

# Oncology Nutrition Connection

## Oncology Nutrition

a dietetic practice group of the  
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and Dietetics



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## Dairy Foods, Milk, Calcium and Risk of Prostate Cancer

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### Introduction

According to the National Cancer Institute (NCI), prostate cancer is the second most common cancer in the United States (U.S.) and the second leading cause of cancer-related deaths among U.S. men (1). The NCI estimates that 238,590 cases of prostate cancer will be diagnosed and 29,720 men will die from this disease in 2013 (2). Established risk factors for prostate cancer include family history, age, race, and hormone use, specifically dihydrotestosterone (3). Worldwide, prevalence of prostate cancer varies considerably. Prevalence rates in China are approximately 1 per 100,000 men, compared with higher U.S. rates of 45 to 65 per 100,000 white men and approximately 102 per 100,000 black men (4).

Modifiable risk factors such as multivitamin use, calcium intake, and folate intake may potentially affect prostate cancer risk (3). Epidemiologic evidence suggests that dairy foods and/or calcium also may increase the risk of prostate cancer. This paper reviews epidemiological studies and one controlled trial examining the link between intake of dairy products, milk, calcium, and prostate cancer incidence. The majority of studies presented are prospective cohort studies, which used food frequency questionnaires (FFQ) to establish intake of dairy foods and calcium at baseline and examined

associations between their intake and incidence of prostate cancer. Case control studies and meta-analyses also are presented. Unless otherwise noted, all studies performed statistical adjustments for the following confounding variables: age, smoking status, body mass index (BMI), total energy intake and family history of prostate cancer. In order to counsel cancer survivors and communicate with the medical team, RDs should understand the evidence on this important public health issue.

*(Continued on page 3)*

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## ON DPG Chair Message

It's finally arrived...the new and improved ON DPG website. The changes are major, and it was quite an undertaking to upgrade our web presence. A big Thank You to Heather Bell-Temin who worked with our web developer and oversaw this process, and to Maureen Gardner, who assisted Heather with the upgrade. Please take a moment to check it out at [www.oncologynutritiondpg.org](http://www.oncologynutritiondpg.org). Note that the URL has changed, with dpg added to our old website address. Update those bookmarks!



One of the biggest changes to the website is that we have a more public presence, with more information for non-DPG members. A big challenge for us will be keeping this information fresh, up-to-date, and useful. We need your expertise, and *when we post your content, you will be given credit as the author.*

We welcome any and all contributions—FAQs, your tried and true symptom management tips, recipes, research reviews, and other educational materials. We have a committee of talented RDs who will work with you, editing, and getting your work perfected and ready to share with the world. Please send your contributions to Alison Ryan ([alison.n.ryan@gmail.com](mailto:alison.n.ryan@gmail.com)).

In addition to the new website, we've recently formed a webinar committee. This group will be tasked with bringing more continuing education webinars to you in the coming months. We already have plans in the works for three webinars. Topics include the benefits of early nutrition intervention for oncology patients, tube feeding basics, and energy balance for healthy survivorship. Additional topics are being planned. Please drop me a line ([sdixon@umich.edu](mailto:sdixon@umich.edu)) with ideas you'd like us to consider for these webinars. I will pass them on to our webinar committee.

Finally, back due to popular demand: The Oncology Nutrition DPG Symposium. The symposium committee is now beginning its work, planning for our next event, which will take place in the Spring of 2014. If you have ideas for topics you'd like to see at the symposium, or have heard a wonderful speaker who might be a good fit for our symposium, please let me know ([sdixon@umich.edu](mailto:sdixon@umich.edu)). I will pass your requests on to the talented RDs planning your next ON DPG symposium.

Are you sensing a theme? I just wrote three paragraphs in a row that request your input! This group is only as good as what we can do for you, our members. Please let us know what you'd like to see in the future from your DPG.

Suzanne Dixon, MPH, MS, RD  
ON DPG Chair, 2012-13

### CPE Article Answer Key:

- |      |       |
|------|-------|
| 1. B | 6. B  |
| 2. C | 7. B  |
| 3. D | 8. D  |
| 4. A | 9. C  |
| 5. D | 10. A |

## Dairy Intake and Risk of Prostate Cancer

### *Prospective cohort studies*

Data on intake of total, low-fat, and high-fat dairy foods and incident prostate cancer cases were collected from a large cohort of men enrolled in the Prostate, Lung, Colorectal, and Ovarian Cancer (PLCO) Screening Trial. Men from multiple sites throughout the U.S. were followed for 8.9 years (5). Findings include:

- There was no association between aggressive prostate cancer risk and total, low-fat or high-fat dairy intake.
- Total dairy intake was associated with a significantly increased risk (RR=1.20; 95% CI: 0.99-1.46) of non-aggressive prostate cancer.
- Low-fat dairy intake was associated with a significant and positive increased risk of all cases of prostate cancer (RR=1.23; 95% CI: 1.07-1.41) and incidence of nonaggressive cases of prostate cancer (RR=1.3; 95% CI: 1.09-1.55).
- High-fat dairy intake was not associated with risk of total or non-aggressive prostate cancer incidence.

Over an 11-year period, the Physicians' Health Study (6) examined associations between prostate cancer and dairy intake in a cohort of male physicians. Highest quartiles of dairy intake were associated with significant increases in risk of total, (RR 1.34; 95% CI: 1.04-1.71), advanced (RR 1.38; 95% CI: 0.95-2.01) and non-advanced (RR 1.42; 95% CI: 0.98-2.04) prostate cancers when compared with intake in the lowest quartiles. (See Table 1 for quartile servings). In the CLUE II study (7), a small cohort of randomly selected residents of Washington County, Maryland were followed for up to 15 years. There was a significant 65 percent increase in prostate cancer risk among participants in the highest tertile, who consumed five or more servings of dairy per week, when compared with those in the lowest tertile, who consumed one serving or less per week (RR 1.65; 95% CI: 1.02-2.66). The study did not control for family history, but the percentage of participants with a positive family history was similar across tertiles of

dairy intake. Another small cohort of men from the National Health and Nutrition Examination Survey I (8) were followed for 10 years. Participants in the highest intake tertile, who consumed three servings of dairy food per day, the amount currently recommended by the Dietary Guidelines for Americans, experienced more than twice the risk of prostate cancer when compared with those who consumed five servings per week, or slightly less than 1 serving per day (RR 2.2; 95% CI: 1.2-3.9).

Three prospective cohort studies conducted in France (RR 1.35; 95% CI: 1.02-1.70), Finland (1.26; 95% CI: 1.04-1.51) and Japan (1.63; 95% CI: 1.14-2.32) also found significantly increased prostate cancer risk in the group consuming the highest versus lowest amount of dairy intake, though results of the Finnish study were no longer significant when the analysis was adjusted for calcium (9–11).

Using dairy protein as an estimate of total dairy intake, the European Prospective Investigation into Cancer (EPIC) and Nutrition found that dairy protein was associated with an increased risk of prostate cancer (RR 1.22; 95% CI: 1.07-1.41) over 8.7 years of follow-up (12). In this large study, risk of prostate cancer increased by 32 per cent for every 35 additional grams of daily dairy protein consumed (RR 1.32; 95% CI: 1-72%). This trial did not account for family history of prostate cancer, which could confound results.

Unlike the previous studies, which suggested that dairy intake could increase prostate cancer risk, three prospective cohort studies found no significant associations between dairy intake and prostate cancer incidence (13–15). In the Multiethnic Cohort Study (13), there was no association between total dairy intake and risk of total, advanced, or high-grade prostate cancer. The Harvard Alumni Health Study also found no association between dairy intake and risk of prostate cancer in the cohort studied (14). Another large study of adult males, aged 50-74 years at baseline, found no association between either total or advanced prostate cancer and dairy

product intake (15). BMI and smoking status were measured but not included in multivariate analysis, though BMI was reported as similar across tertiles of calcium intake. This study used prostate specific antigen (PSA) testing to detect cancers, which may be a potential confounding factor. PSA can increase for reasons other than prostate cancer, and cancers detected via this method may have weaker associations with diet (16).

### *Retrospective and Case-Control Studies*

The association between dairy intake and prostate cancer risk was examined in a small cohort from the Baltimore Longitudinal Study of Aging. Most subjects completed a FFQ after being diagnosed, and no significant association was found between dairy intake and prostate cancer risk. However, neither smoking status nor family history of prostate cancer was assessed, each of which could be a confounding factor (17). A population based case-control study from Sweden (18), which matched 526 cases with 536 controls, found that, adjusted for age, men with the highest level of dairy intake ( $\geq 4.5$  servings per day) had a significantly higher prostate cancer risk (RR 1.53; 95% CI: 1.09-2.13,  $p=0.02$ ) compared with men with the lowest intake level ( $< 2.5$  servings per day). When data were adjusted for energy, the results were non-significant (RR 1.40;  $p= 0.10$ ). A small, hospital based case-control study in Greece found no statistical significance comparing highest versus lowest categories of dairy intake and prostate cancer risk, though authors did report a non-significant trend for this association ( $p=0.08$ ) (19).

### *Meta-analysis*

Gao et al. examined prospective cohort studies published in English language journals between 1996-2005, finding a greater risk of prostate cancer in the highest intake category of dairy products as compared with the lowest (overall pooled RR =1.11; 95% CI: 1.00-1.22) (20). Huncharek et al. (21) examined 45 observational studies. Of 21 cohort studies that met inclusion criteria, 11 contained a "dairy exposure

*(Continued on page 5)*

**Table 1. Summary of Prospective Cohort Studies On Prostate Cancer and Dairy Intake:**

Prospective Cohort Studies	n, cases, follow-up	Results
<b>Prostate, Lung, Colorectal and Ovarian Screening Trial (PLCO) (5)</b> Highest category of total dairy intake $\geq 2.75$ svgs/day; lowest category of total dairy intake $\leq 0.98$ svgs/day  Highest category of low-fat dairy intake $> 1.89$ svgs/day; lowest category of low-fat dairy intake $< 0.15$ svgs/day	n = 29,509; 1,910 cases; 8.9 years	<ul style="list-style-type: none"> <li>• No significant association between total, low-fat or high-fat dairy intake and risk of aggressive prostate cancer.</li> <li>• Highest versus lowest category of total dairy intake associated with increased risk of non-aggressive prostate cancer (RR=1.20; 95% CI: 0.99-1.46).</li> <li>• Highest versus lowest category of low-fat dairy intake associated with increased risk of total prostate cancer cases (RR 1.23; 95% CI: 1.07-1.41).</li> <li>• Highest versus lowest category of low-fat dairy intake associated with increased risk of nonaggressive prostate cancer cases (RR 1.3; 95% CI: 1.09-1.55).</li> <li>• No association between high-fat dairy intake and total or non-aggressive prostate cancer cases</li> </ul> Note: After adjusting for calcium intake, authors reported no association between dairy product intake and prostate cancer risk.
<b>Physicians' Health Study (6)</b> Highest quintile of dairy foods $> 2.5$ svgs per day; lowest quintile $< 0.5$ svgs/day	n = 20,885; 1,012 cases; 11 years	<ul style="list-style-type: none"> <li>• Highest versus lowest categories of total dairy intake associated with increased risk of total (RR 1.34; 95% CI: 1.04-1.71), advanced (RR 1.38; 95% CI: 0.95-2.01) and non-advanced (RR 1.42; 95% CI: 0.98-2.04) prostate cancer cases.</li> </ul>
<b>CLUE II Study (7)</b> Highest tertile of dairy food intake 5+ svgs per week; lowest tertile of dairy intake $< 1$ svg/week	n = 3,892; 199 cases; 15 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of dairy intake associated with increased prostate cancer risk (RR=1.65; 95% CI: 1.02-2.66).</li> </ul>
<b>National Health and Nutrition Examination Epidemiologic Follow-up Study cohort (8)</b> Highest tertile of dairy intake 21 servings / week; lowest tertile 5 servings per week	n = 3,612; 131 cases; 10 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of dairy intake associated with increased prostate cancer risk (RR 2.2; 95% CI: 1.2-3.9).</li> </ul>
<b>Cohort of Supplementation en Vitamines et Mineraux Antioxydants (SU.VI. MAX) Study (9)</b> Median highest quartile of dairy food intake $> 696$ g/day; lowest quartile $< 354$ g/day	n = 2,776; 69 cases; 7.7 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of dairy intake associated with increased prostate cancer risk (RR= 1.35; 95% CI: 1.02-1.70).</li> </ul>
<b>Alpha-Tocopherol Beta-Carotene (ATBC) Cancer Prevention Study (10)</b> Mean highest quintile of dairy intake 1,220 g/day; lowest quintile of dairy intake 380.9 g/day	n = 27,028; 1,276 cases; 17 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of dairy intake associated with increased prostate cancer risk (RR 1.26; 95% CI: 1.04-1.51). Non-significant after adjustment for calcium (P=0.17).</li> </ul>
<b>Population based prospective study in Japan (11)</b> Median highest dairy intake category 339.8 g/day; lowest intake category 12.8 g/day	n = 43,435; 329 cases; 7.5 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of dairy intake associated with increased prostate cancer risk (RR 1.63; 95% CI: 1.14-2.32).</li> </ul>
<b>Cohort from the European Investigation Into Cancer (EPIC) Study (12)</b> Mean intakes for quintile 1 through quintile 5 for dairy protein were 10, 14, 17, 21 and 27 g/day	n = 142,251; 2,727 cases; 8.7 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of dairy protein associated with increased prostate cancer risk (RR 1.22; 95% CI: 1.07-1.41).</li> <li>• Prostate cancer risk increased by 32% for every additional 35 grams of dairy protein consumed daily (RR 1.32; 95% CI: 1-72%). Note: Trial did not account for family history of prostate cancer.</li> </ul>
<b>Multiethnic Cohort Study (13)</b> Mean highest quintile of dairy intake $> 332$ g/day; lowest quintile of dairy intake $< 49$ g/day	n = 82,483; 4,404 cases; 8 years	<ul style="list-style-type: none"> <li>• No association between dairy intake and total, advanced, or high-grade prostate cancer risk.</li> </ul>
<b>Cohort of the Harvard Alumni Health Study (14)</b> Highest quartile of dairy intake $> 3.25$ svgs/day; lowest intake quartile $0-1.25$ svgs/day	n = 10,011; 815 cases; 10 years	<ul style="list-style-type: none"> <li>• No association between dairy intake and prostate cancer risk.</li> </ul>
<b>Cancer Prevention Study II Nutrition Cohort (15)</b> Highest quintile of dairy intake 4+ svgs/day; lowest quintile $< 3$ svgs per week	n = 65,321; 3,811 cases; 7 years of	<ul style="list-style-type: none"> <li>• No association between dairy intake and prostate cancer risk. Note: PSA-detected cases of prostate cancer only, not biopsy confirmed.</li> </ul>

category”, meaning they defined which types of dairy were included in the study. Among these 11 homogeneous studies there was a non-significant increased prostate cancer risk (summary RR=1.11). Among 24 case-control studies, five reported a dairy exposure category; a non-significant increased prostate cancer risk was observed in homogeneous data from these studies (RR 1.14).

