



*E & N News*

*October 2008*

**EXERCISE & NUTRITION** during/after **CANCER**

**CURRENT PEER-REVIEWED MEDICAL LITERATURE and EXPERT COMMENTARY**  
from **RELIABLE SOURCES and DR. BLEYER**

Reminder: the January-June 2008 compendium on *E&N News* is available for downloading on the DEFEAT Cancer website: [www.defeatcancer.info](http://www.defeatcancer.info). It is fully indexed and bookmarked.

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## Exercise and Nutrition

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### ***Relationship between obesity and pathologic response to neoadjuvant chemotherapy among women with operable breast cancer***

Overweight women with operable breast cancer are less likely to achieve a complete pathologic response to preoperative chemotherapy compared to women of normal weight, and had a worse overall survival during a median follow-up period of 4.1 years

Journal of Clinical Oncology, Vol 26, No 25 (September 1), 2008: pp. 4072-4077

Jennifer K. Litton, Ana M. Gonzalez-Angulo, Carla L. Warneke, Aman U. Buzdar, Shu-Wan Kau, Melissa Bondy, Somdat Mahabir, Gabriel N. Hortobagyi, Abenaa M. Brewster

**Purpose:** To understand the mechanism through which obesity in breast cancer patients is associated with poorer outcome, we evaluated body mass index (BMI) and response to neoadjuvant chemotherapy (NC) in women with operable breast cancer.

**Patients and Methods:** From May 1990 to July 2004, 1,169 patients were diagnosed with invasive breast cancer at **M. D. Anderson Cancer Center** and received NC before surgery. Patients were categorized as obese (BMI  $\geq 30$  kg/m<sup>2</sup>), overweight (BMI of 25 to  $< 30$  kg/m<sup>2</sup>), or normal/underweight (BMI  $< 25$  kg/m<sup>2</sup>). Logistic regression was used to examine associations between BMI and pathologic complete response (pCR). Breast cancer-specific, progression-free, and overall survival times were examined using the Kaplan-Meier method and Cox proportional hazards regression analysis. All statistical tests were two-sided.

**Results:** Median age was 50 years; 30% of patients were obese, 32% were overweight, and 38% were normal or underweight. In multivariate analysis, there was no significant difference in pCR for obese compared with normal weight patients (odds ratio [OR] = 0.78; 95% CI, 0.49 to 1.26). Overweight and the combination of overweight and obese patients were significantly less likely to have a pCR (OR = 0.59; 95% CI, 0.37 to 0.95; and OR = 0.67; 95% CI, 0.45 to 0.99, respectively). Obese patients were more likely to have hormone-negative tumors ( $P < .01$ ), stage III tumors ( $P < .01$ ), and worse overall survival ( $P = .006$ ) at a median follow-up time of 4.1 years.

**Conclusion:** Higher BMI was associated with worse pCR to NC. In addition, its association with worse overall survival suggests that greater attention should be focused on this risk factor to optimize the care of breast cancer patients.

#### **Dr. Bleyer:**

- ☑ Obesity is not only associated with a higher risk of breast cancer, the cancer is often more advanced, more difficult to treat, and has a worse survival rate when it does occur in overweight women
- ☑ This should be a powerful study in convincing persons to avoid excessive weight
- ☑ DEFEAT Cancer strongly recommends the combination of exercise and nutrition (E&N) in combating both obesity and cancer

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### ***Higher BMI may reduce chemotherapy response***

Comment on prior report, with speculation that obese women are undertreated, including noting that obese patients were also at greater risk for hormone-negative and stage III tumors

NEW YORK (Reuters Health) – Sep 12, 2008

New research indicates that overweight patients with operable breast cancer are less likely than their normal-weight peers to achieve a complete response with chemotherapy.

Prior research has linked obesity with worse breast cancer outcomes, but the mechanisms involved were unclear, note Dr. Abenaa M. Brewster and colleagues from the University of Texas M. D. Anderson Cancer Center in Houston.

