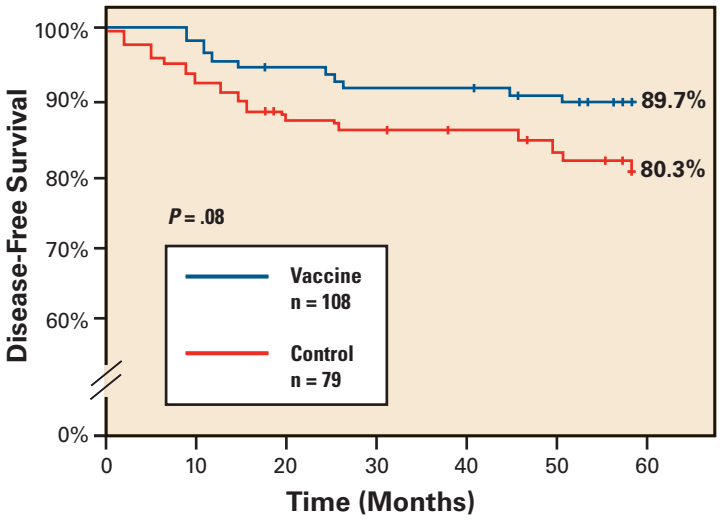
Emerging Vaccines Take Aim at Preventing Recurrent Breast Cancer

By Joe Munch

Myriad advances have been made in the treatment of breast cancer, and cures are achieved in many patients. However, there are still patients whose cancer recurs, and most of these patients will die of their disease. This indicates a need for other therapies that can be used to prevent recurrent disease. One potential option is breast cancer vaccines.



Kaplan-Meier plots depict disease-free survival for patients in the phase I and II trials of the E75 vaccine. Following standard treatment for breast cancer, patients were vaccinated with E75 and granulocyte-macrophage colony-stimulating factor or remained unvaccinated (controls).

"Breast tumors are made up of so many different types of cells that we have to use many different drugs and therapies to treat them," said Jennifer Litton, M.D., an assistant professor in the Department of Breast Medical Oncology at The University of Texas MD Anderson Cancer Center. "Vaccines come at the cancer in a totally different way than our current systemic therapies do." Vaccines thus may augment the effects of adjuvant treatments currently used to forestall recurrence.

Potential clinical role

Several types of adjuvant therapy are used to prevent breast cancer from returning; the therapy or combination of therapies used depends on the individual patients and their disease. For example, radiation therapy is used for patients who have undergone breast-conserving surgery, and chemotherapy may benefit patients at high risk of recurrence. Hormonal therapy with tamoxifen or an aromatase inhibitor is used in patients with estrogen receptor–positive disease, and immunotherapy with trastuzumab is used in those with tumors that highly express human epidermal growth factor receptor 2 (HER2).

Today, several clinical trials are evaluating the use of breast cancer vaccines—not as an alternative to currently available preventive therapies for recurrent disease but as

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an additional adjuvant therapy.

"This is a novel approach specifically for people who want another form of therapy to decrease the chance of the cancer coming back," Dr. Litton said. "People are looking for something extra that may improve their outcome but doesn't expose them to a lot of extra toxicity."

Peptide vaccines

Cancer vaccines stimulate patients' immune systems to recognize and kill tumor cells. The vaccines consist of a tumor-associated antigen that, once introduced into a patient's body, elicits an immune response. Several systems have been devised to deliver tumor-associated antigens into the body, including whole-cell vaccines, viral vector vaccines, and dendritic cell vaccines, which are custom made from the patient's own white blood cells. The only therapeutic cancer vaccine currently approved by the U.S. Food and Drug Administration is sipuleucel-T (Provenge), a dendritic cell vaccine used in men with metastatic hormone-refractory prostate cancer.

The breast cancer vaccines being investigated at MD Anderson are of a fourth type, peptide vaccines. Peptide vaccines are made by taking a small amino acid sequence (peptide) from a tumor-associated antigen. The tumor-associated antigen most frequently used in breast cancer vaccines is the HER2 oncoprotein, which promotes tumor growth.

