

## Special Feature

# The BCERF Regional Cancer and Environment Forum: Fall 2005

*Ribbon* readers are aware of the twice-yearly Regional Cancer and Environment Forums that BCERF facilitates around New York State (NYS); we publish summaries of each one in this newsletter. Many of you – even out-of-state readers – have participated in these events. In this issue, we are featuring an expanded overview of the most recent Forum, including an interview with one of the speakers, Nellie Brown. We place special emphasis on the panel discussion featured at the Forum.

### Emerging Chemical Concerns

Over 50 participants gathered for an interactive day addressing issues related to occupational cancers in women, exposure to mammary carcinogens, and emerging research on the flame retardants, PBDEs (polybrominated diphenyl ethers). These issues were discussed at BCERF's fall 2005 Regional Cancer and Environment Forum, held in Albany on September 30. Presentations and discussion created an opportunity to share information and address the critical question: where do we go from here on issues of emerging chemical hazards?

When the Forum takes place in Albany, BCERF strives to present an opportunity for elected representatives and their staffs, as well as state agency professionals, to interact with other scientists, activists and members of the public on these topics. There was excellent participation from the many branches of the NYS Department of Health, as well as from legislative staff. Other participants included representatives of the medical community, several breast cancer advocacy groups, Cornell Cooperative Extension and other not-for-profit organizations, and the American Chemistry Council.

### Women, the Workplace and Breast Cancer Risk

The morning sessions addressed an area increasingly important to BCERF's translational

research work: occupational exposures to chemical carcinogens. Dr. Suzanne Snedeker drew on her work investigating the state of the research on female occupational cancers for her talk, *Women, the Workplace, and Cancer Risk*. Her overview of the history of what is known about women and occupational cancer risk displayed both important early observations – such as the discovery of the increased risk of breast cancer in nuns in the 1700s – as well the long-term lack of inclusion women in occupational cancer studies. Not only were women often not included in studies that did take place historically, but specifically female cancers, as well as women's different or increased vulnerabilities to exposure to carcinogens, have all been understudied.

Since the mid 1990s more data is accumulating which suggests that women's risk of breast cancer is increased in some workplaces. Worldwide epidemiologic research is showing an increased risk in certain professions, and with certain chemical exposures (laboratory research has also identified mammary carcinogens; more below). Based on these observational studies, Dr. Snedeker presented a list of occupations that need further evaluation (see box 1). Fortunately, there are also several large epidemiologic studies taking place currently that are addressing some populations at increased risk, such as the Sister Study (which

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has an occupational component) (see [www.sisterstudy.org](http://www.sisterstudy.org) and Volume 9, No. 4 issue of *The Ribbon*), the California Teachers Study (see [www.calteachersstudy.org](http://www.calteachersstudy.org)), and others.

### **Mammary Carcinogens: Scenarios for Exposure**

The National Toxicology Program (NTP) identified 42 mammary carcinogens in cancer bioassays, many of which exist in contemporary workplaces. BCERF is working with this list in a project entitled *Chemicals, the Workplace and Cancer Risk*. This work grew out of the EnviroChem and Cancer Database (see <http://envirocancer.cornell.edu/eccd/> and Volume 9 Number 3 issue of *The Ribbon*). In the September Forum, participants were able to hear the unique work being done by Dr. Snedeker and colleague Nellie Brown in bringing to light the many possibilities for exposure to these mammary carcinogens. Ms. Brown's presentation, *Mammary Carcinogens: Scenarios for Exposure*, demonstrated the workplace, home and broader community and environmental possibilities for exposure to NTP mammary carcinogens such as benzene, 1,3-butadiene, and 2,4-toluenediamine. Ms. Brown has developed a "cradle-to-cradle protocol" for examining the real-life scenarios for exposure in the workplace, based on the chemical's origin, its transport, all intended or unintended uses of it, and its disposal. She is also compiling information on ways consumers may be exposed to these carcinogens. See the interview with Ms. Brown on page 5 for a fuller picture of the experience she brings to this work and the data being compiled.

### **Polybrominated Diphenyl Ethers (PBDEs)**

BCERF strives to communicate the latest information on emerging contaminants. There is growing evidence that the flame retardants PBDEs are bioaccumulating in humans and wildlife. PBDEs are structurally similar to polychlorinated biphenyls (PCBs). Research in animal models indicates PBDEs may have some of the same health effects as PCBs, which are environmental estrogens and have been

#### **Box 1: Occupations that need further evaluation**

- Chemical manufacturing workers
- Pharmaceutical and biomedical workers
- Electronics / semi-conductor workers
- Cosmetologists and hairdressers
- Print, dye, and textile workers
- Metal workers and mechanics
- Health care workers
- Teachers and librarians
- Dry cleaner workers
- Fire fighters

composition and uses of these commercial mixes.) PBDEs have been phased out by some European countries; some types are being voluntarily phased out by manufacturers in the United States. NYS has passed legislation to phase out two of the commercial formulations, penta-BDE and octa-BDE. The use of deca-BDE is being reviewed to assess health effects of the deca form (deca-BDE has 10 bromine atoms), and whether it can degrade to other forms (congeners) of PBDEs that have fewer bromine atoms. While researchers believed that deca-BDE was poorly absorbed because of its bulky structure and therefore did not bioaccumulate in tissues, new research has detected deca-PBDE in bird eggs. Some types of fish appear to be able to break deca-BDE down to congeners

shown to interfere with thyroid function and learning development. Certain types of PBDEs are suspected of linkages with a variety of long-term health concerns, such as hormone disruption, possible carcinogenicity, and neurological, reproductive, and developmental effects (see box 2).