The current investigation, reported in the Journal of Clinical Oncology, involved 1169 patients who were treated at the researchers' center from May 1990 to July 2004. Standard body mass criteria were used to divide patients into obese, overweight, and normal/underweight groups. This included body mass index (BMI) - the ratio of height to weight, often used to classify people into weight categories.

Compared to normal-weight patients, those in the overweight and the combination of overweight and obesity categories had a reduced likelihood of a complete response with chemotherapy response.

Although obese patients were as likely as normal-weight patients to have a complete chemotherapy response, they were at greater risk for hormone-negative, stage III tumors and had worse overall survival over a follow-up period of 4.1 years.

The link between a higher body mass index BMI and a reduced chemotherapy response, the authors note, "may be attributed to the influence of body mass index on the clinical effectiveness of chemotherapy or the underdosing of overweight and obese patients by clinicians because of fears of toxicity, despite randomized studies that have demonstrated that this practice contributes to worse disease-free survival."

SOURCE: Journal of Oncology, September 2008.

**Dr. Bleyer:**

- ☑ There is increasing evidence that overweight patients receive less chemotherapy that they could (or should)
- ☑ In addition to the fear of increased toxicity mentioned by the authors, the increased fat compartment of such patients may lead to deposition of lipid soluble chemotherapy drugs (of which there are many) in fat rather than in the tumor
- ☑ Also dosage calculation modifications may underestimate the need for equally effective dose administration

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***Obesity, insulin level impact prostate cancer survival***

[Heavy men with prostate cancer who have a high output of insulin have quadruple the death risk](#)

By Amanda Gardner

HealthDay News - Oct. 5, 2008)

Men who are overweight and who have high insulin levels when they are diagnosed with prostate cancer may be more likely to die from the disease, research shows.

This striking finding, published early online and expected to be in the November issue of **The Lancet Oncology**, is yet more reason to continue fighting the battle of the bulge, experts say.

"I don't want to be sensationalist, but obesity effects and the insulin effects are so big that I think if you had to choose between being thin and having a low insulin level or having access to the best chemotherapy, you would be more likely to survive without chemotherapy," said study senior author **Dr. Michael Pollak**, professor of oncology at **McGill University** in Montreal, Quebec, Canada.

"Tens of thousands of men are taking chemotherapy for prostate cancer -- as they should, because it is a good treatment. Doing so is actually helping," he said. "But **potentially, dealing with insulin, obesity may one day be of more benefit.**"

The findings also have scientific import, giving researchers a clue that could lead to new prevention and treatment strategies.

Experts have long known that androgens, or male hormones, play a critical role in spurring prostate cancer.

In fact, these cancers are often treated with approaches that deprive the tumors of testosterone.

Smaller reports have suggested that obese patients with prostate cancer have a worse prognosis than patients of regular weight, though weight hasn't been related to actually developing a malignancy.

"We found in a large sample that obesity has a very important influence on prostate cancer outcome," Pollak said.

"Then the question becomes, why would obesity make the outcome worse?"

Pollak and his colleagues looked at information on more than **2,500 men** who had been **followed for 24 years** as part of the **Physicians' Health Study**. Information on body mass index (BMI) was available for all of these men, while information on C-peptide concentration (a marker of insulin levels in the blood) was available for 827 men. Overweight men (those with a BMI of 25 to 29) had a 47 percent higher risk of dying from prostate cancer, while obese men (BMI of 30 or over) were more than two-and-a-half times more likely to die of the disease, compared with men of healthy weight (BMI under 25).

Men with the highest C-peptide concentrations also had more than double the risk of dying from their cancer compared with men with the lowest levels, the study found.

**Finally, men who had a BMI of more than 25 and high C-peptide concentrations had quadruple the risk of dying from their cancer compared with men who had lower BMIs and lower C-peptide levels**, the researchers reported.