Once taken from the antigen, the peptide is mixed with an immunoadjuvant to help stimulate an immune response. The immunoadjuvant used in the trials being conducted at MD Anderson is granulocyte-macrophage colony-stimulating factor (GM-CSF), which has been used primarily to treat neutropenia in transplant recipients.

When the peptide–GM-CSF combination is injected, GM-CSF stimulates the dendritic cells in the area of injection to take up and process the peptide so that it can be better presented to the immune system. The length of the peptide dictates the type of immune cell it stimulates.

Current clinical studies

Several HER2-derived peptide vaccines are being studied in clinical trials at MD Anderson. Although the vaccines are based on a HER2 peptide, they have the most benefit in the 60% of breast cancer patients with low HER2 expression (1+ or 2+ by immunohistochemistry).

Phase III trial of E75

The E75 vaccine (NeuVax) is the most studied of the HER2-derived peptide vaccines. The 9-amino-acid peptide E75 binds with major histocompatibility complex (MHC) class I molecules to stimulate CD8-positive T cells; when these T cells recognize a target as foreign, they attack it and release cytotoxic enzymes to kill it. Because E75 is an MHC class I peptide, the vaccine works only in patients whose cells are positive for human leukocyte antigen (HLA)-A2 or HLA-A3; only cells with those HLA types will present the peptide on the cell surface to activate T cells.

In May 2012, Elizabeth Mittendorf, M.D., Ph.D., an assistant professor in the Department of Surgical Oncology, and her colleagues published the 24-month landmark analysis of their phase I and II trials of E75. The group's findings opened the door to the phase III PRESENT (Prevention of Recurrence in Early-Stage, Node-Positive Breast Cancer with Low to Intermediate HER2 Expression with NeuVax Treatment) study, currently the only phase III trial of a breast cancer vaccine. Dr. Mittendorf is the overall principal investigator of the multinational study.

This randomized, double-blind, placebo-controlled trial will enroll approximately 700 breast cancer patients who were rendered disease free following standard treatment. Patients must be positive for HLA-A2 or HLA-A3 and have had cancers that were scored as HER2 1+ or 2+ by immunohistochemistry. The vaccine will be given once a month for 6 months and then given as a booster inoculation every 6 months thereafter through 3 years. Because GM-CSF causes inflammation at the injection site, it will be given to patients in each study group, serving as the immunoadjuvant for the vaccine group and as an active placebo for the control group. The primary endpoint of the study is 3-year disease-free survival.

Positive results from this trial, researchers hope, would eventually lead to indications for the E75 vaccine in the routine care of breast cancer patients. "We are all cautiously optimistic—and excited—as we wait for the results. If they do show that E75 has significant benefit, it could be an amazing opportunity for our cancer patients," Dr. Litton said.

Phase II trial of GP2 and AE37

The GP2 vaccine works in much the same way as the E75 vaccine. Like E75, the GP2 peptide is 9 amino acids long and binds to MHC class I molecules to stimulate CD8-positive T cells; thus, the vaccine works only in patients who are positive for HLA-A2 or HLA-A3. In contrast, the AE37 peptide, which is longer than the E75 and GP2 peptides, binds to MHC class II molecules and stimulates CD4-positive T cells, thereby eliciting a more robust immune response. Although MHC class II peptides can be HLA-restricted, AE37 is a promiscuous peptide, meaning that blood cells of almost any HLA type can present it. In addition, the AE37 peptide is paired with the Ii-Key protein, which enhances the presentation of the peptide to the immune system.

Both the GP2 and AE37 vaccines are being investigated in an ongoing phase II trial to determine whether the individual vaccines can prevent the recurrence of node-positive or high-risk node-negative breast cancer. Patients are sorted into groups depending on their HLA status and then randomly assigned to receive the appropriate vaccine plus GM-CSF or GM-CSF alone (as the control).

The AE37 trial's planned interim analysis revealed that at a median of 22 months, the recurrence rate in the vaccinated patients was 10.3%, whereas the recurrence rate in the control group

receiving only GM-CSF was 18.0%. The difference represents a 43% reduction in recurrence rate.