The three most common commercial mixtures of PBDEs are penta-, octa- and deca-BDE, named according to the number and arrangement of the bromine atoms. (See the table on facing page for

composition and uses of these commercial mixes.) PBDEs have been phased out by some European countries; some types are being voluntarily phased out by manufacturers in the United States. NYS has passed legislation to phase out two of the commercial formulations, penta-BDE and octa-BDE. The use of deca-BDE is being reviewed to assess health effects of the deca form (deca-BDE has 10 bromine atoms), and whether it can degrade to other forms (congeners) of PBDEs that have fewer bromine atoms. While researchers believed that deca-BDE was poorly absorbed because of its bulky structure and therefore did not bioaccumulate in tissues, new research has detected deca-PBDE in bird eggs. Some types of fish appear to be able to break deca-BDE down to congeners that have fewer bromine atoms, have the capacity to bioaccumulate, and may travel up the food chain.

In the afternoon of the Forum, participants welcomed Dr. Kurunthachalam Kannan of the Wadsworth Center at the NYS Department of Health and the Department of Environmental Health Sciences at SUNY Albany. His talk was entitled *Polybrominated Diphenyl Ethers (PBDEs) and Polychlorinated Biphenyls (PCBs) in Human Adipose Tissue from New York*. Dr. Kannan shared unique data that his team collected which documents levels of PBDEs and PCBs in fat samples of New York City residents (Johnson-Restrepo, et al., 2005) This study documented the highest adipose tissue levels of PBDEs of any human study published to date. Average PBDE concentrations from

#### **Box 2: Health Hazards of PBDEs Identified in Animal Models**

- Evidence of hormone disruption
  - Some forms are estrogen mimics (PBDE 100)
  - Some forms bind to thyroid hormone receptor or disrupt thyroid hormone pathways
- Some evidence of carcinogenicity
- Neurological and reproductive problems
  - Hyperactivity in male rats fed high or low levels
  - Hyperactivity more pronounced as animal ages
  - Spermatogenesis permanently impaired
  - Structural effects in ovaries of female rats
- Developmental defects (skeletal malformations)

Credit: Suzanne Snedeker

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**Polybrominated Diphenylether (PBDE) Flame Retardants  
Composition, Uses, and Production Levels of Commercial PBDE Mixtures**

Commercial PBDE mixture <sup>1</sup>	Composition <sup>1</sup>	Used In <sup>1</sup>	Specific Products <sup>1</sup>	Percent of PBDE market <sup>2</sup> (U.S. 2001)
<b>Penta</b>	<0.2% tri-BDE (congeners 17, 28) <sup>3</sup>  24-30% tetra-BDE (congeners 47, 66, 77)  50-60% penta-BDE (congeners 85, 99, 100)  4-8% hexa-BDE (congeners 138, 153, 154)	Polyurethane foams	<b>Flexible foams<sup>4</sup></b> Upholstery foam for <ul style="list-style-type: none"> <li>couches and chairs</li> <li>cars, trucks &amp; buses</li> <li>theatre seats</li> <li>office furniture</li> </ul> Carpets and padding Mattresses and pillows	21.5%  7,100 metric tons
		Electrical appliances <sup>4</sup>	<b>Solid foams<sup>4</sup></b> as elastomer in casings <sup>4</sup> Personal computers <sup>4</sup> Television sets <sup>4</sup>	
		Packaging <sup>4</sup>		
<b>Octa</b>	10-12% hexa-BDE (congeners 138, 153, 154)  44% hepta-BDE (congener 183)  35-37% octa-BDE (congener 203) <sup>3</sup>  10-11% nona-BDE  <1% deca-BDE (congener 209)	Acrylonitrile-butadiene-styrene (ABS) plastic	Plastic computer monitors Television housings Circuit boards	4.5%  1,500 metric tons
<b>Deca</b>	Trace octa-BDE  <3% nona-BDE  >97% deca-BDE (congener 209)	High impact polystyrene	Plastic housing for computers, TVs, and other electronic equipment	74.0%  24,500 metric tons
		Polyethylene	Plastic electronic wires, cables and pipes, textile coating/upholstry <sup>1,5</sup>	

<sup>1</sup> Schecter A, et al. J. Toxicology and Environmental Health, Part A, 68:501-503, 2005.<sup>2</sup> www.bsef.com ([http://www.bsef.com/bromine/our\\_industry/index.php](http://www.bsef.com/bromine/our_industry/index.php))<sup>3</sup> Alaei M., et al. Environmental International, 29:683-689, 2003.<sup>4</sup> Prevedouros K., et al., Environmental Science and Technology, 38:3224-3231, 2004.<sup>5</sup> BSEF, Deca-BDE Fact Sheet, Edition 2004, www.bsef.org

Table compiled by Suzanne Snedeker and Katarzyna Fertala

this study were 10- to 100-times greater than those reported for European countries.

There are multiple ways that people can be exposed to PBDEs; for example, since it is present in so many consumer products, there is the possibility of breathing dust from degradation. These materials are heavily present in the environment and can also be taken up through the food chain (see below on Cornell work addressing the degradation of PBDEs in the environment). Dr. Kannan's research suggests there is a high degree variation in human exposures associated with specific occupational and environmental settings, and his research team recommends further research to identify the sources of exposure and to assess the adverse effects on human health. The afternoon panel provided an opportunity to at least briefly discuss the many public health questions brought up by the kind of data Dr. Kannan shared.