"This suggests that there may be a whole new story to tell, whereby not just androgens have something to do with cancer behavior, but also insulin," Pollak said.

The insulin hormone may be latching onto insulin receptors located on prostate cancer cells, he speculated.

Some pharmaceutical companies are already testing drug candidates that target insulin signaling, Pollak added.

And the findings could have broader implications for other cancers, said study lead author **Dr. Jing Ma, of Harvard University's Channing Laboratory**.

"The simple things are still the important things. Don't drink, don't smoke, exercise, and eat well," said **Dr. Ganesh Palapattu**, assistant professor of urology, pathology and oncology at the **University of Rochester School of Medicine**. "This is yet another piece of evidence suggesting that obesity is not a good thing for many reasons."

"Obesity is the second leading cause of cancer death in this country next to tobacco," emphasized **Dr. Jay Brooks**, chief of hematology/oncology at **Ochsner Health System** in Baton Rouge, La. "Two years ago, I would never have told my patients that obesity is increasing their risk of death from cancer. Today, I do."

**Dr. Bleyer:**

- ☑ Being overweight (BMI >25) and having a high plasma insulin levels is associated with a risk of magnitude (4 times) of premature death from cancer that exceeds most other reported increase risks of cancer associated with obesity
- ☑ Dr. Brooks' comment is worth repeating: "Obesity is the second leading cause of cancer death in this country next to tobacco"
- ☑ "Don't drink, don't smoke, exercise, and eat well" (Dr. Palaputtu) is also worth quoting, especially since this advice combines exercise and nutrition

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***Piling on the pounds increases men's colon-cancer risk, research reveals*** [Prevention]

The correlation between the incidence of colon cancer and weight gain continues to be strengthened, with quantification of the risk in men at 33% for every 10 pounds gained since age 21

Reuters © The Gazette (Montreal) September 10, 2008

Men who gain weight as they age have an increased risk of suffering from colon cancer, according to new research. In a study of more than 46,000 men between the ages of 40 and 75 years old, researchers said nearly one third of all colon cancer diagnosed over an 18-year period were in men who had a body mass index (BMI) - a weight-to-height ratio widely used as a measure of being overweight or obese - greater than 22.5.

BMI is a method of determining overweight and obesity. The normal range for men is a BMI of 18.5 -24.9.

The findings, "support public health interventions to avoid weight gain for prevention of colon cancer," **Dr. Lau Caspar Thygesen** and researchers from the **National Institute of Public Health in Copenhagen** said in a report in the **International Journal of Cancer**.

None of the men had cancer at the start of the study in 1986. Information on the men's medical history, weight and diet was updated every two to four years until 2004.

Men with an average BMI above 22.5 had a significant increased risk of colon cancer compared with those with an average BMI between 20 and 22.5, Thygesen said.

The risk was more than doubled among those with a BMI greater than 30, which is considered obese.

**The researchers estimate that for every 10 pounds gained in the prior two to four years, the risk increased by 14 per cent. Similarly, for every 10 pounds of weight gained per 10 years since age 21, the risk increased by 33 per cent.** By contrast, weight at age 21 was not associated with risk.

**Dr. Bleyer:**

- ☑ The link between excessive weight gain and colon cancer is undeniable, in both men (this report) and women
- ☑ The bariatric surgery experience closes the loop in that it shows that colon cancer risk is reduced in association with weight loss

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**Exercise**

***Randomized pilot test of a lifestyle physical activity intervention for breast cancer survivors***

In a small randomized, controlled trial, weekly exercise interventions for 6-months led to remarkable improvements in physical performance, pain management, and general health among breast cancer patients

Basen-Engquist K, Taylor CL, Rosenblum C, et al.