### Milk Intake and Risk of Prostate Cancer

(See Table 4 for serving data)

Studies have examined the relationship between prostate cancer and specific dairy products including milk. Two prospective cohorts, the large Multiethnic Cohort Study (13) and a smaller cohort followed by Rohrmann and colleagues (7) found no association between total milk intake and prostate cancer risk. In each of these studies, the highest level of milk consumption was lower than the recommended intake for Americans, at approximately one cup or more per day and five or more servings per week, respectively. The differences between high and low intake may not have been enough to uncover an association, if one exists. In a third U.S. cohort, based on NHANES I data, the median milk intake in the highest tertile was fourteen servings per week, which was significantly associated with an 80 percent increase in prostate cancer risk (RR 1.8; 95% CI: 1.1-2.9) when compared with the lowest tertile intake of 0.5 servings per week (8).

Results for non-U.S. prospective cohorts are mixed as well. The EPIC cohort (12) as well as studies in France (9) and Finland (10) found no association between total milk intake and prostate cancer risk, but a population-based prospective study from Japan found an increased risk of prostate cancer when comparing the highest intake quartile with the lowest quartile (RR 1.53; 95% CI: 1.07-2.19) (11). A large prospective study in the Netherlands (4) did not demonstrate strong associations between most clusters of milk intake and prostate cancer risk, but did uncover a significant association between milk and increased prostate cancer risk when comparing the 4<sup>th</sup> (but not the 5<sup>th</sup>) quintile of milk intake with the 1<sup>st</sup> quintile (RR 1.63; 95% CI: 1.2-2.2). Analysis also found a positive trend between milk and milk product intake and prostate cancer risk (RR 1.12; 95% CI: 0.81-1.56) (4).

Milk intake was not associated with prostate cancer risk in the Baltimore Longitudinal Study of Aging, but this study did not control for family history and used PSA levels as a surrogate marker for prostate cancer (17). Two Italian hospital-based case-control studies found increases in prostate cancer risk as milk intake increased (22–23). One was a small case-control study examining 96 cases and 292 controls that demonstrated a 20 percent increased prostate cancer risk for those consuming one-to-two glasses of milk per day compared with nondrinkers of milk or occasional milk

drinkers (22). Another small hospital-based case control study (271 cases versus 685 controls) examined the relationship between intake of various foods and prostate cancer risk in two areas of northern Italy. Those who drank 10 or more servings of milk per week had a 60% higher likelihood of being diagnosed with prostate cancer compared with those consuming < 2 servings of milk per week (23).

Several meta-analyses have examined associations between milk intake and risk of prostate cancer. In one, a review of prospective cohort studies did not find an association, but the pooled RR from case-control studies showed a significant 28 percent increased risk of prostate cancer (RR 1.28; 95% CI: 1.00-1.55) for highest versus lowest milk intakes examined (21). However, the authors questioned the validity of this finding due to heterogeneity in milk intake data between studies. In a review of 11 published case-control studies, Qin et al. (24) found that the highest, as compared with lowest, category of milk intake resulted in a combined odds ratio (OR) of 1.68 (95% CI: 1.34-2.12).

To reduce the risk of many chronic diseases, public health recommendations encourage Americans to consume low-fat or nonfat dairy products. Understanding the effects of dairy fat consumption on prostate cancer risk is important when determining if this recommendation is appropriate for most

*(Continued on next page)*

**Table 2. Summary of Retrospective and Case-Control Studies On Prostate Cancer and Dairy Intake:**

Retrospective and Case-Control Studies	n for cases and controls	Results
<b>Baltimore Longitudinal Study of Aging (17)</b>	n=457; 69 cases	• No association between dairy intake and prostate cancer risk Note: Neither smoking status nor family history of prostate cancer was assessed.
<b>Population based case-control study in Sweden (18)</b> Highest dairy intake category ≥ 4.5 servings/adjusted for energy intake (RR 1.40, p=0.10).	526 cases and 536 controls	• Highest versus lowest category of dairy associated with increased prostate cancer risk when RR was adjusted for age (RR=1.53; 95% CI: 1.09-2.13). Analysis was non-significant when data was adjusted for energy intake; lowest category <2.5 servings/day.
<b>Case-control study in Greece (19)</b> By monthly frequency of milk and dairy intake: highest median intake quintile was 92; lowest intake quintile was 21.5	330 cases and 246 controls	• No significant association between dairy intake (highest versus lowest) and prostate cancer risk, though authors reported a non-significant positive trend of an association (p=0.08).

**Table 3. Summary of Meta-Analyses on Prostate Cancer and Dairy Intake:**

Meta-Analysis	Results
Meta-analysis of 10 publications from English language journals (20)	<ul style="list-style-type: none"> <li>• Highest versus lowest intake of dairy products associated with increased prostate cancer risk (pooled RR =1.11; 95% CI: 1.00 to 1.22).</li> </ul>
Authors pooled data from 45 (cohort and case control) studies (21)	<ul style="list-style-type: none"> <li>• In cohort studies, highest versus lowest intake of dairy intake associated with increased prostate cancer risk (RR 1.11; 95% CI: 1.03-1.19, p=0.33).</li> <li>• In 24 case-control studies, five with a dairy exposure category were analyzed; a non-significant increased likelihood of developing prostate cancer risk was observed in homogeneous data from these studies.</li> </ul>

men and in particular for men at higher than average prostate cancer risk. Several prospective cohort studies have examined effects of milk intake categorized by level of fat. Surprisingly, low-fat and/or non-fat milk (but not whole milk) was associated with increased risk of prostate cancer in several studies (6,8,13). In the Multiethnic Cohort Study (13), there was a moderate and significant association between low/nonfat milk and risk of localized or low-grade prostate cancer for the highest versus lowest quintile of intake (RR 1.16; 95% CI: 1.04-1.29) while an inverse association was observed for whole milk (highest to lowest quintile) and risk of localized and low-grade tumors (RR 0.88; 95% CI: 0.77-1.00). Men enrolled in the Physicians Health Study (6) who consumed >1 servings of skim milk per day had a 32% greater risk of developing prostate cancer compared with men who did not consume milk (RR 1.32; 95% CI: 1.12-1.56). The National Health and Nutrition Examination Epidemiologic Follow-up Study cohort (8) also demonstrated an increased risk of prostate cancer among men in the highest tertile of intake for low-fat milk compared with those who consumed the least milk (RR 1.5; 95% CI: 1.1-2.2).

### Calcium Intake and Risk of Prostate Cancer

In addition to examining links between dairy products and prostate cancer risk, researchers have been interested in determining biologic mechanisms and what component(s) of dairy may be involved. Calcium is the most commonly studied constituent of dairy products in relationship to prostate cancer. Studies have examined associations between total calcium intake and risk of prostate cancer as well as

relationships between prostate cancer and calcium intake from dairy foods, non-dairy foods, and dietary supplements.

Among U.S. prospective cohorts, the Cancer Prevention Study II (CPS II) found that greater intakes of total calcium intake (i.e. intakes > 2000 mg/day compared to intakes <700 mg/day) were associated with increased risk of prostate cancer (RR=1.2; 95% CI: 1.00-1.6) (15). When comparing the highest tertile of calcium intake (median 920 mg/day) with the lowest (median 455 mg/day), study authors found a significantly increased risk of prostate cancer in the NHANES follow-up study (RR 2.2; 95% CI: 1.4-3.5) (8).

The EPIC trial (12) demonstrated that a greater total dietary calcium intake (HR 1.17; 95% CI: 1.00-1.35) and dairy calcium intake (HR 1.18; 95% CI: 1.03-1.36) were associated with increased prostate cancer risk. In the PLCO cohort (5), greater dietary calcium intake was associated with increased risk of total prostate cancer, but that association did not hold up after data were adjusted for dairy intake. However, risk for nonaggressive prostate cancer was associated with greater dietary calcium consumption even after adjustment for dairy (RR 1.52; 95% CI: 0.94-2.47) in the PLCO cohort.

Neither total calcium intake nor dietary calcium intake was associated with risk of prostate cancer in the Multiethnic cohort (13) or in prospective cohorts in Japan (11) and the Netherlands (4). The CLUE II trial (7) found no association between total and nondairy calcium intake and risk of prostate cancer.

Two meta-analyses also examined total calcium intake, but in each study only results for dietary calcium were included in the analysis. These results may therefore better reflect the effect of dietary calcium alone. Gao et al. (20) reported significant increases in prostate cancer risk as total calcium intake increased (RR 1.39) but found that a funnel plot for calcium studies showed asymmetry, which may indicate publication bias, or that a systematic difference exists between smaller and larger studies. Based on data from 10 reports that analyzed calcium intake, Huncharek et al. (21) reported a non-significant (p=0.34) RR of 1.04 from homogeneous data.

Out of four U.S. prospective cohort studies, none demonstrated a statistically significant increased prostate cancer risk with supplemental calcium intake (5,7,13,15). Only one long-term, randomized, controlled double-blind clinical trial has examined the effect of supplemental calcium on prostate cancer risk (25). Men (n=672) were randomly assigned to receive 1,200 mg calcium daily or a placebo for four years. After a mean follow-up of 10.3 years, there were no differences in prostate cancer incidence between the active treatment and placebo groups. During the first six years of the study (up to two years post-intervention), prostate cancer incidence was significantly lower in the calcium treated group (unadjusted rate ratio=0.52).

Regarding dietary calcium intake, a prospective cohort in France (9) found significant increases in prostate cancer risk as dietary calcium increased,

(Continued on page 8)