**At Cornell:** Dr. Anthony G. Hay, Associate Professor in Cornell's Department of Microbiology and the Director of the Institute for Comparative Environmental Toxicology (ICET), researches conditions under which contaminants, such as PBDEs, degrade in the environment. Dr. Hay and BCERF's Dr. Suzanne Snedeker are faculty members within the Graduate Field of Environmental Toxicology. For more information on ICET faculty and research, see <http://www.toxicology.cornell.edu/>

### Emerging Chemical Concerns: Where Do We Go From Here?

The panel reflected the diversity of participants in the day's Forum: Dr. Suzanne Snedeker of BCERF; Kathy Curtis of Citizens' Environmental Coalition; Bob Campbell of Great Lakes Chemical Corporation; Margaret Roberts of Capital Region Action Against Breast Cancer (CRAAB!); Beth Meer from the office of Assemblyman Thomas DiNapoli, and; Debbie Peck Kelleher from the office of Senator Carl Marcellino. The panel was moderated by BCERF's Director, Dr. Rodney Page. Panel members represented their respective constituencies on the question *Emerging Chemical Concerns: Where Do We Go From Here?*

Bob Campbell began the discussion, commenting that flame retardants save lives everyday and that caution must be exercised when promoting product substitution; "the substitute needs to actually reduce risk," and, "the replacement might be worse." When Hope Nemiroff offered the question, "why are we always playing catch up, after chemicals are already out there?" a conversation ensued about the need for a model other than the typical risk assessment/regulatory model.

Beth Meer offered ideas along those lines. Ms. Meer

said that too few chemicals are being tested with the current model (the extremely high cost of testing chemicals came up several times throughout the panel discussion), and there are several persistent challenges with current scientific models: for example, extrapolating from animal studies. She cited several examples of programs that are developing broad-reaching approaches to substitution with safer alternatives, such as the Toxics Use Reduction Institute (TURI) at the University of Massachusetts Lowell (<http://www.turi.org/>) and the Center for Integrated Manufacturing Studies (CIMS) at the Rochester Institute of Technology (<http://www.cims.rit.edu>)

Dr. Snedeker provided some background on the scientific community's response to PBDEs. She described the enormous number of papers that are currently being published on PBDEs, and the escalating levels of these chemicals in both wildlife and humans that this work documents. She expanded upon Dr. Kannan's comments regarding health concerns that these levels raise, and noted that the CDC's biomonitoring efforts, as part of its Environmental Public Health Tracking Program (see Volume 10, Number 3 issue of *The Ribbon*) will be adding PBDEs to its program beginning in 2007.

Speaking for the cancer survivor community, Margaret Roberts reiterated that it will take decades to show proof of harm and that a precautionary approach is warranted as soon as a body of evidence indicates an exposure is harmful. She outlined and expressed support for the several bills developed by Congressman DiNapoli and Senator Marcellino and colleagues that would expand precautionary policies on the NYS level: the Public Health Protection Act (which would establish criteria to guide a precautionary policy; <http://assembly.state.ny.us/leg/?bn=A07256>), the Sustainable and Safe Procurement Act (<http://assembly.state.ny.us/leg/?bn=A07257>), and the Environmental Public Health Tracking Act (<http://assembly.state.ny.us/leg/?bn=A00969>). (Web addresses in parentheses lead to NYS Assembly versions of the bill; you can also search Senate versions of these and other bills on the Assembly's bill search page: <http://assembly.state.ny.us/leg/>)

Kathy Curtis cited a very recent report from the advocacy organization Illinois PIRG, entitled "Body of Evidence II: Latest Science on the Dangers of Deca-BDE in Consumer Products" (<http://www.illinoispirg.org/IL.asp?id2=19439>). Body of Evidence II updates the first Body of Evidence report released in February of 2004, and summarizes research results from the past year, in areas such as measurement of indoor levels of deca-BDE. Kathy also explained that there are viable alternatives that meet the

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## Interview with Nellie Brown: *Tracking Down Exposures to Mammary Carcinogens*

Nellie Brown is currently collaborating with Dr. Suzanne Snedeker to create a report titled, "Chemicals, the Workplace, and Cancer Risk." On the origins of this project, Dr. Snedeker says,

*This project has grown out of the first cancer-risk database BCERF constructed, the EnviroChem and Cancer Database (ECCD). Several years ago, undergraduate Michael Goldman and computer programmer Sean Gardner worked with me to construct an interactive database on the 42 National Toxicology Program (NTP) chemicals known to cause mammary (breast) tumors in laboratory animal cancer bioassays. In our research, we found that most of these chemicals are still manufactured and used, nearly all have the potential for exposure in the workplace, and some are present in household products. Much of the data characterizing occupational exposures to chemicals are based on two surveys conducted 20-30 years ago by the National Institute for Occupational Health and Safety (NIOSH). We lacked a database that would characterize the potential for exposure to mammary carcinogens not only by occupation, but also by specific tasks. We needed to address not just potential exposures resulting from the manufacturing of the chemical and its use in making other products, but also from when the chemical is produced as a by-product or contaminant, as well as when workers are exposed during transport or even during repair of equipment and clean up operations. Our intent is to create a database that would reflect past and current exposure scenarios that could be used by workplace safety professionals. We hope to use this database as a basis of educational programs for consumers as well.*

**The Ribbon:** What about your background and other current work make you a good match for this project?

**Nellie Brown:** Everything I have ever done has turned out to be relevant to this project. Currently – and for as long as I have been doing workplace health and safety programs for the School of Industrial and Labor Relations – I do a great deal of site investigations in the field involving process hazard/failure evaluations and job hazard evaluations. Through this work I am directly familiar with workplace processes that may lead to exposures, and so I can purposefully track those things down. It helps very much when you already know, for example, that in a certain process there may be vents here, leaks there, waste generated here... I do a lot of process failure analysis; that is determining where an industrial process is likely to go wrong, and therefore possibly lead to exposures.