Patient Educ Couns. 2006 Dec;64(1-3):225-34. Epub

The University of Texas M.D. Anderson Cancer Center

**OBJECTIVE:** This paper will report the results of a pilot test of a 6-month, 21-session intervention to increase breast cancer survivors' physical activity by teaching them to incorporate short periods of moderate activity into their daily routines (lifestyle intervention). The effect of the intervention on physical performance, quality of life, and physical activity are reported.

**METHODS:** Sixty breast cancer survivors were randomized to either a lifestyle intervention or a standard care control group. Physical performance, quality of life (Medical outcomes study short form-36 [SF-36]), and physical activity (7-day recall and motivation readiness), were assessed at baseline and 6 months.

**RESULTS:** The lifestyle group had significantly better performance in the 6-min walk task than the controls ( $p=0.005$ ) at 6 months. The intervention had positive effects on the bodily pain ( $p=0.020$ ) and general health ( $p=0.006$ ) subscales from the SF-36. The lifestyle group had a greater motivational readiness for physical activity at

6-month than standard care, but no significant differences were seen between the two in terms of number of minutes of moderate or more intense physical activity or number of days on which they did > or =30 min of moderate or more intense activity.

**CONCLUSIONS:** Despite the small sample size, the lifestyle intervention showed promise for improving physical functioning and quality of life and increasing physical activity, and should be tested in a larger randomized trial.

**PRACTICE IMPLICATIONS:** If the lifestyle approach is shown to be effective in a larger trial, it represents a highly feasible intervention that it can be delivered to cancer survivors by health care institutions or community organizations without dedicated exercise facilities and equipment.

**Dr. Bleyer:**

- ☑ This study was reported in 2006 and missed in the monthly E&N News survey of the peer-reviewed literature
- ☑ The results, in a relatively small number of patients, showed highly statistically significant benefits of exercise on physical performance, pain control, and general health
- ☑ Again, as DEFEAT Cancer continues to point out, the results may have been even more dramatic if nutrition had been included in the study

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***Moderator analyses of participants in the Active for Life after cancer trial: implications for physical activity group intervention studies.***

Whereas an overall comparison of exercise versus educational support versus standard care showed not benefit on quality of life in prostate cancer patients, a subset analysis showed that patients in greater need of mental and psychosocial intervention did benefit and for at least a year

Ann Behav Med. 2007;33(1):99-104

Carmack Taylor CL, de Moor C, Basen-Engquist K, Smith MA, Dunn AL, Badr H, Pettaway C, Gritz ER.  
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**BACKGROUND:** Prostate cancer patients on hormonal therapy experience significant treatment-related physical and psychological sequelae.

**PURPOSE:** We examined moderator variables to determine whether certain participants demonstrated quality of life (QOL) benefits from a group-based lifestyle physical activity program compared to a group-based educational support program and standard care.

**METHODS:** Participants were 134 prostate cancer patients on continuous androgen ablation in a controlled trial that used adaptive allocation.

**RESULTS:** As reported elsewhere, no significant differences were found between study conditions on primary QOL outcomes following the 6-month interventions. However, in a secondary analysis, several significant interactions indicated that both group programs benefited patients with lower psychosocial functioning at baseline; patients with lower mental health and social support scores had significant improvements in these measures compared with standard care. For those with higher pain, the educational support program resulted in significant improvements compared with the other two conditions. Twelve-month findings indicated lasting effects.

**CONCLUSIONS:** Consistent with existing research, results indicate that group interventions benefit cancer patients with limitations in psychosocial functioning. Findings underscore the importance of physical activity/exercise studies to employ control conditions that consider the attention and support provided by health educators and group members, particularly when examining psychosocial outcomes and pain.