**Table 4. Summary of Studies on Prostate Cancer and Milk Intake**

Study	n, cases, follow-up	Results
<b>Netherlands Cohort Study (4)</b> Median milk and milk product intake in the 5th quintile was 566 g; the 4th quintile 376 g and the lowest quintile 74 g	n = 58,279; 642 cases; 6.3 years	<ul style="list-style-type: none"> <li>• 4th quintile (but not the 5th quintile) of milk and milk product intake associated with increased prostate cancer risk compared with the 1st quintile (RR 1.63; 95% CI: 1.2-2.2).</li> <li>• Positive trend between milk and milk product intake and prostate cancer risk (RR 1.12; 95% CI: 0.81-1.56; P= 0.02).</li> </ul> <p>Authors stated that for most clusters of milk items or individual milk items there were no strong associations between intake of milk and milk products and prostate cancer risk.</p>
<b>Physicians' Health Study (6)</b> Highest skim milk intake > 1 svgs; lowest 0 svgs	n = 20,885 1,012 cases 11 years	<ul style="list-style-type: none"> <li>• 1+ servings of skim milk per day (versus no dairy) associated with increased prostate cancer risk (RR 1.32; 95% CI: 1.12-1.56).</li> </ul>
<b>CLUE II Study (7)</b>	n = 3,892; 199 cases; 15 years	<ul style="list-style-type: none"> <li>• No association between total milk intake and prostate cancer risk.</li> </ul>
<b>National Health and Nutrition Examination Epidemiologic Follow-up Study cohort (8)</b> Highest tertile of total milk intake 14 svgs per week; lowest tertile 0.5 svgs/week Highest tertile of low-fat milk intake 7 svgs per week; lowest tertile 0 svgs/week	n = 3,612; 131 cases; 10-12 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of total milk intake associated with increased prostate cancer risk (RR 1.8; 95% CI: 1.1-2.9).</li> <li>• Highest versus lowest category of low-fat milk intake associated with increased prostate cancer risk (RR 1.5; 95% CI: 1.1-2.2).</li> <li>• No association between whole milk intake and prostate cancer risk.</li> </ul>
<b>Cohort of Supplementation en Vitamines et Mineraux Amtopxydants (SU.VI. MAX) Study (9)</b>	n = 2,776; 69 cases; 7.7 years	<ul style="list-style-type: none"> <li>• No association between low-fat or whole milk and prostate cancer risk.</li> </ul>
<b>Alpha-Tocopherol Beta-Carotene (ATBC) Cancer Prevention Study (10)</b> Mean highest quintile of total milk intake 993.5 g/day; lowest quintile 152.6 g/day	n = 29,133; 1,276 cases; 17 years	<ul style="list-style-type: none"> <li>• No association between total milk intake and prostate cancer risk.</li> </ul>
<b>Population based prospective study in Japan (11)</b> Median highest milk intake category 290.5 g/day; lowest intake category 2.3 g/day	n = 43,435 329 cases 7.5 years	<ul style="list-style-type: none"> <li>• Highest versus lowest category of milk intake associated with increased prostate cancer risk (RR 1.53; 95% CI: 1.07-2.19).</li> </ul>
<b>Cohort from the European Investigation Into Cancer (EPIC) Study (12)</b>	n = 142,251; 2,727 cases; 8.7 years	<ul style="list-style-type: none"> <li>• No association between milk intake and prostate cancer risk.</li> </ul>
<b>Multiethnic Cohort Study (13)</b> Mean highest quintile of total milk intake >256 g/day; lowest quintile < 7 g. Highest quintile of low/nonfat milk intake >243 g/day; lowest quintile 0 g. Highest quintile of whole milk intake: > 163 g/day; lowest quintile intake of whole milk 0.	n = 82,483; 4,404 cases; 8 years	<ul style="list-style-type: none"> <li>• No association between total milk intake and prostate cancer risk.</li> <li>• For localized or low-grade tumors, highest versus lowest category of low-fat or nonfat milk intake associated with increased prostate cancer risk (RR 1.16; CI: 1.04-1.29).</li> <li>• For localized or low-grade tumors, non-significant inverse association for prostate cancer risk comparing the highest to lowest intake categories of whole milk intake (RR 0.88; CI: 0.77-1.00).</li> </ul>
<b>Cancer Prevention Study II Nutrition Cohort (15)</b>	n = 65,321; 3,811 cases; 7 years	<ul style="list-style-type: none"> <li>• No association between milk intake and prostate cancer risk.</li> </ul>
<b>Baltimore Longitudinal Study of Aging (17)</b>	n = 454 69 cases	<ul style="list-style-type: none"> <li>• No association between milk intake and prostate cancer risk Note: Study did not control for family history and used PSA as a surrogate marker for prostate cancer.</li> </ul>
<b>Case-control study in Greece (19)</b> By monthly frequency of milk and dairy consumption, the highest median intake quintile was 92 and lowest median intake quintile was 21.5	330 cases and 246 controls	<ul style="list-style-type: none"> <li>• No significant association between highest versus lowest milk and dairy intake categories and risk of prostate cancer, though authors reported non-significant trend for an association (P=0.08).</li> </ul>
<b>Hospital-based case control study in Northern Italy (22)</b> Analysis examined associations between ≥ 2 glasses of milk per day versus occasional or non-milk drinkers and associations between 1-2 glasses of milk daily versus occasional or non-milk drinkers.	96 cases and 292 controls	<ul style="list-style-type: none"> <li>• Milk intake (1-2 glasses per day) versus nondrinkers or occasional milk drinkers associated with increased prostate cancer risk (RR 1.2; 95% CI: 0.7-1.9). RR = 5.0 (95% CI: 1.5-16.6) comparing 2+ glasses of milk per day with non-milk drinkers and occasional milk drinkers.</li> </ul>
<b>Hospital-based case control study in two areas of Northern Italy (23)</b> Highest milk intake tertile: ≥10 servings per week; lowest intake tertile: <2 servings/week	271 cases and 685 controls	<ul style="list-style-type: none"> <li>• Highest versus lowest category of milk intake associated with increased prostate cancer risk (OR 1.6; 95% CI: 1.1-2.4).</li> </ul>
<b>Meta-analysis (20)</b>	45 observational studies analyzed	<ul style="list-style-type: none"> <li>• Pooled RR from case-control studies showed a significant 28 per cent increased risk of prostate cancer (RR 1.28; 95% CI: 1.00-1.55) for highest versus lowest milk intakes. However, authors questioned the validity of this finding due to heterogeneity in milk intake data between studies.</li> </ul>
<b>Meta-analysis (21)</b>	18 relevant articles and 13 independent studies analyzed	<ul style="list-style-type: none"> <li>• Highest versus lowest category of milk intake associated with increased prostate cancer risk (RR1.68; 95% CI: 1.34-2.12).</li> </ul>

(RR=2.43; 95% CI: 1.05-5.62), as did a case-control study conducted in Sweden when results were adjusted for phosphorous (RR=1.91; 95% CI:1.23-2.97) (18).

A few studies have examined calcium intake from dairy sources. The Physician's Health Study (6) demonstrated a 32% greater risk of prostate cancer in men consuming >600 mg/d compared with men consuming ≤150 mg calcium/day from dairy (95% CI: 1.12-1.56). A prospective cohort in Finland demonstrated a RR of 1.28 (95% CI: 1.07-1.54) for the fifth (1613.7 mg/d) versus the first (565.8 mg/d) quintile of dairy calcium intake (10). The EPIC cohort (12) and a French prospective study (9) found an association between dairy calcium (but not for nondairy calcium) and increased prostate cancer risk (RR 1.18 (95% CI: 1.03-1.36) for EPIC and a RR of 2.43 (95% CI:1.05-5.62) for the 4<sup>th</sup> v. 1<sup>st</sup> quartile of dairy calcium intake in the French study. A U.S. prospective cohort by Koh et al. (14) found no association between dairy calcium intake and risk of prostate cancer, while neither dairy calcium nor non-dairy calcium were associated with prostate cancer risk in a U.S. prospective cohort by Rohrmann and colleagues (7). A U.S. cohort examining NHANES I data (8) found that only calcium consumed from low-fat milk was associated with increased risk of prostate cancer (RR=1.7; 95% CI: 1.1-2.2), while dietary calcium intake from other dairy and non-dairy sources was not associated with risk (8).

### Proposed Mechanisms

Epidemiologic evidence suggests that dairy products possibly increase risk of prostate cancer. Several mechanisms for this association have been proposed. Sufficient blood levels of vitamin D, or more specifically 1,25-dihydroxyvitamin D (1,25-(OH)<sub>2</sub>D) may be cancer protective through an ability to reduce cellular proliferation and enhance differentiation in established prostate cancer cell lines and malignant tissues (27). While many dairy foods are high in vitamin D, all dairy foods are high in calcium, and high calcium intake (>1500 mg/day) may reduce circulating and prostate tissue 1,25-(OH)<sub>2</sub>D concentrations (26,28). Authors of a

recent meta-analysis suggested that circulating levels of insulin-like growth factor I (IGF-I) are associated with increased risk (29); these levels may increase with greater milk intake (30). Investigation also suggests that a high calcium intake leads to poorly differentiated prostate cancers, which over time may be more likely to progress and lead to fatal disease (27).

### Conclusions

A majority of prospective cohort studies demonstrate that men with the highest (as compared with the lowest) dairy consumption have an increased risk of prostate cancer. However not all studies have reached this conclusion. RRs vary greatly; the ten-fold range of increased risk (from approximately 12% to as high as 120%) may reflect heterogeneity in foods included in the "dairy" group on FFQs as well as differences in types of dairy foods consumed by study populations. A positive association between dairy intake and risk of prostate cancer was less evident in retrospective and case-control studies, and results of meta-analyses also are mixed. In addition, meta-analyses are limited by different stages and types (e.g., advanced or aggressive) of prostate cancer, and in some cases, insufficient data for sub-analyses.

Results of studies examining the effect of milk intake on risk of prostate cancer were more varied than those examining effects of dairy intake. A number of studies conducted in the U.S. have found no association. However, data from NHANES I found significant and impressive results, suggesting that men with the highest milk consumption (top tertile) have an 80 percent increased risk of prostate cancer, when compared with men with the lowest consumption (bottom tertile). Among international studies, about half of the studies found an association and half found null results. Limited evidence suggests that low fat dairy has a stronger association with prostate cancer risk than whole milk products. Dairy fat increases vitamin D absorption and decreases calcium absorption, but associations between dairy fat, vitamin D, and calcium have not been investigated for effects on prostate cancer risk.

In studies reviewed, calcium from dairy foods was more likely to be associated with increased risk of prostate cancer than calcium from nondairy foods, but because only one study controlled for intake of total dairy as a confounding factor, it is difficult to conclude whether significant positive associations seen in some studies are due to the effect of calcium or due to another unaccounted for component of dairy products. Neither total calcium intake, which includes calcium from diet and dietary supplements, nor calcium from supplements alone has been associated with prostate cancer risk. Evidence on high calcium intakes (above 2000 mg/day) is limited, with one study suggesting there is increased risk at this intake level.

### Implications for Oncology Nutrition Practice

Men who are older, African-American, and have a family history are at increased risk of prostate cancer and may need to consider how much dairy to consume; if and how much milk and other dairy foods to consume; and whether reduced fat milk is a more healthful choice, as is recommended in the Dietary Guidelines for Americans (31). While limited evidence suggests that low-fat milk may increase risk of prostate cancer, high-fat milk may not be recommended for men who have or are at risk for heart disease. The recommended intake for calcium for men ages 19 to 70 is 1,000 mg per day (32) while recommended intake for men ages 70 and over is 1200 mg daily (32). And national nutrition recommendations encourage intake of dairy foods as a source of calcium and vitamin D.

At this time the American Institute for Cancer Research states that evidence associating an increased intake of dairy foods with increased risk of prostate cancer is limited but suggestive (33). Research examining this potential association will continue, and RDs must monitor new findings in this area to stay current. RDs should educate men on the possible association between dairy foods and prostate cancer risk, while acknowledging

*(Continued on page 10)*

**Table 5. Summary of Studies on Prostate Cancer and Calcium Intake**

Study	n, cases, follow-up	Results
<b>Prospective cohort in the Netherlands (4)</b>	n = 58,279; 642 cases; 6.3 years	• No association between total or dietary calcium and prostate cancer risk.
<b>Prostate, Lung, Colorectal and Ovarian Screening Trial (PLCO) (5)</b> Highest category of calcium intake >2001 mg/d; lowest category of calcium intake ≤750mg/d	n = 29,509; 1,910 cases; 8.9 years	• Highest versus lowest category of dietary calcium intake associated with greater risk of nonaggressive prostate cancer (RR 1.52; CI: 0.94-2.47).
<b>Physician's Health Study (6)</b> Highest dairy calcium intake category >600 mg calcium/day; lowest calcium intake category ≤150 mg calcium/d	n = 20,885; 1,012 cases; 11 years	• Highest versus lowest category of dairy calcium intake associated with increased prostate cancer risk (RR 1.32; 95% CI: 1.12-1.56). • Each additional 500 mg calcium daily from dairy products associated with a 16% increase in prostate cancer risk (P = 0.03).
<b>CLUE II (7)</b>	n = 3,892; 199 cases; 15 years	• No association between total or dietary calcium intake and prostate cancer risk.
<b>National Health and Nutrition Examination Epidemiologic Follow-up Study cohort (8)</b> Median of highest calcium intake tertile 920 mg/day; lowest tertile median = 455 mg/day	n = 3,612; 131 cases; 10-12 years	• Highest versus lowest category of calcium intake associated with increased prostate cancer risk (RR 2.2; 95% CI: 1.4-3.5). • Highest versus lowest category of calcium intake from low-fat milk associated with increased prostate cancer risk (RR=1.7; CI: 1.1-2.2).
<b>Cohort of Supplementation en Vitamines et Mineraux Antioxydants (SU.VI. MAX) Study (9)</b> Highest calcium intake quartile >1081 mg calcium/day; lowest quartile <725 mg	n = 2,776; 69 cases; 7.7 years	• Highest versus lowest category of total calcium intake associated with increased prostate cancer risk (RR=2.43; 95% CI: 1.05-5.62). • Highest versus lowest category of dairy calcium intake associated with increased risk of prostate cancer (2.94; 95% CI: 1.16-7.51).
<b>Alpha-Tocopherol Beta-Carotene Cancer Prevention Trial (Prospective cohort in Finalnd) (10)</b> Highest dietary total calcium intake ≥2000 mg/d; lowest 1000 mg/d Highest dairy calcium intake category 1613.7 mg/d; lowest 565.8 mg/d	n = 27,028; 1,276 cases; 17 years	• Highest versus lowest dietary calcium intake associated with increased prostate cancer risk (1.63; 95% CI:1.27-2.1). • Highest versus lowest dairy calcium intake associated with increased prostate cancer risk (RR 1.28; 95% CI: 1.07-1.54)
<b>Population based prospective cohort in Japan (11)</b>	n = 43,435 329 cases 7.5 years	• No association between total or dietary calcium intake and prostate cancer risk.
<b>Cohort from the European Investigation Into Cancer (EPIC) Study (12)</b> Highest quintile intake for total dietary calcium = 1.32 g/day; lowest quintile intake = 0.78 g/day Highest quintile intake for dairy calcium = 0.88 g/day; lowest quintile = 0.33 g/d	n = 142,251; 2,727 cases; 8.7 years	• Highest versus lowest category of total dietary calcium intake associated with increased prostate cancer risk (HR 1.17, 95% CI: 1.00–1.35). • Highest versus lowest category of dairy calcium intake associated with increased prostate cancer risk (1.18, 95% CI: 1.03–1.36).
<b>Multiethnic Cohort (13)</b> Highest mean quintile of calcium intake ≥ 2000 mg/d; lowest quintile 500-<750 mg	n = 82,483; 4,404 cases; 8 years	• No association between total, dietary or supplemental calcium intake and total, advanced, or high-grade prostate cancer risk.
<b>Cohort of Harvard Alumni Study (14)</b> Highest calcium intake category ≥ 600 mg; lowest calcium intake category ≤ 199 mg/day	n = 10,011; 815 cases; 10 years	• No association between dairy calcium intake and prostate cancer risk.
<b>Cancer Prevention Study II Nutrition Cohort (15)</b> Highest total calcium intake category > 2000 mg/day; lowest intake category < 700 mg/day	n = 65,321; 3,811 cases; 7 years	• Highest versus lowest category of total calcium intake associated with increased prostate cancer risk (RR 1.2; 95% CI: 1.00-1.6).
<b>Baltimore Longitudinal Study of Aging (17)</b>	n = 454 69 cases	• No association between calcium intake and prostate cancer risk.
<b>Population based case-control study in Sweden (18)</b> Highest quartile of calcium ≥ 1183 mg; lowest quartile <825 mg	526 cases and 536 controls	• Highest versus lowest category of calcium intake associated with increased prostate cancer risk after adjustment for phosphorus intake (RR=1.91; 95% CI: 1.23-2.97).
<b>Meta-analysis (20)</b>	10 publications from English language journals	• Analysis suggested an increased risk of prostate cancer as total calcium intake increased (RR 1.39) but a funnel plot for calcium studies showed asymmetry, possibly indicating publication bias or a systematic difference between smaller and larger studies.
<b>Meta-analysis (21)</b>	45 observational studies analyzed	• Based on data from 10 reports that analyzed calcium intake, authors found a non-significant association between calcium intake and prostate cancer risk for homogeneous data (RR 1.04; p=0.34).
<b>Randomized, controlled, double-blind clinical trial (25)</b>	N=672 Mean 10.3 years of follow-up	• Men randomly assigned to receive placebo vs 1,200 mg calcium daily. Over 10-years, no difference in prostate cancer incidence observed.