In my employment previous to this I have worked as a wastewater treatment chemist and developed a knowledge base in biogradability, product composition and potential disposal possibilities. I became interested in whole formulations of products, not just an active ingredient or two. I began my career in limnology (the study of the biology, chemistry, and physics of fresh water) and also worked as a chemist for a coke oven battery; as a result, my experience in dealing with environmental issues, as well as my industrial process experience have proven useful for this project.

Tracking down all the possibilities for exposure to these mammary carcinogens really draws on all this experience. The project draws upon all I am and do. I feel energized when I work on it – always a good sign!

**R:** When you presented in Albany on September 30, you talked about a "cradle-to-cradle protocol" for examining exposure to these chemicals; can you explain this to readers?

**NB:** One often hears the concept of cradle-to-grave. But the fact is, there are a lot of materials that, environmentally-speaking, don't rest easily in their graves. About a year before beginning work on this project, I came across this concept of a cradle-to-cradle protocol. Actually, many industries have grown up around taking care of used materials – keeping them out of landfills by remanufacturing or reusing them. Many of the items we are dealing with in the mammary carcinogen database involve exposures in these types of industries or are themselves produced by using these processes to recycle into other products. We need to be able to capture the fact that these chemicals really stay in the system or have their origin in a place one might not normally think about. Through the cradle-to-cradle protocol, I check to make sure I have accounted for all the ways the chemical might come into being or create exposures. And this can be within all kinds of jobs, not just manufacturing.

**R:** Talk a bit more about the procedure you go through to complete your work on each of these chemicals.

**NB:** I tend to start out with two kinds of things. First, I account for various ways the chemical might come into being: sometimes it is made by natural processes, some-

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times it is deliberately synthesized, sometimes it exists in a matrix such as petroleum and is separated out, sometimes it is a by-product or may not be desired but rather is a contaminant, and finally there can be *de novo* synthesis, such as may take place with thermal decomposition or some other chemical reaction during use.

Second, I try to capture all intentional uses and predictable misuses, and, along with these, issues of transport and disposal. I use a variety of databases, as well as books and technical references. As I do these retrievals, I may not need more than an abstract to know how a chemical might be used or present as a contaminant, and other times I need to go quite deeply into the reference source for details. Then I take each item (origin, use, transport, disposal, etc.) and put it into the appropriate industry classification categories. So these initial two tasks become my “staging area” to organize the information. The industry classifications include both the North American Industry Classification System (NAICS), which is recent, as well as the older Standard Industrial Classification (SIC) system.

Envisioning where to classify the chemical as to specific jobs and tasks is sometimes a process of thought and reflection. For example, for a compound that is in development I may need to give it a laboratory classification in addition to a manufacturing (research and development) one. And of course I have to make sure to cover transportation, unless it is one that is used where it is created.

An example of one of the mammary carcinogens with major transportation issues is benzene. It is a component in gasoline, and transported by every mode: trucks, barges, ships, pipelines, along with tank farms (area depots where material is transferred), until it reaches the point of sale (wholesale or retail). And of course emergency services (such as firefighters performing hazmat, or police handling evacuations) always come into play with transportation due to the potential for leaks, accidents, derailments, etc. on land or water, and exposures can occur with all of these occupations.

**R:** *Have any of the exposure scenarios you have been working on surprised you? What are some examples?*

**NB:** For me some major surprises have been those related to food and food processing, for example the use of 1,2 dichloroethane in extracting cholesterol from organ meats or to decaffeinate coffee. Fortunately there has been a move away from using organic solvents for some processes such as decaffeination. There are several of these chemicals used or formed in the manufacturing of dyes. One of them, known as C.I basic red 9 (p-Rosaniline hydrochloride) has been used for coloring apple-packing trays, as well as a tint for antifreeze and in toilet sanitary products. Another surprise for me was the use of benzene as a disinfectant in veterinary medicine.

And a totally different situation for benzene exposure I have come across is in reports of it occurring (in one study) in 80% of fire scenarios, as plastics and other synthetic materials smolder.

**R:** *You have a lot of knowledge about how changes can actually be made in the workplace with regard to reducing chemical exposures. What needs to happen? Who needs to be involved?*

**NB:** There are a couple ways this process can be driven. Both management and the workforce need to be involved. Expertise is not only available from management, but also from people on the front lines who can have a lot of good ideas about how change can happen, with all their shop floor experience on how the processes run. And this would include both operations and maintenance; maintenance can often be overlooked. Many industrial processes have been cleaned up and made into closed systems – this can protect operators very well, so that maintenance might primarily be where exposure does occur. For example, a worker repairing a valve or cleaning up a spill may be at risk for exposure.

It is certainly helpful to have expertise applied by people in the health and safety field, and from the medical professionals. Some physicians may actually visit the workplace, while others may only get involved second hand.

Change in the workplace ideally involves all those on the shop floor, and this type of thing should be handled as any other major change in the workplace. Changing a chemical or a process can make an enormous difference, but there can be resistance. I had a situation in which a water-based material was substituted for an organic solvent, but people were bothered by the fragrance of the safer substitute. So the hazard went down, but people were resistant to the change. Change is best accomplished if employees are directly involved in helping to shape the implementation, along with good background information and training.