"These data are encouraging," Dr. Mittendorf said. "Obviously, we need longer follow-up, and we need to finish accrual in the trial, but the data suggest that it is reasonable to look forward to investigating the AE37 vaccine in a phase III setting."

The interim results for the GP2 vaccine are not yet available.

Potential benefits

One of the benefits of peptide vaccines such as those being investigated at MD Anderson is that they can be given "off the shelf." This makes them more convenient and less expensive than the custom-made dendritic cell vaccines.

Dr. Litton, who has referred a number of patients to the breast cancer vaccine trials, said that patients' enthusiasm about participating in a vaccine trial has been overwhelmingly positive. "Some patients tell me that they feel empowered by using their own bodies, their own immune systems, to fight the cancer," she said.

But the main reason the trials are so popular with patients is that the vaccines offer a potential anticancer benefit with very little risk of toxicity. Most patients have a grade 1 or 2 local toxic response, which means redness at the injection site; and some patients experience grade 1 or 2 systemic symptoms, mostly in the form of minor flulike symptoms for 4–6 hours after receiving the vaccine.

"These are people who have gone through chemotherapy, lost their hair, and had terrible gastrointestinal side effects, toxicity in their nails, and all those other things," Dr. Mittendorf said. "So a treatment that is basically not toxic is very attractive."

Dr. Litton echoed Dr. Mittendorf's sentiments. "It has not been a hard trial for people to become interested in. In fact, I've had several people come from different parts of the country just to be part of the trial," Dr. Litton said. "And we really appreciate all the patients who have stepped forward to participate. It's always important to encourage people to participate in clinical trials; otherwise we could never move forward with therapies such as this."

These vaccines are not for everyone, however. Earlier clinical trials revealed that the peptide vaccines had limited efficacy in patients with late-stage, metastatic breast cancer.

"There's a long list of reasons why these vaccines are not set up to be administered to patients who have diffusely metastatic disease," Dr. Mittendorf said. "It would be difficult, with a peptide vaccine, to mount enough of an immune response to eradicate bulky disease. The microenvironment and immune environment around tumors change as tumors progress, so bulky metastatic tumors also have a less favorable environment for the immune system to function in. And a lot of patients with diffusely metastatic disease have received multiple lines of chemotherapy, which we suspect has a detrimental effect on the immune system."

Future directions

The future of breast cancer vaccines holds many possibilities. Antigens such as cyclin E and folate-binding protein may be targeted for vaccination. Novel immunoadjuvants are being developed that may elicit an immune response more potent than that elicited by GM-CSF. And new approaches using vaccines and harnessing other aspects of the body's immune system against recurrent breast cancer may be forthcoming.

"I would like to see some of these vaccines combined with other exciting immunotherapies that are coming on board," Dr. Mittendorf said. For instance, a vaccine could be paired with a drug that inhibits CTLA-4, a protein that downregulates T cells. "Ipilimumab, an antibody that targets CTLA-4, could be used to take the brakes off the immune system. A vaccine would

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CLINICAL TRIALS: Breast Cancer Vaccines

Efficacy and safety study of NeuVax (nelipepimut-S or E75) vaccine to prevent breast cancer recurrence (PRESENT; NCT01479244). Principal investigator (PI): Elizabeth Mittendorf, M.D., Ph.D. The purpose of this trial is to assess the efficacy and safety of the E75 peptide vaccine administered with adjuvant granulocyte-macrophage colony-stimulating factor (GM-CSF) and to compare the disease-free survival of the vaccinated patients to that of patients receiving GM-CSF only.

Phase IB trial of combination immunotherapy with HER2/neu peptide GP2 + GM-CSF vaccine and trastuzumab in breast cancer patients (2009-0892). PI: Dr. Mittendorf. The goal of this study is to evaluate the safety of a vaccine consisting of the GP2 peptide and GM-CSF in combination with trastuzumab in patients with breast cancer. Researchers also want to learn the highest tolerable dose of the vaccine that can be given with trastuzumab.

