

## Pulmonary Health

The lungs are very important organs that supply oxygen to the body. Sometimes, treatments given for childhood cancer can cause lung damage. If you received any treatments that may cause lung problems, it is important to learn about the lungs, and what you can do to keep them as healthy as possible.

### How the lungs function

The lungs transfer oxygen from the air to the blood, where it is circulated to the body tissues. The lungs also remove carbon dioxide, a waste product made by the body's cells. In order for oxygen to reach the blood, it must move through tiny air sacs (alveoli) in the lungs and into tiny blood vessels (capillaries) that surround each air sac. When the air sacs become damaged or scarred, there is less area for oxygen to enter the bloodstream, and less oxygen reaches the blood. The person may then need to breathe faster in order to get enough oxygen. This can make the person feel short of breath. Other lung problems can be caused by inflammation (swelling) of the air passages in the lungs or increased mucous production as a result of irritation or infection. Symptoms can include cough, wheezing, chest pain, and shortness of breath.



### Am I at risk for lung problems?

If you received any of the following treatments during your cancer therapy, you may be at risk for developing lung problems:

- Bleomycin (*See the "Bleomycin Alert" Health Link for more information*)
- Carmustine (also known as BCNU)
- Lomustine (also known as CCNU)
- Busulfan
- Radiation to the chest
- Total body irradiation (TBI)
- Surgery to the chest or lung (this does NOT include surgery for placement of a central line, such as a Hickman, Broviac, Port-a-Cath or Mediport)
- Bone marrow transplant or stem cell transplant from a donor other than yourself (allogeneic transplant), if you then developed chronic graft-versus-host disease (chronic GVHD)

Certain chemotherapy drugs known as anthracyclines, such as daunorubicin (Daunomycin®), doxorubicin (Adriamycin®), and idarubicin (Idamycin®) can damage the heart and may contribute to lung problems, especially if given in combination with bleomycin, BCNU, CCNU, and radiation treatment.

Other factors that may increase your risk are:

- Younger age at the time of cancer treatment
- A history of lung infections, asthma or other lung problems
- Tobacco use or exposure to second hand smoke

### **What problems can develop?**

Problems can include scarring of the lungs (pulmonary fibrosis), repeated lung infections (such as chronic bronchitis, bronchiectasis, or recurrent pneumonia), inflammation of the lung tissues and small airways within the lungs (bronchiolitis obliterans), and rupture of the tiny air sacs in the lungs or thickening and blockage of air passages within the lungs (restrictive/obstructive lung disease).

### **What are the symptoms of lung damage?**

Symptoms may include shortness of breath, frequent coughing and/or wheezing, chest pain, and frequent lung infections, such as bronchitis or pneumonia. Becoming easily fatigued or short of breath during mild exercise (exercise intolerance) is sometimes an early symptom of lung damage.

### **What monitoring is recommended?**

- **A yearly medical check-up** is recommended.
- **A chest x-ray and pulmonary function tests (including DLCO and spirometry)** may show lung problems that are not apparent during a check-up. For this reason, it is helpful to **have these tests done at least once** (at least two years after completing cancer treatment) to find out if there are any problems. Your healthcare provider can decide if further testing is needed based on these results.

### **Are there any special precautions I should take?**

If you have had any of the treatments listed above you should:

- Get the pneumococcal (pneumonia) vaccine.
- Get yearly influenza (flu) vaccines.
- Avoid SCUBA diving, unless you have had a complete check-up and have been advised by a pulmonologist (lung specialist) that diving is safe.

## What can I do to prevent lung problems?

- If you don't smoke, DON'T START.
- If you smoke, QUIT! **Quitting is the most important thing you can do** to keep your lungs and you healthy.
- Avoid second-hand smoke.
- Get regular physical exercise.
- Avoid breathing toxic fumes from chemicals, solvents, and paints.
- Follow all safety rules in your workplace, such as the use of protective ventilators in some work environments. Report any unsafe working conditions to the Occupational Safety and Health Administration (OSHA).