**Dr. Bleyer:**

- ☑ This study was reported last year but missed in our monthly survey of the peer-reviewed literature
  - ☑ An earlier report of the study (Psychooncology. 2006 Oct;15(10):847-62) reported no overall benefits and concluded that the "results suggest a lifestyle program focusing on cognitive-behavioral skills training alone is insufficient for promoting routine physical activity in these patients."
  - ☑ This follow-up report indicates that survivors in greatest need have the greatest benefit of exercise, a not unexpected result
  - ☑ Once again, the result may have been more obvious and apparent overall, if nutrition was included in the study
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## **Health clubs gear programs for those with ailments (especially cancer)**

[Health clubs are providing programs specifically for cancer patients as the evidence for benefit of exercise continues to accumulate](#)

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By JAMIE STENGLE - The Associated Press  
Sept. 28, 2008

DALLAS — When Patti Kiernan found out she had osteoporosis, she decided it was time to find a more focused workout.

The 61-year-old signed up for a fitness program at her Dallas gym that's geared specifically for women with health problems. Kiernan liked the four-week Female Focus program so much she's still in after two years.

"I just felt that this was the right way to go," said Keirnan, who also began taking medication and saw her bone density improve after a year. "Plus, there were other women in the program who had the same problem."

More and more clubs are offering exercise programs fine-tuned for people coping with a variety of ailments, said Joe Moore, head of the International Health, Racquet and Sportsclub Association. He said the number of programs has grown along with the number of studies showing the health benefits of exercise.

Medical and fitness experts say that exercise not only elevates the mood and energy levels, but helps control weight — a contributing factor for many diseases.

**For breast cancer patients, "being overweight or gaining weight post diagnosis is a huge risk factor" for recurrence, said Colleen Doyle, director of nutrition and physical activity for the American Cancer Society.**

Her group and the American College of Sports Medicine are devising a special certification for people who work with cancer patients on exercise programs.

**Julie Main developed such a program after she was diagnosed with breast cancer at the age of 36 in 1993. She was inspired after her doctor mentioned that she seemed to be going through treatment better than other patients.**

**She told him one thing she was doing was continuing to exercise.**

**"He said, 'Most of my other patients don't do that.' I said, 'Well, maybe they should,'" Main said.**

Now president of West Coast Athletic Clubs with five gyms in California, Main teaches other health clubs how to set up programs similar to her twice-a-week, 10-week program. Her free programs are done in collaboration with the Cancer Center of Santa Barbara and focus on strength-training.

**"With cancer, people feel too tired to exercise, but if they exercise the fatigue is less," said Christine Brown, the Cancer Center's wellness manager.**

In suburban Boston, patients are referred to the Dedham Health and Athletic Complex after they've been diagnosed with anything from heart disease to arthritis to diabetes, said Lloyd Gainsboro, co-owner and director of business development.

Sixty-day programs that cost \$60 emphasize strength and cardiovascular training and are taught in an area of the gym with more carpet and sofas and fewer "spandex and beautiful bodies," Gainsboro said.

Participants in the Female Focus program at Dallas' Cooper Fitness Center pay **\$580 for an evaluation, eight training sessions, two lectures — one on exercise and another on nutrition — and a workout booklet to help them continue their routine.**

Program founder Colette Cole said the evaluation helps her tailor the workouts to each participant and their capabilities.

The program appealed to 47-year-old Gretchen Montgomery, who was feeling some trepidation about resuming exercise after a bout with food poisoning and an emergency hysterectomy in the spring.

"I loved that it wasn't a room of workout babes," Montgomery said.

**Ellen Orzel did two sessions of the program last spring, about a year after a double mastectomy. After the surgery and treatment, the 49-year-old said she was weaker and carrying 20 extra pounds.**

**"I was comfortable going in there, knowing I could tell her I had a mastectomy," she said.**

**Orzel said she's less sore, stronger and has lost about half of the extra weight.**

**"My whole upper body just really felt so much better," she said.**

Experts say such programs can also serve as a support group.

"There's no substitute for the camaraderie that forms among those that know what the other is going through," said Brown of the Santa Barbara center.