conflicting research. RDs should counsel men about the value of having their vitamin D level checked, to determine whether they may benefit from vitamin D supplementation. RDs should also counsel men on the potential benefit of using a variety of food sources to meet their recommended need for calcium. Dairy foods are rich sources of calcium, but nondairy sources of calcium including leafy greens, Chinese cabbage, broccoli, and fortified foods such as calcium-fortified soy and almond beverages can help men meet their calcium need without, or with limited, dairy food intake. As part of a comprehensive nutrition assessment, RDs should consider overall health risks of the individual when recommending dietary strategies to optimize nutritional status and promote good health.

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## Training Program for International Dietitians

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### Introduction

International outreach and/or “twinning” programs are quite common in pediatric oncology, and are great ways to promote the sharing of knowledge and resources between hospitals from high- and low-income countries. Traditionally, these programs have involved medical doctors, but increased recognition of the importance of multidisciplinary teams in oncology practice has resulted in a natural extension of training programs to all disciplines. However, while there are many opportunities for international training for medical doctors, few exist for other members of the multidisciplinary team such as dietitians, pharmacists, speech pathologists, physical therapists, child life specialists, and social workers. Here we discuss an international training program for pediatric oncology dietitians developed by the RDs at St Jude Children’s Research Hospital in Memphis, Tennessee.

#### Role of Oncology Nutrition in Pediatric Cancer Care

Because of the nature of the disease, nutrition in cancer treatment is extremely important; the benefit of preserving nutritional status during cancer treatment is well documented (1). Due to growth and developmental needs of pediatric cancer patients, nutritional status is crucial for the success of treatment, the child’s physical and psychological development, ability to weather infections, and his or her quality of life. While it is challenging to maintain appropriate nutritional status of pediatric oncology patients in hospitals from high-income countries, it can be particularly difficult in hospitals from low-income countries. In these countries, where the majority of the world’s children live, many are already malnourished at the time of diagnosis. Improving or maintaining nutritional status of a child undergoing cancer treatment becomes a challenging task which may be complicated by side effects of treatment, lack of hospital resources and, in many countries, also by food scarcity.

#### Establishing the Need for International Training Programs

Childhood cancers are relatively rare, accounting for approximately 2% of all oncology cases in the United States (2). Worldwide, the prevalence of pediatric cancers is also dwarfed by the incidence of diseases of infectious etiology, which result in significant morbidity and mortality among children. Limited resources force difficult decisions, and as a result many low-income countries have a limited number of hospitals specializing in treatment of pediatric cancer. In many hospitals in low-income countries, there are no dietitians available, and nurses or medical doctors rather than dietitians provide nutrition care for pediatric oncology patients. In other countries, there are only a handful of dietitians working in this narrow field of expertise. As a result, training in pediatric oncology nutrition for dietitians in low-income countries is almost non-existent. International training programs provide a way for RDs in the U.S. to share important knowledge, standards, and experience in the field of pediatric

oncology nutrition while also providing research opportunities and gaining valuable multicultural experience.

#### International Outreach Program for Dietitians

The Clinical Nutrition Department and the International Outreach Program at St. Jude Children’s Research Hospital have worked together since 2005 to develop a training program for pediatric oncology dietitians from around the world. Since that time, St. Jude has hosted dietitians from Mexico, Brazil, the Czech Republic, Turkey, Russia, and Guatemala. The purpose of this program is to share information and foster cooperation between dietitians from different countries and backgrounds. In this 3-week program, dietitians have the opportunity to observe St. Jude dietitians working in hematology, leukemia, solid tumors, neuro- oncology, and hematopoietic stem cell transplantation. Food Service and Infectious Disease rotations can be accommodated upon request. The curriculum provides experience in nutrition risk screening, the nutrition care process, nutrition for cancer prevention and palliative care, and exposure to nutrition support. The Training Program utilizes existing Academy and ON DPG tools, such as Standards of Professional Practice and Performance and the nutrition care process; incorporates current nutrition assessment practices, such as nutrition focused physical assessment; addresses national nutrition assessment guidelines; and utilizes international tools such as the World Health Organization’s growth curves. In turn, visiting dietitians share their creativity in meeting the nutrition needs of low-income pediatric oncology patients, as well as processes and standards used in each country, allowing everyone to learn from each other.

The Clinical Nutrition Department and International Outreach Program may provide assistance for air travel, hotels, and meals if necessary. Continuation of the program after dietitians return to their home countries is accomplished via webcasts through Cure4Kids ([www.cure4kids.org](http://www.cure4kids.org)). This provides international dietitians with an opportunity to discuss

their efforts to develop pediatric oncology nutrition programs in their home country and brainstorm ideas for implementing standards and processes relevant to each institution. The main obstacles we have identified in our efforts are financial limitations, language barriers, and differences in job descriptions. St Jude Children's Research Hospital provides finances to support 2-3 dietitians from low-income countries per year. Participants must be able to communicate in English; those who speak Spanish or Czech with limited English will also be considered. The job description and responsibilities for dietitians differs greatly among different countries and different hospitals. Therefore, effective training has to be targeted to individual needs of each dietitian.

### Conclusion

In conclusion, international collaboration is feasible and enriches the professional life of participants from high- and low-income countries. The ultimate beneficiaries of this program are the patients. Participating dietitians from low-income countries gain additional knowledge and evidence-based practice regarding management of pediatric oncology patients. Dietitians from high-income countries gain cultural competency and accumulate practical experience helping international patients. In an increasingly multicultural and multiethnic country such as the United States, it is extremely important for dietitians to be culturally competent in order to meet the needs of multiethnic populations and caregivers. In the future, it would be ideal not only to have dietitians from low-income countries visit our department, but also have the ability to send our own dietitians to developing countries. This would allow them to work side by side with local dietitians to fully understand the needs of that particular clinical nutrition department and its patients.

### Developing Your Own International Outreach Program for Dietitians

Any hospital with an expertise in a certain area of nutrition can implement an international outreach program or "twinning" program. A nutrition department

may collaborate with an already established medical international outreach program or start its own collaborative program. Collaboration itself may come in various different forms: informal exchange of information via email or phone; providing books or journals for the department; formal and regular online meetings (using Skype, Horizon Wimba, or another tele-meeting service); observations of dietitians' work; and member exchanges. Some of these forms of collaboration need more financial support than others, but all are relatively easy to establish and support. The only requirement necessary to start such collaboration is personal enthusiasm and dedication.

### Role of Terezie Tolar Mosby in the program

Terezie Tolar Mosby serves as the coordinator of the project. Because she herself is originally from a low-income country and has worked and lived in several low-income countries, she recognized the need for such a program, and its potential benefits for everyone involved. St Jude Children's Research Hospital already had an established International Outreach Program (IOP) for medical doctors and for nurses. Under the leadership of Ms. Mosby, the Clinical Nutrition Department of St. Jude Children's Research Hospital, together with the International Outreach Program from SJCRH, agreed to support international dietitians as well. Terezie selects qualified candidates and determines what candidates would like to accomplish during their stay at SJCRH. Applicants then apply through the IOP program by completing an online application. Terezie helps to arrange travel and accommodations on the SJCRH campus. When candidates arrive, a detailed schedule is developed, based on candidates' needs and requirements. Usually, the candidate spends time with a variety of dietitians from the clinical nutrition department, working in services such as solid tumor, neuro-oncology, leukemia, and transplant. At the end of the program each participant submits a power point presentation that addresses his or her work and challenges during the program as well as possible future research. Terezie also coordinates

online lectures using the Cure4Kids' website, which offers two way communication capabilities for existing groups.

### Statements from past participants: Katja Stein, PhD, Dietitian, Pediatric Hematology/Oncology Department of Guadalajara, Mexico

"Including Dietitians in the International Outreach Program raises the awareness of the fundamental importance of nutritional support in pediatric cancer care. Being involved in the evaluation of any patient as well as in research increases the body of knowledge about cancer and nutrition. My participation in the Clinical Nutrition Services IOP for Dietitians at the St. Jude Children's Research Hospital in Memphis gave me the opportunity to gain experience and update my knowledge about optimal nutrition care in children with cancer. Our purpose is to improve the patient care and realize investigations together in the field of nutrition and cancer."

### Derya Bıçaklı Hopancı of Izmir, Turkey

"I participated in this program in June 2009 for 3 weeks. I took an opportunity for observation about oncology specific nutrition. I experienced working with pediatric oncology dietitians in the USA where I saw many differences from Turkey. I benefited a lot from this program. My colleagues who work in the Clinical Nutrition department at St. Jude Children's Research Hospital were very friendly, helpful and well-versed in oncology. I loved them and consider this a great experience in my professional life. Thank you."

### Ana Lucía Molina Linares of Guatemala

"Thanks to this experience I met wonderful people not only professionally but also personally. I made many good friends. The program gave me the opportunity to promote research to improve nutritional interventions for our patients and improve their tolerance to treatment."

### Claudia Paola Medina Jiménez of Guadalajara, Mexico

"I am proud to have gone to the hospital

*(Continued on next page)*

with the highest level of expertise in its genre, and I am delighted to have shared the workplace with people whom I lived with. I not only had a good experience working with knowledge of clinical nutrition services and other services in the hospital, but I found good friendships as well. I am willing to do further exchanges of professional interest.”

**Maria Claudia Bernardes Spexoto of Brazil**

“I found it a very stimulating experience. I certainly learned and brought some new strategic changes back to my home country and hospital. I also had a remarkable experience [learning about] research opportunities.”

**Marieta Balikova of the Czech Republic**

“Finally, I found what the job description of a dietitian should be and what competencies a clinical dietitian should have. In my country, nothing like that exists yet. Based on my experience, I started a training program for our dietetic students. I established a new position for one dietitian to be designated only to pediatric oncology. I also went back to school to pursue an additional degree in nutrition. None of that would have happened if I had not had the experience at St. Jude.”

Authors are employed at the Clinical Nutrition Service at St. Jude Children’s Research Hospital in Memphis, Tennessee.

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Participant Name \_\_\_\_\_

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Date Completed \_\_\_\_\_

(1.0) CPEUs Awarded      (2) CPE Level      \_\_\_\_\_ Learning Need Code\*

*Diane W. Evans, MPH, RD*  
CDR Accredited Provider Signature

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## Breaking News from The Academy of Nutrition and Dietetics!

Most members are aware that the Academy has been engaged in conversation with the Centers for Medicare and Medicaid Services (CMS) regarding therapeutic diet order regulation. In addition to meeting with CMS several times, the Academy has offered letters that outline the Academy’s rationale for allowing registered dietitians to be able to independently change diet prescriptions.

CMS recently announced that it is proposing a rule change that would, among other things, “Save hospitals significant resources by permitting registered dietitians to order patient diets independently, which they are trained to do, without requiring the supervision or approval of a physician or other practitioner. This frees up time for physicians and other practitioners to care for patients.”

The proposed rule will be open for public comment until April 8, 2013.