In looking at some of these processes where mammary carcinogens are involved, I see many examples of processes that should not be done as I am seeing them described or reported, in any case. I came across a situation in which an ethylene oxide procedure was being used for sterilization in a hospital. The sterilizer sometimes had an unventilated air gap between the discharge line and sewer such that, at the end of the sterilization cycle, the resulting backpressure could blow the sterilizer door and gases back at the operator. Ethylene oxide is still in use for medical instrument sterilization but alternatives are being brought into play.


**R:** *You also know a lot about consumer products and their chemical contents; would you say we should be*

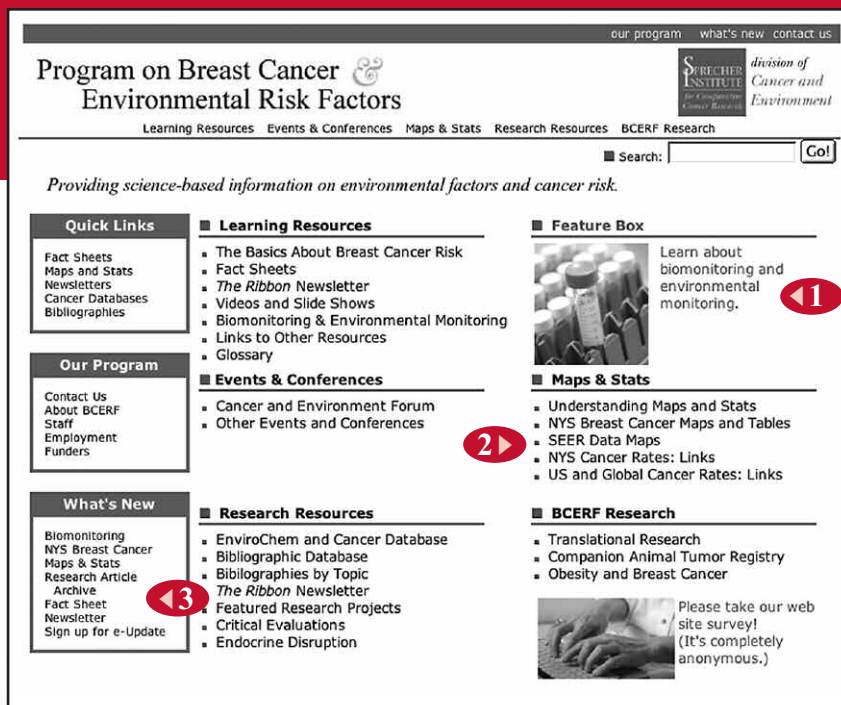
# News from the Web

**1▶** Biomonitoring and environmental monitoring have been in the spotlight recently at BCERF. Beginning with a distance learning session in February 2005, followed by the Cancer and Environment Forum in June and the Fall 2005 edition of *The Ribbon*, we've developed a lot of information about these complex and rapidly expanding fields. Visitors to the web site can now find all of our resources collected in one section. This new section includes links to handouts, a slide show, a question and answer section, articles from *The Ribbon*, fact sheets, and links to other resources on the web.

**2▶** We updated our New York State Breast Cancer maps and data section. The data and maps for 1997-2001 and 1998-2002 are now available. The data comes from the New York State Department of Health Cancer Registry. BCERF converts the breast cancer data into maps color-coded by county.

**3▶** When you visit the BCERF web site and want to know immediately which sections have changed, check the What's New box (or the What's New link in the blue bar above our program name). This reference highlights the newest additions to the site.

Subscribers to the BCERF eUpdate receive periodic emails detailing additions to the site and current BCERF news. If you'd like to subscribe to the eUpdate, send an email to Ellen Hartman: eh79@cornell.edu. 




The screenshot shows the BCERF website interface. At the top, there's a navigation bar with links: "our program", "what's new", and "contact us". Below this is the main header: "Program on Breast Cancer & Environmental Risk Factors". A secondary navigation bar includes "Learning Resources", "Events & Conferences", "Maps & Stats", "Research Resources", and "BCERF Research". A search bar is located on the right. The main content area is divided into several sections: "Quick Links" (Fact Sheets, Maps and Stats, Newsletters, Cancer Databases, Bibliographies), "Our Program" (Contact Us, About BCERF, Staff, Employment, Funders), "What's New" (Biomonitoring, NYS Breast Cancer Maps & Stats, Research Article Archive, Fact Sheet, Newsletter, Sign up for e-Update), "Learning Resources" (The Basics About Breast Cancer Risk, Fact Sheets, The Ribbon Newsletter, Videos and Slide Shows, Biomonitoring & Environmental Monitoring, Links to Other Resources, Glossary), "Events & Conferences" (Cancer and Environment Forum, Other Events and Conferences), "Research Resources" (EnviroChem and Cancer Database, Bibliographic Database, Bibliographies by Topic, The Ribbon Newsletter, Featured Research Projects, Critical Evaluations, Endocrine Disruption), "Feature Box" (Learn about biomonitoring and environmental monitoring), "Maps & Stats" (Understanding Maps and Stats, NYS Breast Cancer Maps and Tables, SEER Data Maps, NYS Cancer Rates: Links, US and Global Cancer Rates: Links), and "BCERF Research" (Translational Research, Companion Animal Tumor Registry, Obesity and Breast Cancer). There are also images of laboratory equipment and hands typing on a keyboard.