Prospective, randomized, single-blinded, multicenter phase II trial of the HER2/neu peptide GP2 + GM-CSF vaccine versus GM-CSF alone in HLA-A2–positive or the modified HER2/neu peptide AE37 + GM-CSF vaccine versus GM-CSF alone in HLA-A2–negative node-positive and high-risk node-negative breast cancer patients to prevent recurrence (2007-0125). PI: Dr. Mittendorf. The goal of this study is to find out whether GP2 or AE37, given as a vaccine combined with GM-CSF, can help keep node-positive or high-risk node-negative breast cancer from recurring. ■

FOR MORE INFORMATION

Visit www.clinicaltrials.org.

Compass

Quarterly discussion of cancer types for which there is no standard treatment or more than one standard treatment

Hepatocellular Carcinoma

Concomitant liver disease affects treatment options

By Sunni Hosemann

Introduction

Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver.

This discussion addresses HCC that is confined to the liver (has not metastasized to distant sites). Although traditional TNM staging is used to guide treatment decisions for many cancers, it is less useful for guiding HCC treatment because it does not take into account the liver disease that often accompanies liver cancer—an important determinant of therapy.

The current 5-year overall survival rate for patients with very early-stage liver cancer who undergo surgical resection or liver transplantation is 50%–70%. However, these treatment options are available to very few patients because most liver cancers are not discovered until they are more advanced or occur in patients who are not candidates for liver transplantation or for whom a matching organ cannot be found. Thus, the 5-year overall survival rate for patients with liver cancers of any stage is about 15%.

According to Ahmed Kaseb, M.B.B.S., an assistant professor in the Department of Gastrointestinal Medical Oncology at The University of Texas MD Anderson Cancer Center, it is useful to consider liver cancer not as a disease but as a syndrome wherein the cancer itself is one component and underlying disease in the liver is the other. "Two patients with the same stage liver cancer but differing health in the rest of the organ would likely need different treatments," he said. "Treatment must be personalized to both conditions."

As many as 90% of patients diagnosed with HCC have underlying cirrhosis, and the risk factors for developing cirrhosis and HCC are the same—infection with hepatitis B or C virus and chronic alcohol use are the most prevalent. Liver disease caused by environmental exposure or autoimmune or hereditary conditions is less common. Nonalcoholic steatohepatitis—fatty infiltration of the liver associated with obesity, metabolic syndrome, and diabetes—is an increasingly important factor in the development of HCC and affects patients who are younger than the traditional population of patients with liver disease, said Steven Curley, M.D., a professor in the Department of Surgical Oncology. Patients who have more than one of the known risk factors—chronic viral hepatitis and alcohol use, for example—are at heightened risk of developing HCC.

"Patients with chronic hepatitis B or C infections are at risk for the development of HCC and should be followed closely," Dr. Curley said. "Ultrasonography and serum α-fetoprotein monitoring are cost-effective methods for that purpose."

HCC may present as a solitary tumor or as multiple, sometimes diffuse, liver lesions. HCC tends to spread within the liver first and then to distant sites. Without treatment, HCC results in liver failure and death, often within weeks or a very few months.

Treatment options

Surgery: resection or transplantation

According to Dr. Curley, surgery—either resection or liver transplantation—is the preferred primary treatment option and is potentially curative for patients whose disease is confined to the liver and consists of a single tumor or a few small, well-defined tumors.

Cancer that involves lymph nodes or has spread to distant sites precludes surgery. "Unfortunately, fewer than 10% of our patients are surgical candidates," Dr. Curley said.

Another consideration in establishing candidacy for any surgery is whether the patient is able to tolerate the proposed operation. Performance status compromised by the cancer itself or comorbidities stemming from advanced cirrhosis, such as portal vein hypertension or esophageal varices, often render patients ineligible for surgery. For serious surgical procedures like liver resection, some patients who might not do well in other settings can be successfully operated on in high-volume centers where extensive supportive care is available.

Other considerations are whether the size and location of the tumor(s) permit the cancer to be completely resected and whether the remaining liver (future liver remnant) will be adequate. Patients without cirrhosis require at least 20% of the liver to remain after resection; those with early-stage cirrhosis require 40% or more; and patients with advanced cirrhosis usually are not candidates for resection. If the cancer can be completely resected and the future liver remnant is adequate, resection is the recommended treatment.