# Using Nutrition Intervention to Resolve Nutrition Impact Symptoms and Save Healthcare Dollars

Nicole Fox, RD, LMNT, CNSC

## Diagnosis: Acute Myeloid Leukemia

Acute myeloid leukemia (AML) is a fast-growing cancer of the blood and bone marrow (1). In AML, bone marrow makes immature white blood cells called blasts. These blasts do not develop normally into functional white blood cells that fight infection. The bone marrow also may produce abnormal red blood cells and platelets. These abnormal cells crowd out the normal red blood cells, white blood cells and platelets needed to carry oxygen throughout the body, fight infection and control bleeding. Over 11,900 new cases of AML are diagnosed in the United States annually, and most of these cases are diagnosed in adults (1).

## Medical History

SH was a 61y/o female who presented with a six-week history of fatigue, shortness of breath and easy bruising. A complete blood panel was drawn revealing hemoglobin of 6.7 g/100 mL (low), hematocrit of 19.0% (low), platelet count of 60,000/mmol (low) and white blood cell count of 8,000/ $\mu$ L. SH was admitted to the hospital, where a bone marrow biopsy was performed and pathology confirmed a diagnosis of AML. Her past medical history was significant for hypercholesterolemia and smoking (quit smoking at age 40).

## Medical Treatment

SH's treatment course for AML began with induction chemotherapy. The goal of this treatment was to bring the disease into remission, meaning that after SH recovered from neutropenia, the blood counts would return to normal and there would be no sign of disease in the bone marrow (1). Induction chemotherapy was then followed by consolidation chemotherapy, where the goal was to kill any remaining leukemia cells and keep SH in remission. Due to high-risk cytogenetics (changes in the chromosomes of leukemia cells), an allogeneic peripheral stem cell transplant (PSCT) was recommended as the best option for long-term remission. An allogeneic PSCT replaces abnormal cells in a

patient's bone marrow with blood-forming cells from a matched sibling or unrelated matched donor (1).

Three months after being diagnosed, SH had completed both her induction and consolidation chemotherapy and was admitted to the hospital to undergo a non-myeloablative (also referred to as reduced-intensity) allogeneic peripheral stem cell transplant from a matched sibling donor, following a conditioning regimen consisting of pentostatin and total body irradiation (TBI). Non-myeloablative transplants use lower dose conditioning regimens than myeloablative regimens. The goal of the conditioning regimen is disease eradication, with sufficient immunosuppression to prevent the host from rejecting the donor cells (2). Patients over the age of 60, patients with co-morbidities or organ insufficiency, and patients with lower performance status who are at risk for treatment-related mortality are candidates for non-myeloablative regimens (3). The morning of admission, SH received her dose of pentostatin, and later in the day received TBI. The next day, the donor peripheral stem cells were infused. SH remained in the hospital until her absolute neutrophil count (ANC) was above 500/mm<sup>3</sup>, indicating she was no longer neutropenic. SH's blood counts officially recovered on day +17 following her transplant (ANC was 600/mm<sup>3</sup>).

## Baseline Nutritional Status

At the time of diagnosis, SH weighed 147 pounds. Upon admission to the hospital for her PSCT 3 months later, her weight had dropped to 135 pounds. SH reported a reduced oral intake compared with her usual pre-AML intake. Side effects of the induction and consolidation chemotherapies, including nausea, vomiting, anorexia and mouth sores, made it difficult to eat normally and resulted in weight loss.

## Baseline Nutrition Diagnosis

NC 3.2: Unintentional weight loss related to decreased oral intake resulting from chemotherapy side effects as evidenced by significant weight loss of 8.2% in three months.

NI 1.6: Predicted suboptimal energy intake due to side effects of PSCT as evidenced by patient's reports of difficulty eating during prior chemotherapy.

## Medical Treatment

Following her transplant, SH was prescribed multiple medications to suppress her immune system, prevent infection and manage side effects related to the transplant process. The only medication taken prior to treatment, according to a review of the admission history and physical and pharmacy reconciliation of home medications per hospital protocol, was simvastatin for her history of hypercholesterolemia. See Table 1.

## Nutrition Intervention

**ND 1.1: Healthful high protein, high calorie diet.** SH was educated on high protein, high calorie food choices offered by hospital food service and encouraged to select those choices routinely with the goal of maximizing her nutrient intake and minimizing further unwanted weight loss.

**E 1.5: Recommendations for diet modifications.** SH was monitored daily for potential transplant related side effects, in particular nutrition impact symptoms. When side effects were reported, the Registered Dietitian (RD) provided counseling to manage nutrition impact symptoms.

*(Continued on next page)*

**Table 1.**

Medication	Classification	Nutrition Impact Symptoms
Pentostatin	Antineoplastic	Nausea, vomiting, diarrhea, anorexia, mouth sores
Cyclosporine	Immunosuppressive	Hyperglycemia, hyperkalemia, hypomagnesemia, nausea, vomiting
Mycophenolate Mofetil	Immunosuppressive	Nausea, vomiting, diarrhea
Acyclovir	Antiviral	Nausea, vomiting, diarrhea, anorexia, abdominal pain
Fluconazole	Antifungal	Nausea, abdominal pain, anorexia
Ursodiol	Anticholelithic	Nausea, vomiting, abdominal pain, indigestion
Metoclopramide	Antiemetic	Diarrhea
Ondansetron	Antiemetic	Constipation
Magnesium oxide	Mineral supplement	Nausea, vomiting, diarrhea

**ND 6.1: Medications.** In addition to providing diet-related symptom management suggestions, adjustments to supportive medications such as antiemetics were recommended as indicated.

## Nutrition Monitoring and Evaluation

### AD 1.1.2: Weight

**Criteria for evaluating:** Daily weights were ordered and monitored each morning. Given SH's pre-transplant weight loss, the goal was to minimize further unintentional weight loss and maintain weight within 5% of admission weight.

**Status:** SH did experience weight loss following her transplant. By day +17 following transplant, her weight had declined to 128 pounds, a 5.2% weight loss.

### FH 1.2.2.1: Food intake-amount of food &

### FH 1.2.1.1: Fluid/beverage intake-oral fluids

**Criteria for evaluating:** The percentage of meals eaten and volume of oral fluids consumed was recorded and monitored daily. Periodic 24-hour recalls were also taken to assess the calorie and protein density of food and beverage choices.

**Status:** For a majority of her hospital stay, SH ate 50-100% of most meals. The first few days following transplant SH did experience some nausea and vomiting, but symptoms were managed by adjusting her antiemetic regimen. SH also experienced mild diarrhea, but she initially did not feel it interfered with her ability to eat. As her hospital course progressed, SH reported increasing problems with diarrhea, especially days +14 through +18 following transplant. Her medications were reviewed. Since her

nausea had not been problematic for a few days, a decision was made to discontinue metoclopramide to determine if this medication was contributing to diarrhea. Stool cultures were ordered to rule out an infectious cause, such as *clostridium difficile*, but these came back negative. On day +18 following transplant (a Friday), her diarrhea persisted, so the patient's spouse was asked to keep records of all food and fluid intake to determine whether her diet caused this symptom. Because SH's diarrhea was increasing at the same time as her counts were recovering, the transplant medical team was concerned that the diarrhea may represent onset of acute graft-versus-host disease of the gastrointestinal tract, and a gastroenterology consult was ordered.

### Graft Versus Host Disease, Aloe Vera Juice, and Diarrhea

Graft-versus-host disease (GVHD) is a potential complication of allogeneic peripheral stem cell transplant. GVHD occurs when the immunocompetent donor cells recognize the recipient (or host) as foreign and mount an immune response (5). GVHD may be acute (occurring within the first 100 days after transplant) or chronic (occurring beyond 100 days after transplant). Common target tissues are the skin, gastrointestinal (GI) tract and liver. Initial presenting symptoms can include rash, nausea, vomiting, diarrhea, elevated liver function tests and cholestasis. The gold standard for diagnosing GVHD of the GI tract is endoscopic evaluation with histological and microbiological examination of biopsied tissue (6). SH was scheduled for

endoscopy the following Monday to evaluate for possible GVHD of the GI tract.

On day +21 following transplant the RD reviewed SH's food records prior to daily rounds. The RD noted that multiple times per day, SH consumed aloe vera juice. SH shared that she had been drinking it to minimize risk of developing mouth sores, which she had experienced with induction chemotherapy. She had read accounts of individuals using aloe vera juice for this purpose on a cancer-related electronic mailing list. SH had not previously reported use of aloe vera because she considered it a food rather than a dietary supplement. The RD suspected that aloe vera juice was a potential cause for her diarrhea and instructed SH to stop consuming it. On rounds later that morning, the RD shared her analysis, and the medical team agreed to postpone the endoscopy pending observation. By the morning of day +23 following transplant, and two days after suspending use of aloe vera juice, SH's diarrhea had resolved.

### Aloe Vera Juice

Aloe vera gel is the thin, clear jelly-like substance derived from the inside of the aloe leaves (7). The green part of the leaf that surrounds the gel can be used to produce a juice or dried substance known as aloe latex (8). Aloe vera gel is used topically for skin conditions, whereas aloe vera juice or latex is taken by mouth, often to relieve constipation. Aloe products can be sold as dietary supplements in the United States (7). Side effects of the internal

use of aloe may include abdominal pain, nausea and vomiting, diarrhea and electrolyte imbalance (7,8).

### Complementary and Alternative Medicine (CAM)

Complementary and alternative medicine (CAM) refers to health practices that are not generally considered to be part of conventional medical care (9). CAM includes the use of dietary supplements, herbal therapies, and probiotics, as well as mind-body practices such as acupuncture, massage and meditation. Use of CAM practices by cancer patients is high (10). The National Health Interview Survey (NHIS) revealed that 26% of female cancer survivors and 13.7% of male cancer survivors engaged in at least one CAM practice in 2002 (10). Unfortunately, many health care providers may be unaware of their patients' use of CAM. In 2002 and 2007, the National Health Interview Survey (NHIS) included comprehensive questions on the use of complementary health practices by Americans (9). Analysis of the 2002 data found that use was more prevalent among people with a history of cancer. About forty percent of cancer survivors in the 2002 data group reported using CAM, with the most popular practices being the use of herbal or other natural products. Although some cancer patients may use CAM in hopes of curing their disease, the most commonly cited reasons for the use of CAM include a perceived benefit from the practice, including boosting the immune system, pain relief, improved quality of life, increased optimism, and a desire to feel in control of health outcomes, while also managing side effects experienced from disease presence or its treatment (9,11).

### Nutrition Outcomes, Insight, and Lessons

a) Despite attempts to obtain a history about the use of OTC medications and dietary supplements, patients may choose not to disclose their use of dietary supplements. Additionally, as with SH's case, a patient may not realize a particular product is a supplement, and fail to report it for this reason. It is important for RDs to

be direct and specific when asking about the use of nutrition and other dietary supplements, explaining to patients what types of products can be classified as nutritional supplements, and the potential impact of dietary supplements on their health and cancer treatment. Because of interrelationships between diet, functional foods, and dietary supplements, the RD, with her/his knowledge of potential benefits and side effects of these products, is best positioned to take the lead on assessment of dietary supplements, and to counsel patients on use of such supplements.

b) Side effects experienced by patients undergoing PSCT may be attributed to multiple factors including the conditioning regimen and medications, infection, and foods, fluids, and dietary supplements consumed by the patient. In this case study, SH experienced weight loss and diarrhea post transplant. After ruling out medication side effects and checking stool studies, it was decided that SH was potentially developing GVHD of the gastrointestinal tract.

Due to close follow up and participation on daily rounds by the RD, and her insight following careful assessment of food intake, the medical team agreed to delay a costly medical procedure that would not have yielded a diagnosis. According to gastroenterologists at our institution, charges for an endoscopy procedure exceed \$3,000.

The Legislative and Public Policy Committee of the Academy of Nutrition and Dietetics has made Medical Nutrition Therapy one of its seven priority areas. To assist RDs with communicating their value in improving healthcare outcomes and saving healthcare dollars, the MNT Works Toolkit has been published and made available to members (12). As healthcare reform is implemented, it is essential that RDs communicate how their services can save healthcare dollars while improving medical care, as illustrated in this case study.

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## Oncology Nutrition Spotlight!

What nutrition services offered in cancer centers are essential, optional, popular, and effective? As more RDs develop and expand oncology nutrition programs, that question comes up often on the ON DPG's electronic mailing list (EML).

This issue's *Oncology Nutrition Spotlight* showcases a number of cancer centers that recognize the importance of providing oncology nutrition services by RDs, and oncology RDs who offer those services to patients, their caregivers, and their communities. These RDs are prime examples of the energy and dedication of oncology RDs, and the far-reaching potential of an oncology nutrition program.

### Laura Grinnell, RD, CSO and The Martin-O'Neill Cancer Center in St Helena, California

#### Overview:

The Martin-O'Neil Cancer Center, located at St Helena Hospital, St Helena, California, is known for its dedication to providing complete, personalized and compassionate cancer care. The St Helena, CA community provides significant philanthropic support to the cancer center, recognizes the importance of nutrition to cancer and its treatment, and ensures that nutrition services are included in the integrative cancer support services offered at the center. Because clinical nutrition services are considered an essential part of care at St Helena, RD services are included in general treatment costs, similar to RN services. Patients do not pay extra for nutrition assessment and intervention provided by an RD. Laura Grinnell, RD, CSO,

works two days a week (.4 FTE) as the sole RD assigned to the cancer center, which serves an average of 525 patients each year.