**http://envirocancer.cornell.edu is BCERF's home on the web.**  
**After our complete revamp of the site last spring,**  
**we've been adding new features and updating current resources.**

**Interview: Nellie Brown** *continued from page 6*

## ***equally concerned about non-occupational exposures to mammary carcinogens? Examples?***

**NB:** The issue for me is multiple exposures. If you are exposed to any of these things in the workplace, chances are you are going to get multiple exposures, due to the many consumer exposures you are also likely to have. For example, how do we avoid exposure to benzene in gasoline? If one only considers consumer routes, there are possibilities to try to avoid some of them. Of course we all weigh where we put our energy, with choosing alternatives and trying to stick with them. It is not easy as a consumer to individually avoid some of these chemicals. For example, with the food colorings extracted with problematic solvents: could you successfully not consume any of that coloring, anywhere? It is difficult on our own. So many of these chemicals are in such

widespread use, the pressure will need to come from consumers to press manufacturers to use alternatives. 

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# Preschool Diet and Adult Risk of Breast Cancer: Considerations of Fundamental Issues in Carcinogenesis and Acrylamide Exposure

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Michels KB, Rosner BA, Cameron Chumlea W, Colditz GA, and Willett WC. Preschool diet and adult risk of breast cancer. *International Journal of Cancer* 2005 Aug 10; [Epub ahead of print]

A great deal of attention has recently been given to a study that examined the association of adult breast cancer risk with various foods in the diets of women during their preschool years (ages three to five years) (Michels et al., 2005). This study found a moderate increase in breast cancer risk (27%) for each weekly serving of french fries in the preschool diets of the women being studied. This is a preliminary report that will require further verification before recommendations can be made. Nevertheless, it has a good scientific foundation and its review provides fertile ground for the discussion of a number of fundamental issues important to breast cancer. I will build the review of this study around the discussion of these issues.

**1. There are likely to be critical periods of susceptibility to the initiation of breast cancer.** This study examines the association of 30 different foods eaten during women's preschool years with their adult breast cancer risk. Previous studies have examined women's diets during puberty but this study is the first to examine diet at this early life period. This time may well be an important period for breast cancer susceptibility. Studies of breast cancer risk in women exposed to radiation from the Hiroshima and

Nagasaki bombings reported the greatest risk for women exposed at ages up to five years (Tokunaga et al., 1987). Examinations of potential breast cancer risk factors during this time period of women's life are important.

**2. Cancer takes decades to develop following the initial exposures to cancer causing agents. Study of these initial exposures, which occurred decades earlier, is difficult to carry out but nonetheless critical.** This study is part a group of studies known as the Nurses' Mothers' Health Study. These studies gathered information from the mothers of nurses being followed in two large cohort studies. This case-control study evaluated the breast cancer risk associated with nurses' preschool diets as remembered by their mothers. The design of the study, built around gathering information about exposures far in the past, has validity as it fits well with the biological time course of the cancer formation. However, this design also has several important weaknesses. The results are dependent on how well the mothers of these nurses remember their daughter's diet at ages three to five, a time 40 to 80 years earlier. In addition, there is concern that the memory of mothers whose daughters developed breast cancer might be

selectively affected by their daughter's disease, leading to inaccurate reporting of certain foods. For example, a mother might take on some responsibility for her daughter's breast cancer and report lower values for healthy food and higher values for unhealthy foods. Because of these weaknesses, it will be important to see the results of other studies that examine diet and breast cancer risk during this life period.

**3. An association found in an epidemiological study does not necessarily indicate a cause and effect relationship.** The association of weekly servings of french fries at ages three to five and adult breast cancer risk may indicate that the french fries, themselves, affect breast cancer risk. On the other hand, it may also be that the association merely reflects other behaviors associated with breast cancer risk. Girls who ate more french fries may have had poorer overall diets and it is this, rather than the french fry consumption, which contributed to the moderate increase in breast cancer risk.

These limitations are well understood in epidemiological studies and the evidence necessary for a cause and effect relationship has been defined. This topic was discussed in an earlier issue of *The Ribbon* (see "Evaluation of the Evidence: What



Does It Take to Show a Cause and Effect Relationship Between Carcinogen Exposure and Cancer Formation?" *The Ribbon*, Volume 7, Number 4). A key piece of such evidence is the presence of a biologically plausible explanation, as is described below.

**4. A cause and effect relationship between an exposure and cancer formation must be biologically plausible.** The authors of this study postulate that since they did not find an association with potatoes, the preparation of the french fries may be important. The typical use of frying oils high in saturated fats and trans-fatty acids was noted, but recent cohort studies have downplayed such an effect. What has gotten more attention has been the presence of high levels of acrylamide in french fries. The International Agency for Research on Cancer (IARC) has reviewed the scientific literature on acrylamide. This agency has classified acrylamide as *probably carcinogenic to humans* based on its carcinogenicity in animals and its genetic toxicity.

Exposure to acrylamide was, until recently, thought to occur only in industrial environments but this idea dramatically changed following a Swedish contamination incident in 1997 (Reynolds, 2002). Acrylamide is present in grouts used to make watertight seals and workers were exposed to high levels of acrylamide in a Swedish tunnel construction project. Studies to document the levels of acrylamide exposure examined and compared markers of acrylamide exposure in these workers to those of "unexposed" members of the general

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*Acrylamide can be generated when carbohydrate foods are cooked at high temperatures, and substantial levels have been found in numerous foods.*

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population. Surprisingly, substantial levels of the markers of acrylamide exposure were seen in both groups. The source of the levels in the "unexposed" individuals was ultimately traced to a dietary exposure. Acrylamide can be generated when carbohydrate foods are cooked at high temperatures, and substantial levels have been found in numerous foods (Dybing and Sanner, 2003; Jagerstad and Skog, 2005; Ruden, 2004). The highest levels of acrylamide exposure are thought to arise from french fries, potato chips, coffee and some cookies and breakfast cereals. But levels can vary considerably depending on the source of the food, and increase with the extent of browning during cooking.