**Dr. John Pippen, a cancer specialist at Baylor University Medical Center, said that he tells his breast cancer patients to try to walk three to five hours a week.**

**"To me, it's killing several birds with one stone — preventing osteoporosis, reducing cancer risk, perhaps most important of all, reducing cardiovascular risk," Pippen said.**

And while joining a fitness club might help keeping up with an exercise routine, he said it's not necessary. "You can just start at your own front door with your comfortable walking shoes and away you go," he said.

**Dr. Bleyer:**

- ☑ Obviously the health clubs are identifying a niche for cancer survivors that will not only help their business but also the clients
- ☑ If combined with a nutrition program, these programs are well worth the cost (e.g. \$580 for an evaluation, eight training sessions, two lectures — one on exercise and another on nutrition)

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***The broccoli fight against breast cancer*** [Prevention]

[New research on diet, nutrition and disease finds certain vegetables have a compound some studies suggest may help stop breast cancer](#)

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BY DELTHIA RICKS

Newsday - October 5, 2008

1 2 next Broccoli, the stalky green vegetable long sniffed at by children and even a U.S. president, is one of a growing number of common foods that may help stop breast cancer before it starts.

For years, scientists who theorized that women could avoid breast cancer by eating foods packed with certain chemical compounds were regarded as renegades.

Now some of those theories are producing intriguing results. And as they prowl the vegetable aisle for inspiration, some scientists have trained a spotlight on a family of kissing cousins - cruciferous vegetables, including cabbage, cauliflower, collard greens and, most of all, broccoli.

"A variety of healthy foods can provide a broad range of protective compounds," said **Karen Collins**, nutrition consultant for the **American Institute for Cancer Research**, a charity that supports research on diet and cancer prevention. "We are only beginning to scratch the surface into what they may involve."

Even as food science and medical research increasingly intersect, many doctors are cautious about sweeping recommendations that focus on a single family of plant foods. And research into foods that combat breast cancer faces a powerful institutional barrier: money. Consumer advocates point out that conducting studies that follow people for years to see they don't get sick as they eat certain foods is expensive. By comparison, drug approval is more efficient.

"The world is still not ready for prevention as a way to handle the medical problems of an aging population," said **Dr. Paul Talalay of Johns Hopkins University**, the leader on research that suggests the cancer-thwarting potential of broccoli.

Still, the menu of possible cancer-fighting foods is growing. Collins said there was also evidence compounds from an array of foods may work together. Walnuts recently have been found to possess a powerful effect against breast cancer cells because they contain a type of omega-3 fatty acid (alpha-linolenic acid or ALA) that reduces inflammation, prevalent in a variety of medical conditions, including cancer. Canola oil and flaxseed are additional ALA sources, she said.

New research also has pointed to pigment compounds in strawberries, pomegranates and green tea as providing protection against breast cancer.

Talay was the first to isolate a broccoli-related compound called sulforaphane glucosinolate in 1992, which shows potent activity against breast cancer cells. Other scientists, such as **Dr. Jerry Kosmider of the University of Chicago**, also have demonstrated that sulforaphane may be a powerful anti-cancer agent.

Researchers say the compound energizes enzymes in the body that inhibit cells from becoming cancerous.

Sulforaphane is present in all cruciferous vegetables but is most abundant in broccoli.

The compound can also enhance the activity of two key enzymes in the body that fight against tumor development.

"We found that cruciferous vegetables were very effective in boosting these enzymes and it now appears to be associated with their unique chemistry," Talalay said.

In a Talalay study, lab mice dosed with sulforaphane never developed cancer. But rodents fed their usual diet developed debilitating cancers.

Talay has found the highest concentration of sulforaphane is in broccoli sprouts, which contain about 20 to 50 times more than mature plants. Working with a plant physiologist at Johns Hopkins, Talalay's team has developed a seed that produces sprouts with exceptional sulforaphane levels. He and his university team sell the seeds to a network of growers who grow them into sprouts for sale in supermarkets.