#### Nutrition Screening and Assessment:

At this time, a specific nutrition screening tool is not used. Both physicians and RNs can refer patients to RDs within the Martin-O'Neill Cancer Center for nutrition assessment, through verbal or written referrals. In addition to her role in the cancer center, Laura also provides nutrition care for inpatients of St Helena Hospital, and responds to referrals for inpatient oncology patients.

Laura provides individual nutrition assessment and intervention, including education for those dealing with cancer and its treatment. The majority of her time is spent working with people actively going through chemotherapy or radiation treatment, with the goal of helping patients optimize nutritional intake, reduce incidence and severity of nutrition impact symptoms of treatments, and enhance effectiveness of treatment. Working with a team of physicians, nurses, radiation therapists and social workers, Laura ensures that one of the most important contributors to quality oncology care, nutrition, is recognized and addressed. She also coordinates nutrition services when needed for home enteral or parenteral nutrition support. Following treatment, Laura meets with cancer survivors to discuss nutrition and lifestyle changes associated with survivorship.

Laura publishes a quarterly newsletter, *Nourishing News*, which provides information on seasonal nutrient-rich fruits and vegetables, recipes, cooking tips with herbs, food safety information and symptom management tips. The newsletters are distributed at the hospital and cancer center.

Laura works with a chef to coordinate and help manage the *Food of Love* program. This program provides weekly meals free of charge to people who are actively going through cancer treatment. The program provides nutrient-dense meals with ingredients containing cancer fighting, bioactive compounds to enhance healing through nutrition. Tremendous community support, teen and adult volunteers, and fundraisers help finance the program.

Understanding the importance of nutrition to long-term cancer survival, Laura was instrumental in the development of a *Nutrition For Survivorship Program*. The program provides presentations on nutrition and cancer survival, which are offered to those actively going through cancer treatment, as well as those who have completed treatment. This program was offered as part of a survivorship series in 2012.

#### Goals of the Clinical Nutrition Program

Laura shared three primary goals of the Clinical Nutrition Program at the Martin-O'Neil Cancer Center:

- 1) provide support to those affected by cancer and help improve nutritional status, tolerance to cancer treatment, recovery following cancer treatment, and survivorship through nutrition and wellness
- 2) provide nutritional counseling and resources based on each patient's unique nutritional needs (education, meal planning, enrollment in the free meal program, and nutrition support)
- 3) communicate with cancer center team members (physicians, nurses, radiation therapists, social worker, pharmacist and other support staff) to ensure quality care



## Internet Presence

Receiving a cancer diagnosis is daunting. Today, the Internet is a major vehicle for finding information about treatment options and support. As a result, many cancer centers want a strong presence on the Internet, where they can promote their services and share their commitment to the whole person. Many cancer centers have added nutrition information to their website, letting cancer survivors know that they recognize the importance of nutrition to cancer care, recovery, and survival. The Martin-O'Neil Cancer Center's website is among those providing information regarding the nutrition services offered at the cancer center. Laura also posts oncology nutrition tips on the Martin-O'Neil Cancer Center Facebook page, which provides additional presence on the Internet.

## Measuring Success

Outcome measurement is important to every program. To begin with, Laura strives to provide quality clinical nutrition care and support before, during and after cancer treatment, and measures success on a patient-by-patient basis. For example, knowing that nutrition intervention to manage nutrition impact symptoms helped someone modify their diet to maintain weight and improve tolerance to cancer treatment provides immediate feedback. Managing the nutrition care of enterally and parenterally fed patients directly establishes delivery of adequate nutrition to help a patient maintain their weight when unable to do so with oral nutrition alone. More formal ways of measuring success are via surveys used for quality improvement feedback, which are sent to each patient treated at The Martin-O'Neil Cancer Center.

## Summary

Laura reports to Shari Bluband, MBA, Executive Director of the Martin-O'Neil Cancer Center and Joanne Hatch, MS, RD, CNSC, Director of Nutrition Services for St Helena Hospital. Laura's vision for the future is to spend more time at the cancer center and further develop the oncology nutrition program. "I believe the oncology program already offers a variety of resources for

people dealing with cancer, however I would like to expand the program. I would like to offer cooking demonstrations and more frequent presentations to people living with cancer, their families and caregivers, and the community. Presentations would address nutrition for cancer prevention and survival; nutrition education for those dealing with the effects of cancer; nutrition recommendations for specific cancer populations; and other nutrition topics of interest. I would like to develop the survivorship program in order to have a greater impact on lifestyle change regarding nutrition, physical activity and wellness. I hope to spend more time educating patients and people in the community about the connection between nourishing food and wellness."

## Lora J. Anderson, RD, CSO, LDN and the Centegra Sage Cancer Center in McHenry, Illinois

### Overview

The Centegra Sage Cancer Center in McHenry, Illinois is proud of their extensive list of advanced care therapies, diagnostic services and state-of-the-art equipment, as well as the compassionate support provided by their staff. Centegra also provides an impressive variety of cancer support services, including nutritional support. RD services are included with cancer treatment and are offered to all patients at no cost. This includes nutrition education programs, post-treatment weight loss counseling when indicated, and survivorship programs that include nutrition counseling. Members of the community who have been diagnosed with cancer and DO NOT receive treatment at Centegra are also eligible for nutrition counseling at no cost to them. Nutrition services provided by the RD are considered a community benefit, and are reported for their nonprofit status.

In 2012, the center treated 459 new patients. Lora Anderson, RD, CSO, LDN is assigned to the cancer center, working 3 days a week, 8 hours each day (24 hours per week). Lora provides comprehensive nutrition care to those undergoing

treatment, those who have completed treatment, and residents within the community who are interested in cancer prevention programs.

## Nutrition Screening and Assessment

The electronic medical record (EMR) system at Centegra was customized to provide relevant diet, nutrition, elimination, and mucous membrane information for the RD. During RN assessment, if a certain degree of alteration occurs (e.g., mucositis grade 4) and is highlighted in the EMR system, the record turns red, triggering a QCL (i.e., referral) to the RD. This customized tool is unique, and is an example of the importance placed on multidisciplinary care by Centegra management. Non-Centegra medical oncologist offices are aware of our clinical nutrition services, and are able to send a verbal referral to see one of their patients on an as-needed basis. The community medical oncologist provides the patient with the RD's business card, and the patient uses this information to call the RD to make an appointment.

## Comprehensive Nutrition Services

The oncology nutrition program at Centegra Sage Cancer Center includes nutrition assessment and intervention; oncology nutrition education; ongoing one-on-one visits before, during, and after treatment for all oncology outpatients; and community outreach cancer prevention lectures to various groups. Survivors, even if several years out from treatment, are invited to participate in group programs or individual nutrition counseling, and frequently take advantage of this offer. After an initial assessment, the RD determines follow-up care based on policy and clinical judgment. Often this is weekly or bi-weekly during treatment. Post-treatment visits may be scheduled every 3 weeks or per patient preference. A team within the cancer center plans community education programs. A six-week formal Survivorship program is offered twice a year, and includes a nutrition component. Prevention programs and health fairs also are offered. Cooking demonstrations and other nutrition

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education programs are taught by other RDs within the system; direct mail is used to inform patients of these educational opportunities.

The cancer program at Centegra Sage Cancer Center is ACCC accredited, and program goals are consistent with ACCC recommendations.

The Centegra Sage Cancer Center has a website within the hospital website, centegra.org and a Facebook page. Both of these inform the public that nutrition counseling is available by an RD who is board certified in oncology nutrition, and provide a phone number for clinical nutrition services.

### Measuring Success

Each year, Lora chooses specific parameters to track. For example, she may track how many new patients began treatment; and how many patients are referred to the RD and receive clinical nutrition services. In addition, specific, individual patient outcomes are tracked, such as weekly weights and the number of patients that experienced less than a 2% weight loss, or greater than 10% loss, with the intention of tracking weight loss trends and reducing weight loss during treatment.

### Summary

Lora's position is unique in the cancer center. Of the 30 cancer center staff

members, she is the only one who reports to a manager outside of oncology. Lora reports to the clinical nutrition manager for our health system and the director of oncology. Clinical direction comes from the clinical manager, but programming direction comes from the director of the oncology department.

### Carole Havrila, RD, CSO and the Emily Couric Clinical Cancer Center at the University of Virginia Health System

#### Overview

The Emily Couric Clinical Cancer Center at the University of Virginia Health System, dedicated in 2011, provides a full range of state-of-the-art cancer treatments in a warm and inviting space designed for the needs of patients and their families. Carole Havrila, RD, CSO, provides full time oncology nutrition care for patients receiving care at the Emily Couric outpatient center. Her services are included in the general cost; there is no additional fee or charge for clinical nutrition services by an RD.

The table below details data on patient visits, by specialty, between July 1, 2011 and June 30, 2012.

#### Nutrition Screening and Assessment

At this time a specific nutrition risk screening tool is not used. However, Carole is in the process of generating triggers within the EPIC nursing assessment

program that would result in RD referrals and consults. These triggers include:

- BMI <19,
- >10% weight loss since treatment initiation,
- >5% weight loss in one month,
- Any patient receiving enteral and parenteral support.

For all patients referred, Carole provides a full range of clinical nutrition care including nutrition assessment, intervention, education and follow-up to monitor nutritional status and revise the nutrition care plan as required. In addition, Carole presents lectures to the community on nutrition and cancer related topics (US TOO, American Cancer Society guidelines, and others), and participants in Livestrong's Cancer Transitions program for survivors. Carole also participates in a monthly head and neck cancer support group, and each month distributes a newsletter to group members. Carole feels it is important to create a nutrition presence within the cancer center, and so she contributes cancer and nutrition related information to UVA blogs and other online/television/radio forums. Her dedication to community involvement also has led her to present cooking demonstrations, in conjunction with local natural foods chefs, for patients and caregivers.

**Table. University of Virginia Health System - Cancer Center**

Attended Patient Visits - July 1, 2011 through June 30, 2012

Month/Year	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Visits
CC Hem Onc													
TOTAL	1,247	1,388	1,260	1,240	1,279	1,236	1,409	1,401	1,514	1,275	1,529	1,373	16,151
INFUSION & TAC													
TOTALS	1,419	1,491	1,485	1,512	1,463	1,496	1,547	1,563	1,709	1,699	1,684	1,389	18,457
CC Palliative													
TOTAL	110	119	121	118	110	105	134	148	140	128	115	149	1,497
CC Gyn Onc													
TOTAL	324	428	353	370	392	285	359	330	403	359	403	360	4,366
CC Surg Onc													
TOTAL	288	366	295	343	390	288	372	375	343	353	430	330	4,173
CC Neuro Onc													
TOTAL	213	207	230	218	176	213	225	201	225	208	215	229	2,560

## Goals of the Nutrition Program include

- Professional Development
- Self-Care for staff
- Expansion of IT to facilitate delivery of nutrition services
- Expansion of integrative medicine access
- Delivery of comprehensive nutrition counseling services
- Development of survivorship program
- Expansion of outreach through telemedicine
- Establishment of efficient team interactions, including culture and shared purpose
- Ensuring patient assessment and feedback on nutrition services

## Internet Presence

The Emily Couric Cancer Center has a website (<http://uvahealth.com/services/cancer-center>) that provides information on how to make an appointment, types of physicians on staff, and support services (including nutrition) available to patients. Also, Facebook and Twitter pages are available. Nutrition related events, such as those provided during October for Breast Cancer Awareness month, are posted on Facebook and Twitter.

## Summary:

Carole reports to an assistant clinical nutrition manager and also the manager of support services within the cancer center, which includes the nutrition program. However, Carole's nutrition manager completes her yearly evaluation.

To measure program outcomes, the cancer center monitors Press Ganey satisfaction scores, monthly RD productivity, and Performance Improvement, which looks at appropriateness of patients referred to the RD. Carole's involvement in this busy cancer program encompasses all aspects of traditional clinical nutrition care, as well as community outreach programs and cancer support groups. Her future goals include developing programs in nutrition and cancer survivorship, which will round out a fully developed oncology nutrition program.

## Anne Chiavacci, MS, MA, RD, LDN and Hillary Wright, MD, RD, LDN and the Dana Farber Cancer Institute in Boston, Massachusetts

### Overview

Since its founding in 1947, Dana Farber has been committed to providing adults and children with cancer with the best treatment available today while developing tomorrow's cures through cutting-edge research. In addition to its dedication to providing expert, compassionate care to children and adults with cancer, as an affiliate of Harvard Medical School and a Comprehensive Cancer Center designated by the National Cancer Institute, Dana Farber provides training, engages in clinical research, and devotes resources to programs for high-risk and underserved populations.

Consistent with the goal of comprehensive care, Dana Farber employs six RDs Nutritionists – one full time and 5 part-time (three 20 hour, one 27 hour, and one 24 hour). RDs also provide clinical nutrition care in four Dana Farber satellite locations (Faulkner Hospital in Boston, Londonderry, New Hampshire, Milford, MA and South Shore Hospital in Weymouth, MA). All satellite positions are part time of various hours.

Nutrition consultations are covered in various ways. Some appointments are individually billed while others are included in the general costs of cancer treatment. Over the past 11 years, Dana Farber has treated an average of 4,030 patients per year. This figure includes only billable initial and return consultation; it does not include a variety of support services including group nutrition sessions, phone contacts, home TPN management, etc.