Resection alone results in prolonged survival and, in select patients, a cure; however, resection is associated with a

CONTRIBUTING FACULTY, THE UNIVERSITY OF TEXAS MD ANDERSON CANCER CENTER

Steven A. Curley, M.D.
Professor, Surgical Oncology

Sanjay Gupta, M.D.
Professor, Diagnostic Radiology

Ahmed Kaseb, M.B.B.S.
Assistant Professor, Gastrointestinal Medical Oncology

high rate of recurrence—presumably due to occult disease.

Liver transplantation offers the best possibility of a cure for HCC because it addresses the cancer itself as well as the underlying cirrhosis that most often accompanies HCC. However, the criteria for transplant eligibility are narrow, and patients who meet them can face a long wait for a donor organ to become available.

Transplant eligibility is determined by the Milan criteria, proposed by Mazzaferro et al. in 1996 for the purpose of selecting patients who would most benefit from receiving transplant organs. Meeting these criteria are patients with single tumors no larger than 5 cm in diameter or three or fewer tumors no larger than 3 cm in diameter and with no evidence of vascular invasion or extrahepatic disease.

There are ongoing efforts to refine the Milan criteria to account for the length of time a patient has been waiting for an organ and for potential death during the wait. Other attempts to widen the criteria, particularly for tumor size, remain controversial. Meanwhile, the United Network for Organ Sharing reports that more than 16,000 patients in the United States are currently waiting for a liver to become available for transplantation.

HEPATOCELLULAR CARCINOMA: Treatment Options

Diagnosis: Hepatocellular Carcinoma
Disease confined to liver

	Variables Considered for Each Patient	*Outcome-Based, Primary Treatment Options*
RESECTABLE	• Tumor location • Tumor size • Performance status • Hepatic function/reserve	**Surgical resection**
UNRESECTABLE	• Transplant eligible? • Tumor location • Tumor size • Performance status • Hepatic function/reserve	**Transplant** OR **Liver-directed therapy** *Ablation* • Thermal • Chemical *Embolization* • Chemoembolization • Bland embolization • Radioembolization *Radiation therapy* OR **Systemic therapy**

Liver-directed therapies

Because most patients with HCC are not good candidates for surgical resection or transplantation, liver-directed therapies for HCC have become increasingly important. These procedures are carried out by interventional radiologists under image guidance (computed tomography, magnetic resonance imaging, or fluoroscopy) and include several techniques that can be customized to treat tumors that would otherwise be untreatable or would be treated with a less focused modality such as external-beam radiation.

According to Sanjay Gupta, M.D., an interventional radiologist and a professor in the Department of Diagnostic Radiology, liver-directed therapies for HCC fall into two broad categories: ablation and embolization. Ablation is a needle-based application to tumor tissue of a chemical (ethanol) or thermal energy (heat or freezing) to effectively destroy the tumor. Radiofrequency, laser, or microwave energy sources may be used for thermal ablation. Embolization is the selective occlusion of blood vessels to prevent blood from reaching the tumor.

Embolization techniques take advantage of the liver's unique blood supply, wherein the portal vein supplies the organ with 75% of its blood and the hepatic artery supplies the remaining 25%. Liver tumors are typically fed by the hepatic artery, so embolizing branches of this vessel can effectively deny tumor tissue its blood supply. This is accomplished by injecting microspheres into the hepatic artery through a catheter.

Bland embolization uses microspheres alone, but chemotherapy drugs can be added to deliver a high drug dose directly to the tumor without the side effects that systemic

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therapy would have. Although chemotherapy drugs were formerly injected via the catheter as solutions, a more recent development is the use of drug-eluting beads—microspheres that can sequester the drug (most commonly doxorubicin) and release it in a controlled and sustained way. This prolongs drug contact with cancer cells and leads to tumor necrosis while reducing potential damage to hepatic tissue. Similarly, microspheres impregnated with yttrium 90 may be introduced via the catheter to deliver a higher dose of radiation to tumor tissue with less exposure to normal tissue than would be possible using an external radiation source.