Yet, after nearly 20 years, Talalay has not conducted a large-scale clinical trial that could produce the kind of evidence needed to win sulforaphane's official endorsement from the medical community.

Prevention trials, he said, are difficult to conduct because they require thousands of people who would have to be monitored over 20 years. The cost of managing such a trial, he added, would be too high.

Arthur Levin, director of the Center for Medical Consumers in Manhattan, is not surprised. In a prevention trial based on a vegetable chemical, he noted, the aim is to show a disease did not occur, a concept often difficult to prove, whereas, with drugs, the aim is to prove the treatment of an existing disease.

"If they have to run a trial for 15 or 20 years that means they're not going to see any return on their investment for a very long time," said Levin, who has served on numerous advisory committees of the Food and Drug Administration, which oversees the approval of pharmaceuticals.

Talalay is convinced the world will one day see broccoli as he does. "This is my baby. Everybody has to have a baby of some sort. This is mine."

**Dr. Bleyer:**

☑ DEFEAT Cancer presumes that no single food substance or group will be sufficiently effective to either prevent or treat cancer

☑ And DEFEAT continues to recognize limitations of nutrition in cancer treatment (and prevention) without concomitant physical activity (exercise et al)

## Nutrition

### ***Vitamin C megadoses hamper cancer treatments in mice*** [Laboratory Study]

#### **Study suggests disruption of chemotherapy's ability to target tumor cells**

By Randy Dotinga

Oct. 1 - HealthDay News)

[Large doses of vitamin C could reduce the effectiveness of anticancer drugs, according to a new study that focused on laboratory cancer cells and mice](#)

The finding raises questions about whether human patients might suffer the same effects, the study authors said.

"There's a possibility that taking supplemental vitamin C could have a detrimental effect on cancer treatment," said study author Dr. Mark L. Heaney, associate attending physician at Memorial Sloan-Kettering Cancer Center in New York City.

However, there's no indication that smaller doses of vitamin C, such as those found in food and ordinary multivitamins, might be a problem, he said.

Vitamin C has not traditionally been considered a hindrance to cancer treatment. In fact, some scientists -- including the late Linus Pauling -- have long viewed vitamin C as a potential cancer fighter. Recent research has suggested that vitamin C could help prevent cancer, but it's not clear why.

The vitamin, found in fruits and vegetables, also has a reputation as a treatment or preventive for a variety of ailments, including colds.

In the new study, Heaney and his colleagues gave doses of vitamin C to mice with tumors before they underwent chemotherapy. While the type of vitamin C given to the mice isn't available over the counter, it's the equivalent of a 2,000-milligram dose for humans, Heaney said. That's the equivalent of the vitamin C found in 75 six-ounce glasses of orange juice. Supplements packing that much vitamin C are found in health stores, he said.

The researchers found that the vitamin C reduced the effectiveness of the chemotherapy by about 30 percent to 70 percent.

Heaney theorized that it's possible that vitamin C may disrupt chemotherapy's killing processes and provide protection to the cancer cells.

The findings were published in the October issue of the journal *Cancer Research*.

Heaney said the next step is to launch studies with people, but, he added, it may be a "hard sell" to convince patients to take high-dose vitamin C supplements if it appears they counteract chemotherapy.

For now, he said, "What I recommend to my patients is that they continue to eat a well-balanced diet that has vitamin C, and that they don't take supplemental vitamin C. I think a multivitamin is fine."

Dr. Chi Van Dang, who directs the Institute for Cell Engineering at Johns Hopkins University School of Medicine, said the new study appears valid, "although some conclusions are based on small numbers of animals. A larger number of animals could settle whether there is a real trend or not."

Scientists should take the study seriously, he added, but the other side of the equation must be examined, too.

"Additional studies are necessary regarding whether vitamin C as a single agent could prevent cancer or the recurrence of cancer once treated."