### Nutrition Screening and Assessment

Patients are referred to the Nutrition Consult Service by all disciplines including physicians, nurse practitioners, nurses, social workers, the Zakim Center for Integrative Therapies, and the survivorship clinic. Patients may also self-refer. Triggers for a nutrition consult include weight loss or gain, TPN and enteral feeding management,

symptom management, use of dietary supplements and special dietary patterns, and integrative therapies.

Currently, most nutrition referrals are either clinician or patient generated, and nutrition consultation is considered a service available to all patients. However, the Clinical Nutrition Service of DFCI is in the process of implementing the American Cancer Society's Screening tool with the thoracic oncology population, as part of an Anorexia/Cachexia Symptom Management Excellence Initiative designed to identify patients at risk of anorexia/cachexia and trigger consults in a timely fashion. This screening process will eventually be expanded to other oncology populations within the Institute.

### Comprehensive Nutrition Services

Oncology RDs at Dana Farber provide nutrition assessment; individual oncology nutrition education; ongoing nutrition reassessment and monitoring; cooking demonstrations; nutrition seminars to clinicians and patients (both within the Institute and for community-based cancer support organizations); community lectures; and classes on easy food preparation, including how to make cancer fighting smoothies, etc.

Timely, proactive care is most likely to be effective, in particular in the high-risk population. Therefore a primary goal of the Clinical Nutrition Service is to identify those at risk for cachexia/anorexia in order to provide early intervention. RDs at DFCI are also committed to providing timely access to nutrition care for all patients (i.e. within 5 working days of request or at one of each patient's next two Institute visits). RDs at DFCI are committed to providing evidence-based nutrition interventions and staying abreast of current research in oncology, and also meet Institute-wide QA standards for medical record documentation.

Both patients in active treatment and survivors, regardless of how far out of treatment they are, are eligible for nutrition

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services offered by the Clinical Nutrition Service of Dana Farber Cancer Institute. Routine program offerings include “Fighting Cancer with Your Fork” every other month, and additional classes as suggested or desired by staff team members. Fork is regularly well-attended. Other classes may or may not be repeated, depending on attendance and demand, and nutrition seminars are offered as part of cancer-specific support groups.

### Internet Presence

The Nutrition Department has their own website within the Dana Farber website at [www.danafarber.org/nutrition](http://www.danafarber.org/nutrition). It includes information about DFCI Nutrition Services and how nutrition intervention can help patients during treatment and beyond. It includes a section describing each of the team members; a section on meal planning for healthy eating and symptom management; an extensive archive of “Ask the Nutritionist” questions and answers; a list of special upcoming events; and resources of books, education materials and recommended websites. Visitors also have access to evidence-based nutrition information recorded by nutritionists, can view the “Recipe of the Month”, and peruse recipe archives. Recently, DFCI posted instructions on how to download a new Smartphone nutrition app called “Ask the Nutritionist: Recipes for Fighting Cancer.” The app provides a link to most of the information on the website. It also allows the user to choose recipes and generate a shopping list. This app has been very well received by cancer patients both within and outside Dana Farber Cancer Institute.

### Goals of the Nutrition Program

Patient evaluations, quality assurance initiatives, and Press-Ganey scores are used to assess the quality of the DFCI nutrition program. In addition, heavy utilization of nutrition services by clinicians, as well as feedback they provide, suggest nutrition services are highly valued by both patients and staff here at DFCI.

RDs with the DFCI Nutrition Service report to Kathy McManus, MS, RD, LDN, the clinical

nutrition manager at Brigham and Women’s Hospital (located in the same complex as DFCI), with whom we are affiliated.

### Summary

DFCI nutritionists are highly regarded as experts in oncology nutrition in the Boston/New England area. In addition to being very lucky to have expert and adequate staffing to serve their population, they also serve as the oncology rotation for the Brigham and Women’s Hospital Dietetic Internship. Interns regularly rate the DFCI rotation as one of their favorites, and frequently request to do their special internship projects with the DFCI nutritionists on oncology nutrition-related topics. Having a regular flow of interns helps them stay up to date on the latest oncology nutrition information. Most of their part time staff also have outside professional activities, such as private practice, consulting to industry, university teaching, and freelance writing, which brings a wealth of diverse experience and expertise to their highly skilled team. They also provide integrative nutrition consults through the Zakim Center of Integrative Therapies, complementing the Massage, Reiki, and Acupuncture services offered.

### Heidi Pinsky, MS, RD and the Maimonides Cancer Center

#### Overview

As the only dedicated Cancer Center serving Brooklyn’s 2.5 million residents, Maimonides is committed to offering a comprehensive approach to cancer care. Maimonides Cancer Center is part of Maimonides Medical Center, which is more than 100 years old yet remains a vital and thriving non-profit, non-sectarian hospital. It is the pre-eminent treatment facility and academic medical center in the Borough of Brooklyn. Within the overall Cancer Center its Breast Cancer Center offers the only accredited *Breast Imaging Center of Excellence* in Brooklyn. The experienced team at the Maimonides Cancer Center offers both adult and pediatric care in Surgical Oncology, Radiation Oncology and Hematology/Oncology. In addition to

addressing the universal issues faced by cancer patients, Maimonides tailors its approach to the unique needs of the ethnically and financially diverse population it serves. In addition to nutrition services, the Center offers other support services, ranging from genetic counseling to social work to Psychological/Psychiatric counseling to Reiki massage.

The spirit of Maimonides Cancer Center can be summed up by this quote from the philosopher Maimonides “The physician should not treat the disease, but the patient who is suffering from it.” That philosophy extends to the Clinical Nutrition program at Maimonides.

In 2012, the Center provided 67,194 patient encounters. Heidi Pinsky, MS, RD works full-time as the RD dedicated to the Cancer Center and counseled 900 patients in 2012. Her position was created in 2009 from a grant given to the Cancer Center by The Susan G. Komen Foundation. The grant initially focused on breast cancer patients, but quickly expanded to cover the entire center’s patient population. Once the grant ended, Maimonides absorbed Heidi’s salary to allow her to continue to provide this needed service. Currently, insurance companies are billed for nutrition services and sometimes (but not always) the service is covered. If nutrition services are not reimbursed, the Cancer Center incurs the cost as part of their comprehensive care package.

### Nutrition Screening and Assessment

Heidi, in collaboration with the Nurse Managers from Heme/Oncology and Radiation Oncology, designed and implemented a nutrition screening tool to identify patients at nutrition risk. All nutrition referrals, assessments and follow up visits are documented in The Center’s electronic medical record system. Patients can be referred by any team member via referral form, email, or phone. Heidi makes rounds in the infusion suites where patients also self-refer. The nutrition screening tool considers weight status (loss or gain assessed by percentages), nutrition impact

symptoms such as anorexia, nausea/vomiting, diarrhea/constipation, comorbidities, obesity, etc. Comprehensive Nutrition Care is provided for all patients referred to Nutrition Services. That includes nutrition assessment, intervention and monitoring, nutrition education on a wide variety of issues, weight management counseling post treatment and nutrition workshops with cooking demonstrations. All patients and patients' friends/family may attend the workshops, regardless of their type or stage of treatment. Heidi manages her own schedule in order to efficiently meet the demands of the variety services (i.e., outpatient and community) offered.

### Comprehensive Nutrition Services

The oncology nutrition program at Maimonides Cancer Center includes nutrition assessment and intervention (either in a private office or at the patient's chair in the infusion suite), oncology nutrition education, and ongoing one-on-one visits before, during and after treatment for all referred outpatients. After a comprehensive initial assessment, Heidi determines follow-up care based on policy and clinical judgment. Often this is every 2 weeks during treatment. Post-treatment visits may be scheduled every 3-4 weeks or per patient preference. A nutrition education workshop with cooking demos are offered once a quarter. A pre-chemotherapy orientation is offered once a month, and includes a nutrition component. Heidi has made it one of her goals to provide nutrition education materials in Chinese, Russian, and Spanish, because a substantial part of the patient population is not primarily English speaking.

The cancer program at Maimonides Cancer Center is accredited by the CoC (Commission On Cancer), ACR (American College of Radiology; both imaging and Radiation Oncology), QOPI (Quality Oncology Practice Initiative), and NAPBC (National Accreditation Program for Breast Centers). Patients are also offered access to National Cancer Center sponsored research protocols.

### Goals of the Clinical Nutrition Program

1. Improve treatment outcomes
2. Manage and reduce nutritional side-effects of treatment which can interfere with eating
3. Collaborate with the Cancer Center team members (physicians, nurses, therapists, social workers, and administrative support staff) to ensure quality care

### Internet Presence

The Maimonides Cancer Center has a website <http://www.maimonidesmed.org/cancercenter/cancerHome.aspx> with additional information about making appointments, types of physicians, types of cancers, treatments and procedures, and support services (including nutrition) available to patients.

### Measuring success

Heidi considers it a success if there is quality care in each patient experience. She tracks how many patients are referred to nutrition services and how many patients actually receive services. Being able to educate and help every patient have a successful nutrition journey through treatment is what she is most passionate about.

### Summary

Heidi reports to Paulette Cirillo, RN, MSN, Vice President of Maimonides Cancer Center. Currently, Heidi is working on a Performance Improvement (PI) project with Ruth Knecht, NP (Nurse Manager of Radiation Oncology). The PI project identifies breast cancer patients with a high BMI at their first follow up visit to their Radiation Oncologist. The goal of the PI project is to see how many breast cancer patients would benefit from weight management counseling post-treatment to minimize their risk of recurrence. Heidi's goal is to continue to educate patients about the power of nutrition.

## Tenth Annual Russell Klein Nutrition Research Symposium:

**Day:** March 26, 2013

**Time:** 09:00 AM – 04:00 PM

**Location:** Biomedical Research Tower, 460 West 12th Avenue, Columbus, Ohio

Join the Graduate Society of Nutritional Sciences (GSNS) at The Ohio State University as they proudly host the **tenth annual Russell Klein Nutrition Research Symposium**.

The goal of the symposium is to provide an interdisciplinary framework for students and faculty interested in nutrition to showcase their research endeavors while highlighting renowned speakers from across the United States. This year's event will feature presentations by the following experts:

- **John Milner, PhD, United States Department of Agriculture in Beltsville, Maryland**
- **Karen Cullen, DrPH, RD, LD, Baylor College of Medicine in Houston, Texas**
- **Dale Romsos, PhD, Food Science & Human Nutrition Department, Michigan State University**

Graduate students from the departments of Human Science, Animal Sciences, Food Science and Technology, and all other FIC associated disciplines are invited to present research they have conducted in the past year to be judged by faculty members and nutrition professionals in the area.

# Cancer Treatment Centers of America's® Nutrition Program

by Stephanie Paver, RD, CSO, CNSC

Cancer Treatment Centers of America® (CTCA) has a national network of five cancer centers located in Zion, Illinois, Tulsa, Oklahoma, Philadelphia, Pennsylvania, Goodyear, Arizona, and Newnan, Georgia. Each community-based oncology specialty hospital is licensed for inpatient and outpatient services, including infusion centers & radiation centers. Each hospital is fully accredited by the Joint Commission and a number of other organizations. CTCA is recognized by numerous renowned healthcare organizations, such as the Association of Community Cancer Centers (ACCC), for delivering high-quality care and exceeding patient safety standards.

What CTCA has to offer goes beyond state-of-the-art cancer treatment. Many people are familiar with the term “patient-centered care”, as it is used ubiquitously to describe the treatment approach at many hospitals. In 2009, CTCA pioneered and trademarked the Patient Empowered Care® (PEC) model, which provides patients with truly integrative cancer care. Each oncologist has a team of providers that includes a clinic nurse, RD, naturopathic doctor (ND), nurse care manager, mind-body therapist, and pastoral care services. Each team participates in a morning meeting to review patients for the day. Current chemotherapy (type and cycle), results of scans, and any side effects or struggles the patient has experienced since his/her last clinic visit are addressed. Once a patient is brought back into the clinic, the nurse completes a nursing assessment and then forwards relevant information to each team member. The oncologist then sees the patient, followed by the ND, RD, and care manager. It cannot go without mention that we also offer pain management, speech language pathology, rehab services, massage, and chiropractic care to support the whole body, mind and spirit.

CTCA believes each patient should be treated with the attention and compassion we would want for our own loved ones. This is evident in each interaction with our

patients. We call this the Mother Standard® of care.

## Nutrition Program

For the RD, the PEC® model allows us to see our patients frequently, which helps to establish trusting relationships. This fosters proactive monitoring of response to nutrition interventions. Goals of nutrition care at CTCA are outlined below:

- Reverse and/or prevent weight loss and malnutrition so that patients can receive the prescribed amount of antineoplastic treatment as scheduled.
- Maintain or improve quality of life and physical function during cancer treatment.
- Modify behaviors to lower risk of recurrence, secondary cancers, or chronic disease.
- Aid in nutritional recovery after cancer treatment.
- Clarify and protect patients from confusing and contradictory health claims.
- Aid in weight control efforts for cancer survivors.

The RD's role on the team is to screen and assess all patients during their initial visit with the oncologist, and then reassess nutritional status at each subsequent visit to the clinic. Feedback on patients' nutritional status and planned intervention is shared with the team during daily

prospective reviews. The RD currently uses the Subjective Global Assessment (SGA) as an assessment tool to identify patients at risk (JPEN 1987), and nutrition-focused physical exam when appropriate. In addition to the SGA, the RD has a “nutritional laboratory panel” available to them which includes: Prealbumin, iron, TIBC, ferritin, and 25-hydroxy Vitamin D levels. A bioelectrical impedance (BIA) analyzer can be used to assess body composition. In addition, a hand-held indirect calorimeter can assess resting energy expenditure. Having all of these assessment tools at hand allows for a more accurate assessment of nutritional status, and helps to monitor and track response to nutrition intervention.