According to Dr. Gupta, these techniques are customized to individual patients, and a combination of techniques may be used. Generally, ablative techniques are used for small tumors (3–5 cm) or where there are few lesions (five or fewer lesions ≤ 3 cm). "This is best used where there is a chance of killing the entire tumor and creating tumor-free margins," Dr. Gupta said. He added that studies have shown thermal ablation to be superior to chemical ablation with ethanol in treating small, well-defined lesions. However, if a tumor is near another organ or a major blood vessel that could be damaged by the application of heat or cold, then chemical ablation is safer. The presence of an adjacent blood vessel can also reduce the local temperature as the blood flow carries away the heat caused by thermal ablation, resulting in inadequate thermal exposure for a portion of the tumor tissue. In such situations, Dr. Gupta often ablates half the tumor thermally and the other half chemically.

For tumors larger than 5 cm or for multiple tumors larger than 4 cm, there is less possibility of complete tumor eradication. In such cases, Dr. Gupta prefers using chemoembolization to debulk the tumors. For lesions that are less defined—that is, more diffuse—radioembolization is considered.

"All of these techniques can be used as stand-alone treatments or as a bridge to other treatment," Dr. Gupta said. In some patients, for example, tumors that have been debulked using thermal or chemical ablation can then be resected. In other patients, the techniques can be used to downstage the disease to render a patient eligible for a transplant. For patients who are awaiting a liver transplant, ablation or embolization can be used to keep the disease at bay until an organ is available. "The wait for a transplant organ can be quite long, and uncontrolled disease progression during that time can mean that a patient becomes ineligible and is thus denied potentially curative treatment," Dr. Gupta said.

"It is notable that these procedures can themselves result in long-term survival if done properly," Dr. Curley said. He noted that this is particularly true for patients with small, early-stage tumors located deep in the right lobe of the liver.

Portal vein embolization is another interventional strategy that can be employed for patients who are not candidates for surgical resection because of an inadequate future liver remnant. This procedure can be used to block blood flow and cause atrophy on one side of the liver, which causes hypertrophy on the other side, thus taking advantage of the liver's unique regenerative capability and increasing the amount of functional liver tissue that would remain after resection.

External-beam radiation therapy

External-beam radiation therapy is an option for patients in whom liver-directed therapies are not possible because of performance status or comorbidities. When external-beam radiation is used, three-dimensional conformal, stereotactic, or proton therapy is preferred to target tumor tissue and minimize the radiation dose to surrounding liver tissue.

Systemic therapy

Traditional chemotherapies have proven ineffective against liver cancers and until recently were used only in palliative care, according to Dr. Kaseb. The 2007 advent of the oral multikinase inhibitor sorafenib added a much-needed treatment for HCC. Sorafenib is an option for patients with advanced disease that is not amenable or not responsive to other approaches, such as patients with infiltrative or ill-defined lesions.

At MD Anderson, sorafenib is being given to patients with unresectable HCC in combination with yttrium 90 radioembolization, a treatment that requires close collaboration between medical oncologists and interventional radiologists. Also, the combination of bevacizumab and erlotinib is being studied in a clinical trial for patients whose HCC progressed during treatment with sorafenib.

Dr. Kaseb said that local and systemic therapies are particularly important for patients whose comorbidities preclude surgery. "The goal is to extend life and improve quality of life for these patients," he said. "These therapies focus on tumor control and can delay progression to liver failure, which is a more imminent cause of death from this disease than distant metastases."

On the horizon

Systemic therapy for HCC is an area of ongoing research. "At MD Anderson, we are studying neoadjuvant chemotherapies aimed at downsizing disease to fit criteria for resection or transplant," Dr. Kaseb said. This includes more aggressive therapies for patients who have single metastases that are resectable or treatable.

According to Dr. Kaseb, the trend will be toward increasingly personalized treatment for this complex and serious disease. For example, researchers hope to identify biomarkers that will help stratify HCC patients for treatment based on their functional hepatic reserve.

Because it often occurs in a cirrhotic liver and because of its numerous possible treatments, HCC is a condition that usually requires the coordination of a number of specialists,

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Music Therapy

Music therapists help cancer patients manage stress and side effects

Listening to music affects people's emotions. But did you know that music can have health benefits as well? Health care professionals called music therapists harness the power of music to improve healing and enhance quality of life for patients with cancer or other serious illnesses.