Epidemiological studies examining acrylamide exposure and various types of cancer have not consistently detected an associated cancer risk (Rice, 2005). However, many of these studies have re-evaluated existing data in light of reported acrylamide levels in various foods. This approach is limited as it does not take into account the differences in acrylamide levels that can occur in foods depending on their source and preparation. These, as well as other design shortcomings, have raised questions about the validity of these studies. Studies of men exposed to acrylamide during its industrial pro-

duction of acrylamide have also been inconsistent (Erdreich and Friedman, 2004; Rice, 2005).

Currently, there is little contention that acrylamide presents a potential human carcinogenic hazard. But the size of the associated human cancer risk is not agreed upon. Some regulatory agencies such as the World Health Organization do feel that the methods to predict human cancer risk are of sufficient reliability to be applied. The US Environmental Protection Agency does not agree with this assessment of these methods and has estimated a lifetime cancer risk of 4.5 per 1,000 at high dietary levels of acrylamide exposure (i.e., if 10,000 people were exposed it would be expected that 45 of these exposed individuals would get cancer).

The California Attorney General has also weighed into this issue. California's proposition 65 requires that the state's Office of Environmental Health Hazard Assessment (OEHHA) maintain a list of substances that cause cancer, birth defects or other reproductive harm. More importantly, it also requires that if a business exposes its customers to any of these substances, it must provide them with a clear and reasonable warning. Acrylamide is on this OEHHA list and the current

*continued on page 10*

California Attorney General has filed a suit against nine manufacturers of potato chips and French fries seeking a warning on these products indicating that they contain a cancer-causing chemical.

**5. If everyone is exposed to a cancer-causing agent, case-control and cohort studies will fail to detect the risk and will only identify markers of susceptibility.**


Case-control and cohort studies are designed to determine the relative risk of cancer linked to some agent or factor. Relative risk is determined by comparing the levels of absolute cancer risk of two groups, one group exposed to the agent being studied and another group not exposed to the agent. If this comparison is between groups that are both exposed to the agent being studied, the risk of each group will be the same and no risk will be found. However, what can be detected in this situation is risk resulting from susceptibility to the disease. For example, an epidemiological study of smoking and lung cancer risk could not be carried out if all of its subjects smoked; the groups being compared would both be

exposed and their lung cancer risks would be close to the same. However, an increase in risk would be detected if an examination were carried out in which one of the groups contained a large number of people susceptible to lung cancer. Asbestos increases the susceptibility to smoking induced lung cancer (Williams and Sandler, 2001). So if one of the examined groups contained many asbestos exposed auto brake repair technicians, this group would have a higher lung cancer risk. The increased risk would arise due to the higher susceptibility of the asbestosis exposed individuals.

Could a similar case be operating with french fries in these girls' diets? It is likely that most of the population is exposed to acrylamide, as it is present in many commonly eaten foods. As in the above example, epidemiological studies would have difficulty detecting cancer risk unless they examined a group with many susceptible individuals, like the brake repair technicians. It is possible that age, particularly ages three to five years, is such a marker of susceptibility for breast cancer risk and dietary acrylamide exposure.

At this point this is no more than a theoretical suggestion and much more study is needed before it can begin to be verified.

*Where does this leave women, and especially mothers, now?* Regardless of their potential cancer association, french fries and potato chips are high in fat and sodium and for these reasons alone should be eaten infrequently. This is no less true for children, as atherosclerosis has been described as a nutritional disease of childhood. Further, fried potatoes have been found to be the source for three quarters or more of the acrylamide in the diets of people in Sweden, Holland and Switzerland (Pelucchi et al., 2005).

There are currently no recommendations regarding other foods containing acrylamide. This is an area of high interest and the result of more examinations should become available in the near future. 

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# Ribbon Evaluation Results

Thanks to the over 400 of you who returned your **Ribbon** evaluation form, sent out in May 2005 to over 2,800 recipients. While we will be furthering analyzing the data and determining in the near future whether any changes will be made as a result, we wanted to take this opportunity to let readers know the basics of what we found out. We have a lot of good feedback to work with as a result of this project.

## Who were the respondents?

You may recall that we wanted to learn a bit about the age, education level and other aspects of our readers. About two-thirds of respondents were between the ages of 46 and 65. Respondents tended to have a high level of education, with much more than half (57%) having earned a master's degree or Ph.D.

We asked, "what describes you best?" and offered descriptors of who we thought readers may be, professionally and in terms of their relationship to the cancer experience. These choices were based on a previous survey of *Ribbon* readership, as well as other BCERF programming and evaluation experiences. Respondents could select as many categories as applied. 286 respondents described themselves as either a friend or family member of a cancer patient; 89 as survivors and 66 as activists. Professionally, the categories with the largest number of respondents were government/policy employee, educator (not Extension), healthcare provider, scientist, environmental advocate, homemaker, and Cooperative Extension educator.