Nutrition interventions are provided based on nutritional status as determined by SGA. The SGA considers the percentage of body mass change over a specified time frame to determine significance (i.e. 5% weight loss x 1 month, 7.5% weight loss x 3 months and >10% weight loss x 6 months); presence and number of nutrition impact symptoms (i.e. nausea/vomiting, diarrhea/constipation, taste changes, sensitivity to smells, dysphagia, mucositis); any change in intake as compared to baseline (i.e. intake less than or much less than usual); and functional capacity (i.e. normal daily activities, bedridden, etc.). A number is assigned to each parameter. SGA scoring of 0-4 indicates a well-nourished patient, 5-9 reflects moderate malnutrition and >10 indicates severe malnutrition.

Well-nourished patients receive education on healthy eating during cancer treatment, based on the American Institute of Cancer Research (AICR) guidelines. These patients also receive proactive recommendations on potential side effects of their treatments with information on how to manage them at home should they occur. Patients receive educational materials that were developed by CTCA dietitians.

Moderately malnourished patients receive education on ways to increase calories and protein with food and oral supplements, as

well as tips to manage nutrition impact symptoms. If nutrition impact symptoms are not resolved at reassessment, cases are reviewed with the appropriate oncologist to determine if medications such as appetite stimulants, pro-kinetics, digestive enzymes, or other interventions may be indicated. Some of these patients also may be referred to the nutrition support team for evaluation for enteral and/or parenteral nutrition. Severely malnourished patients receive similar care to moderately malnourished patients, but often are referred to the nutrition support team much sooner.

CTCA takes a team-spirited approach to meet our patients' needs. For example, for head and neck patients with dysphagia who are getting radiation, the RD can set up a meeting with the head chef, the patient, and his or her caregiver. For the patient who can tolerate pureed or soft foods, the chef will inform his staff of the needs of this patient. At each visit to the cafeteria, the culinary staff will modify the patient's food choices accordingly. The RD will advise culinary staff on the protein and calorie needs, and modular calorie and protein powders can be added as directed by the RD. Many times we also plan for utilization of high protein/calorie drinks with added sherbet, and modular calorie powder that are prepared by the fresh juice and smoothie bar. There are a number of cases in which patients can avoid PEG tube placements using this personalized approach.

The Nutrition team partners closely with the Culinary team at each site. The objective is to serve healthy meals that emphasize whole grains, vegetables, fruits, and lean protein sources to align with our messaging. CTCA offers cooking demonstrations to make it easier for patients to replicate healthy meals at home. Recently, the CTCA dietitians and chefs developed a multi-focused cookbook. It includes chapters for managing each nutrition-related side effect of treatment. For example, one chapter provides recipes for soft foods for patients with difficulty chewing and swallowing, while another

chapter provides high protein and high calorie meals for patients with early satiety and anorexia. One chapter focuses on plant-based foods high in antioxidants and low in fat and added sugar to represent an ideal way of eating. The cookbook includes recipes of favorite patient foods served in CTCA dining rooms.

CTCA's mission goes beyond cancer treatment. With the understanding that diabetes, whether it is treatment-induced or pre-existing, can impact healing and immune function, CTCA at Tulsa has developed a Diabetes Self-Management Education Program that is accredited by the

American Diabetes Association. Some of the other sites have developed a diabetes program as well, but are not yet accredited.

With a majority of CTCA RDs being board certified in oncology and a number of them being credentialed as nutrition support clinicians, RDs at CTCA have the experience, training and tools to maximize good nutrition outcomes. In addition, functioning as an indispensable part of the PEC® model, they are able to be proactive and aggressive in managing treatment side effects, as well as guiding patients to safely make better nutrition choices, which support immune function and quality of life.

## Awards and Honors

Hello everyone! It's that time of year again when we begin thinking about Awards and Honors for the ON DPG. These awards are a wonderful way to recognize a fellow member or colleague who has done a terrific job and deserves to be recognized.

When you think of the Service Award...look at the ON DPG organization itself. Ask yourself: who has devoted their time and energy, and embodies the spirit of our DPG? The recipient of the award will receive a \$500 monetary gift.

When you think of the Practice Award...look for someone who is doing something innovative, something unique and who is helping to move our practice forward. The recipient of the award will receive a \$250 monetary gift.

Our Professional Partner Award is self-explanatory...it is to recognize a person or an organization who helps us communicate our message or promote our membership.

Go to <http://www.oncologynutritiondpg.org/about-us/awards/distinguished-service-award/distinguished-practice-award/> to find nomination forms. Again, I know you are busy but this is important and will only take a few minutes. Nominate someone for each award and then save and reattach the completed form to an email to Tricia Cox (contact information below). The nomination deadline is March 15, 2013. I will contact the candidates to obtain the necessary documentation for evaluation.

Thank you for helping us recognize our volunteers, membership and partners who make ON a vital and forward-moving organization!

Tricia Cox, RD/CSO/LD/CNSC  
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# Cranberries! Native Fruit's

Maybe you remember when cranberries mostly showed up at year-end holidays as the perfect relish for your roast turkey.

In the 1960s, however, the introduction of flavorful cranberry juice beverages helped build a new, year-round use for the berry. These pleasant blends balanced the cranberry's naturally tart flavor with the sweetness of other favorite fruits such as apples and pears.

In the 1990s, the launch of dried, sweetened cranberries, which look somewhat like little red raisins, brought new attention to the colorful fruit.

Cranberries are rich in fiber, low in sodium, and provide vitamin C and potassium. They also contain intriguing natural compounds referred to as flavonoids, polyphenols, or, more generally, phytochemicals.

Phytochemicals are of ongoing interest to nutrition and medical researchers worldwide. For instance, cranberry phytochemicals have been the focus of a series of studies by chemist Ronald L. Prior and colleagues. Formerly with the Agricultural

Research Service at the Arkansas Children's Nutrition Center in Little Rock, Prior is now an adjunct professor of food science at the University of Arkansas in Fayetteville.

### **Cranberry Juice-Processing Leftovers: A Treasure Trove of Phytochemicals?**

In one investigation, Prior collaborated with Brittany L. White, formerly at the university and now a food technologist with ARS at Raleigh, North Carolina, and with Luke R. Howard, a professor in the university's food science department, to closely examine the kinds and amounts of phytochemicals in cranberry pomace—the stems, skin, and pulp that are left when the plump berries are pressed to make juice or canned products.

“Cranberry processors are looking for new, value-added uses of these byproducts,” says Prior. Knowing more about the polyphenols in pomace might lead to new ways to build new markets for it.

Much is already known about the major polyphenols in fresh cranberries. But the Arkansas study is apparently one of the first to extensively investigate and document

the kinds and amounts of major cranberry-pomace polyphenols.

The researchers used several sophisticated analytical procedures, including high-performance liquid chromatography-electrospray ionization-mass spectrometry and matrix-assisted laser desorption time-of-flight mass spectrometry. These procedures can measure the molecular weight of pomace constituents and, from that, determine their identity. If appropriate reference standards are available, the quantity of each constituent can be determined.

Among other findings, the scientists determined that the pomace contained “appreciable levels” of flavonols, a class of polyphenols that includes, for example, quercetin and myricetin.

Fresh whole cranberries are already known to contain high levels of flavonols—more than most other berries and, in fact, more than most fruits or vegetables. But the research was the first to show that nearly half of the total flavonol content of whole berries was left behind in the pomace instead of making its way into juice.

Published in the peer-reviewed *Journal of Agricultural and Food Chemistry*, the study is the most up-to-date analysis of its kind for cranberry pomace.

The findings are a useful, readily accessible reference for medical and nutrition researchers, food processors, and others.

### **Tactic Targets “Unextractable” Pomace Components**

A related investigation showed that the conventional procedure for gleaning polyphenols from pomace doesn't fully extract proanthocyanidins, or PACs, an important class of polyphenols.

The normal extraction process relies on a solution of acetone, acetic acid, and water. The team of White, Howard, and Prior examined an alternative approach—one that requires exposing pomace to various concentrations of sodium hydroxide at 140°F for 15 minutes. This method re-

Garnishing chicken with cranberry chutney adds flavor and nutrients. Cranberries are rich in fiber and provide vitamin C and potassium.



# Interesting Natural Compounds Investigated

leased 3 to 15 times more PACs than the traditional extraction method, according to the scientists.

The team recommends using the traditional method first—to extract the more readily accessible polyphenols—then following that with the sodium hydroxide-based procedure to tackle the recalcitrant PACs.

The sodium hydroxide method is not new. It is already used to recover polyphenols from rice, wheat, and corn, for instance. But the team is likely the first to show that the process works well for extracting cranberry PACs, too. More research is needed to determine what amounts of PACs are lost as a result of the sodium hydroxide treatment. In the

ARS scientists closely examined the types and amounts of interesting compounds in cranberry pomace (center), which is the stems, skin, and pulp left over after the berries are pressed to make juice or canned products.



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meantime, researchers studying PACs in other plants might want to give the procedure a try. Cranberry PACs are of special interest because some research suggests that they may help counteract urinary tract infections. This role remains controversial, however.

The scientists documented their research in the *Journal of Agricultural and Food Chemistry* and have applied for a patent for the sodium hydroxide-based process.

### A Better Way To Measure PACs in Cranberry Products

Prior's investigations of cranberry PACs has also included pinpointing what is perhaps the best available method for commercial labs around the globe to use to reliably determine the PAC content of cranberry products.

Some currently available methods for measuring cranberry PACs either under- or overestimate the levels or pose other problems. Prior and colleagues at five different analytical labs on three continents determined that a quick, inexpensive test, the BL-DMAC

(Brunswick Laboratories 4-dimethylaminocinnamaldehyde) assay, provided similar PAC results from one lab to the next. For this research, all of the participating labs were provided with the same set of 11 samples and a known standard as a reference.

"No single test for quantifying cranberry PACs—including this one—is perfect," says Prior. "But we recommend this one as the industry standard for cranberry product PAC analysis worldwide for several reasons. It is fast and inexpensive; provides results that are accurate, reliable, and reproducible; doesn't require expensive equipment or extensive training; and is fairly easy to use."

A peer-reviewed article in the *Journal of the Science of Food and Agriculture* tells more about the research.—By **Marcia Wood**, ARS.

*This research is part of Human Nutrition, an ARS national program (#107) described at [www.nps.ars.usda.gov](http://www.nps.ars.usda.gov).*

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## CPE Questions for the article *Dairy Foods, Milk, Calcium and Risk of Prostate Cancer*

- 1. Where does prostate cancer fall in the rankings as the cause of cancer-related death among U.S. men?**
  - a. 1st
  - b. 2nd
  - c. 3rd
  - d. 4th
- 2. Which of the following elements are established risk factors for prostate cancer?**
  - a. Hormones, birth weight, race
  - b. Hormones, birth weight, smoking history
  - c. Family history, age, race
  - d. Family history, age, smoking history
- 3. Which of the following groups in the US has the highest incidence of prostate cancer?**
  - a. White men
  - b. Hispanic men
  - c. Chinese men
  - d. Black men
- 4. Circulating levels of which of the following substances are associated with an increased risk of prostate cancer?**
  - a. Insulin-like growth factor
  - b. 1,25 dihydroxy vitamin D
  - c. Calcium
  - d. Cholesterol
- 5. Which of the following findings were found in the PLCO Cancer Screening trial?**
  - a. High-fat dairy intake was associated with an increase in total cases of aggressive prostate cancer.
  - b. Low-fat dairy intake was associated with an increase in total cases of aggressive prostate cancer.
  - c. High-fat dairy intake was associated with an increase in total cases of prostate cancer.
  - d. Low-fat dairy intake was associated with an increase in total cases of prostate cancer.
- 6. Prospective cohort studies in France, Finland and Japan observed which of the following findings in regards to risk of prostate cancer?**
  - a. A significant increase in the lowest vs. highest quantile of dairy intake.
  - b. A significant increase in the highest vs. lowest quantile of dairy intake.
  - c. A significant decrease in the lowest vs. highest quantile of dairy intake.
  - d. A significant decrease in the highest vs lowest quantile of dairy intake.
- 7. The EPIC study used which of the following indicators as an estimate of total dairy intake?**
  - a. Dairy calcium
  - b. Dairy protein
  - c. Dairy fat
  - d. Dairy vitamin D
- 8. The NHANES I data suggested a milk intake of 2 servings/day was associated with what percent increase in risk of prostate cancer?**
  - a. 50%
  - b. 60%
  - c. 70%
  - d. 80%
- 9. When counseling men in regards to prostate cancer risk what advice should be given?**
  - a. Advise men to avoid all dairy products.
  - b. Advise men to consume only whole milk.
  - c. Counsel men on the benefit of obtaining calcium from a variety of sources.
  - d. Counsel men on the benefit of consuming dairy products as the primary source of calcium.
- 10. When deciding what dietary advice to give a man in regards to decreasing risk of prostate cancer which of the following factors should be considered?**
  - a. Race, family history, comorbidities
  - b. Race, family history, smoking history
  - c. Height, age, comorbidities
  - d. Height, age, smoking history