Benefits of music therapy

Music therapy helps patients manage stress and pain and improve their quality of life. For children with cancer, music therapy can encourage social interaction and cooperation. Music therapy can help adult patients to express their feelings; it has also been shown to improve memory and even promote physical rehabilitation.

Clinical studies have shown that music therapy has physical effects: it can reduce high blood pressure, rapid heartbeat, depression, anxiety, and insomnia. No one knows yet all the ways that music benefits the body, but studies have shown that music can increase brain waves, improve blood circulation in the brain, and reduce stress hormones. These effects usually are seen during and shortly after music therapy.

Music therapy can relieve treatment-related side effects, such as nausea from chemotherapy. While music therapy does not cure disease, medical experts believe it can aid healing and improve physical movement.

What is music therapy?

Music therapy sessions are tailored to fit the needs of patients. In these sessions, individual patients or groups may listen to music or play musical instruments. No previous musical experience or ability is needed for a patient to take part or benefit.

In therapy sessions, participants might write songs, talk about lyrics, or listen to specially requested music—sometimes with added visualization or soothing scents. These sessions may take place in a variety of settings, including the hospital and the home.

No particular kind of music is considered the most therapeutic, according to the American Music Therapy Association. The individual patient's preferences and needs determine the type of music a therapist uses.

Different types of music will help in different ways and will aid various symptoms. Upbeat or funny music has been shown to have a positive effect on blood pressure, which can drop drastically as a side effect of immunotherapy. Relaxing music can help ease a patient's stress.

Music therapy also can help with the loss of cognitive function that affects some cancer patients during and after treatment. The therapist might stimulate brain function by having patients make up their own songs or play an instrument. Another technique is having patients listen to several songs and then try to name the titles, artists, or anything else about the music they remember.

The profession of music therapy

Music has been used in medicine for thousands of years. Ancient Greek philosophers believed music could heal both the body and the soul, and Native Americans used singing and chanting as part of their healing rituals.

Music therapy as we know it began after World War I, when music was used to help treat veterans suffering from "shell shock" (now known as post-traumatic stress disorder). This practice continued through World War II, as amateur and professional musicians of all types went to veterans' hospitals around the country to play for thousands of soldiers who had experienced trauma in the wars. The patients showed such positive physical and emotional responses to music that doctors and nurses urged the hospitals to hire their own musicians.

When it became clear that the hospital musicians needed some specialized training, demand grew for a college curriculum. As a result, the world's first music therapy degree program was established in 1944 at Michigan State University.

Today, music therapists complete an approved college program as well as fieldwork and an internship. This training prepares them to assess the needs of their clients, develop and implement treatment plans, and evaluate and document clinical changes.

Many hospitals, including The University of Texas MD Anderson Cancer Center, have music therapists on staff. These professionals integrate music therapy into patients' treatment plans to improve the patients' physical and emotional well-being. ■

– K. Stuyck

FOR MORE INFORMATION

- *Visit the American Music Therapy Association at www.musictherapy.org.*
- *Visit the World Federation of Music Therapy at www.musictherapyworld.net.*
- *Call MD Anderson's Integrative Medicine Center at 713-794-4700.*

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potentially including medical, surgical, and radiation oncologists, hepatologists, diagnostic and interventional radiologists, and transplant surgeons. "This is a complex two-in-one disease, and referral to a multidisciplinary center is desirable," Dr. Kaseb said. "But we are happy to hear from community physicians who would like to consult us about their patients as well, and we encourage them to contact us." ■

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Breast Cancer Vaccines

[Continued from **page 3**]

stimulate the T cells, and the anti–CTLA-4 treatment would allow them to proliferate," she said.

Eventually, such vaccines could be used to treat patients much earlier in the course of their disease. "I think it would be an exciting route to look forward to in the frontline setting as well," Dr. Litton said. "We could potentially cure more people up front at the time of diagnosis." ■

FOR MORE INFORMATION

Dr. Elizabeth Mittendorf.....713-792-2362
Dr. Jennifer Litton.....713-792-2817

FURTHER READING

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