Pamela Mason, scientific adviser and spokeswoman for the Health Supplements Information Service, said, "The

tudy concluded that vitamin C reduced the effectiveness of anticancer drugs in laboratory cell cultures and in mice with implanted cancer cells. Though the researchers said that their findings could have implications for human beings treated with anticancer drugs, they also added that this needs to be tested in a proper clinical trial."

SOURCES: Mark L. Heaney, M.D., Ph.D., associate attending physician, Memorial Sloan-Kettering Cancer Center, New York City; Chí Van Dang, M.D., Ph.D., the Johns Hopkins Family Professor in Oncology Research, and director, Institute for Cell Engineering, Johns Hopkins University School of Medicine, Baltimore; Oct. 1, 2008, news release, Health Supplements Information Service, Anchorage, Alaska; October 2008, Cancer Research

**Dr. Bleyer:**

- ☑ This laboratory report is included because a prior report on experiments demonstrated anticancer benefits of high (intravenous) doses of vitamin C (*E&N News*, August 2008)
- ☑ These two opposing reports on laboratory experiments represent a prototypical example of how laboratory experimental conditions can lead to seemingly contradictory results, which are often due to different animals, tumors, conditions, routes of administrations, endpoints
- ☑ Because thousands of experiments can be performed in the laboratory (in comparison to a few or any in humans), results can vary widely and must be verified and re-verified, preferably by other laboratories, and published in several peer-reviewed journals before they should be accepted for potential human application (and hope)

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***Vitamin C may blunt effect of chemotherapy*** [Laboratory Study]

WASHINGTON (Reuters) – Oct 1, 2008

[Vitamin C supplements may undercut the effectiveness of cancer drugs including Novartis' Gleevec \(further comment on prior report\)](#)

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Vitamin C supplements may undercut the effectiveness of cancer drugs including Novartis' Gleevec. When used on human cancer cells treated with a form of vitamin C in lab dishes, chemotherapy drugs killed 30 percent to 70 percent fewer tumor cells than usual, the scientists wrote in the journal *Cancer Research*.

Dr. Mark Heaney of Memorial Sloan-Kettering Cancer Center in New York and colleagues also implanted human cancer cells into mice, and found that when mice got vitamin C supplements two hours before chemotherapy, the tumors grew more quickly.

They tested five common chemotherapy drugs including Gleevec, also known as imatinib.

"The vitamin C didn't neutralize the effects of the chemotherapy drugs, but it blunted their effects," Heaney said in a telephone interview.

The other drugs were doxorubicin, cisplatin, methotrexate and vincristine. They work in different ways to combat tumors.

"Vitamin C is something everyone needs to have in their diet or you develop scurvy. But I don't recommend taking supplemental vitamin C during that period of time that my patients are receiving chemotherapy," Heaney added.

Heaney said it did not appear that the antioxidant properties of vitamin C were the culprit. Rather, it may be the protective effect vitamin C has on mitochondria -- which generate energy for a cell -- within cancer cells, he added. Chemotherapy drugs damage mitochondria in cancer cells.

"When mitochondria are damaged, they can send signals to the cell to die. And that's, we think, one of the ways that the chemotherapy drugs exert their beneficial effects. And vitamin C helps to preserve the health of the mitochondria," Heaney said.

By protecting the mitochondria, vitamin C prevents chemotherapy agents from working to their full potential. Heaney acknowledged that a study looking at cancer cells in laboratory dishes or in mice is not the final word on the subject, and said more research is needed.

The findings are the latest development in the controversy over vitamin C and cancer. The notion that vitamin C, also known as ascorbic acid, could be used to treat cancer was advanced in the 1970s by American scientist Linus Pauling, who was awarded the Nobel Prize in chemistry in 1954.

Studies in which vitamin C pills were given to treat cancer failed to show a benefit.

But a study at the U.S. National Institutes of Health published in August showed that injections of high doses of vitamin C greatly reduced the rate of tumor growth in mice.

**Dr. Bleyer:**

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