## Content and Format

We asked you to rate, on a scale of 1 to 5 (5 being the strongest agreement), several aspects of the content and format of our newsletter. In response to whether regular reading of *The Ribbon* results in your increased understanding of research findings, we found the following averages, according to themes:

Cancer and the environment: ..... 4.3  
How environmental chemicals may be related to cancer risk: ..... 4.4  
Genetics and cancer risk: ..... 4.1  
How diet and lifestyle may be related to cancer risk: ..... 4.2

Regular reading of *The Ribbon* helped respondents:

Use information about cancer and the environment in their work: ..... 3.9  
Identify ways to reduce their cancer risk: ..... 3.9  
Work with community or professional groups to identify strategies to reduce cancer risk: ..... 3.5

Regarding the format of *The Ribbon*, average response about the appropriateness of the length of articles was

4.1, whether the pictures and charts help understanding, 4.3, and the readability of the size and style of print, 4.3.


## Features and Topics

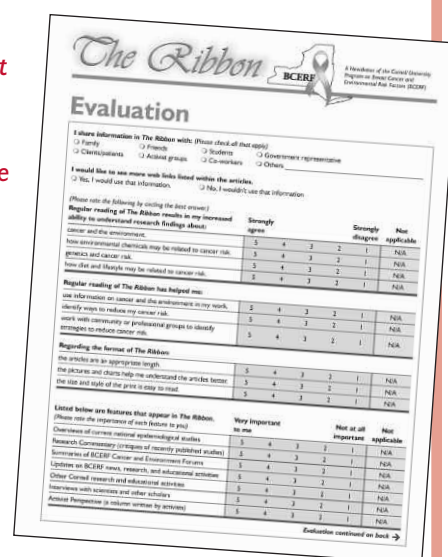
We listed general features and recent topics/titles from the newsletter, and, using the same scale mentioned above, asked whether these were important to you. While all general features received an average over 3.5, the strongest features were overviews of current national epidemiologic studies and *Research Commentaries*. All topics/titles also received over a 3.5 average, with the strongest being "Genetic-Environment Interactions and Breast Cancer Risk" and "Antibiotics and Breast Cancer Risk." Features on the Agricultural Health Study and the Sister Study were also high.

## What else?

We asked readers whether the level of *Ribbon* articles was appropriate. When asked if it was "too simplistic," "somewhat simplistic," "appropriate," "challenging," or "too complex," respondents overwhelmingly said it was "appropriate." For this question in particular we will need to take into account the high education level of most respondents. BCERF may need to consider other ways to determine how we are meeting the needs of less educated populations, on this and other questions.

We will carefully consider responses received to the question: what other cancer topics would you like to see addressed in our newsletter? Responses consisted mostly of specific cancers such as colon, skin, blood, cervical and lung, and also the topic of cancer clusters.

We thank you for all your additional comments and we greatly appreciate the enthusiasm with which you responded. We welcome your feedback at any time. Contact the editor at (607) 255-1185 or [csol@cornell.edu](mailto:csol@cornell.edu) 



The Ribbon BCERF Evaluation form. It includes sections for: 1. Where information in The Ribbon with (Please check all that apply): Family, Characteristics, Adolescent groups, Students, Co-workers, Government representative, Others. 2. I would like to see more work like found within the articles. 3. No, I would not use that information. 4. Please rate the following by circling the best answer: Regular reading of The Ribbon results in my increased ability to understand research findings about: Cancer and the environment, How environmental chemicals may be related to cancer risk, Genetics and cancer risk, How diet and lifestyle may be related to cancer risk. 5. Regular reading of The Ribbon has helped me: Use information on cancer and the environment in my work, Identify ways to reduce my cancer risk, Work with community or professional groups to identify strategies to reduce cancer risk. 6. Regarding the format of The Ribbon: The articles are an appropriate length, The pictures and charts help me understand the articles better, The size and style of the print is easy to read. 7. List below one feature that appears in The Ribbon: Overview of current national epidemiological studies, Research Commentaries (summaries of recently published studies), Summaries of BCERF Cancer and Environment Features, Updates on BCERF news, research, and educational activities, Other General news and educational activities, Interviews with scientists and other relevant, Feature Perspective (a column written by activists). 8. List below one topic that appears in The Ribbon: Genetic-Environment Interactions and Breast Cancer Risk, Antibiotics and Breast Cancer Risk, Agricultural Health Study, Sister Study, etc. The form uses a scale of 1 to 5 for importance and a column for 'Not applicable'.

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**The BCERF Regional Cancer and Environment Forum** *continued from page 4*

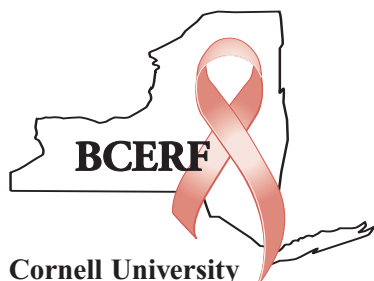
highest flame retardency standards and do not increase cost.

Debbie Peck Kelleher informed the group of a task force formed by the legislature that will address issues of deca-BDE, although it has not yet convened, and that Senator Marcellino is looking into a program to recycle computers, which would then keep more of these substances out of landfills. The group was very interested in innovative policies, such as the one mentioned by Kathy Curtis in which New York City is considering a policy requiring computer manufacturers to take back used computers. Thinking about solving chemical use and exposure problems in new ways was clearly a priority for all panel members. As Beth Meer expressed, "we need a sustainability revolution."

BCERF will continue this panel feature in future Forums and thanks all participants for their contributions to this valuable day. 

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