## Where can a smoker find help in order to quit?

Your most important resources for quitting smoking are your family, friends and your healthcare provider. Listed below are some additional sources of education and support:

### **Telephone Resources:**

If you don't have access to the Internet, you can call the following organizations to request educational materials (usually free) about how to quit smoking:

- American Cancer Society: 1-800-ACS-2345  
American Heart Association: 1-800-AHA-USA1  
American Lung Association: 1-800-LUNG-USA  
National Cancer Institute: 1-877-44U-QUIT

### **On-Line Resources:**

If you have access to the Internet, you may find the following websites helpful:

[www.surgeongeneral.gov/tobacco/](http://www.surgeongeneral.gov/tobacco/)

Very specific tips for getting ready to quit and how to handle the first week. Also has information on myths that can keep you from quitting.

[www.cdc.gov/tobacco/](http://www.cdc.gov/tobacco/)

The Center for Disease Control's Tobacco Information and Prevention Source (TIPS) includes guides for quitting the tobacco habit.

[www.lungsusa.org/ffs](http://www.lungsusa.org/ffs)

The American Lung Association's free on-line "Freedom From Smoking" program.

[www.smokefree.org](http://www.smokefree.org)

On-line assistance from the National Institutes of Health to help you quit smoking.

## **Where can I find more information about how to keep my lungs healthy?**

More information about the lungs, and how to keep them healthy, is available at:

[www.nhlbi.nih.gov/health/public/lung/](http://www.nhlbi.nih.gov/health/public/lung/)

The National Heart, Lung and Blood Institute's web site containing general information for patients and families.

[www.nlhep.org/](http://www.nlhep.org/)

The National Lung Health Education Program has information for patients about how to keep lungs healthy.

---

*Written by Charlene Maxen RN, CNP, CPON® and Sarah Friebert MD, Division of Hematology/Oncology, Childrens Hospital Medical Center of Akron, Akron, Ohio.*

*Reviewed by Melissa M. Hudson MD, Debra Friedman MD, John R. Mussman, Neyssa Marina MD, Wendy Landier, RN, MSN, CPNP, Kevin Oeffinger MD, and Johanne Soucy RN, B.SC.N.*

*Illustrated by Devika Bhatia.*

Additional health information for childhood cancer survivors is available at  
[www.survivorshipguidelines.org](http://www.survivorshipguidelines.org)

**Note:** Throughout this *Health Links* series, the term "childhood cancer" is used to designate pediatric cancers that may occur during childhood, adolescence, or young adulthood. *Health Links* are designed to provide health information for survivors of pediatric cancer, regardless of whether the cancer occurred during childhood, adolescence, or young adulthood.

#### Disclaimer and Notice of Proprietary Rights

**Introduction to Late Effects Guidelines and Health Links:** The "Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers" and accompanying "Health Links" were developed by the Children's Oncology Group as a collaborative effort of the Late Effects Committee and Nursing Discipline and are maintained and updated by the Children's Oncology Group's Long-Term Follow-Up Guidelines Core Committee and its associated Task Forces. **For Informational Purposes Only:** The information and contents of each document or series of documents made available from by the Children's Oncology Group relating to late effects of cancer treatment and care or containing the title "Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers" or the title "Health Link", whether available in print or electronic format (including any digital format, e-mail transmission, or download from the website), shall be known hereinafter as "Informational Content". All Informational Content is for informational purposes only. The Informational Content is not intended to substitute for medical advice, medical care, diagnosis or treatment obtained from a physician or health care provider.

**To cancer patients (if children, their parents or legal guardians):** Please seek the advice of a physician or other qualified health provider with any questions you may have regarding a medical condition and do not rely on the Informational Content. The Children's Oncology Group is a research organization and does not provide individualized medical care or treatment.

**To physicians and other healthcare providers:** The Informational Content is not intended to replace your independent clinical judgment, medical advice, or to exclude other legitimate criteria for screening, health counseling, or intervention for specific complications of childhood cancer treatment. Neither is the Informational Content intended to exclude other reasonable alternative follow-up procedures. The Informational Content is provided as a courtesy, but not intended as a sole source of guidance in the evaluation of childhood cancer survivors. The Children's Oncology Group recognizes that specific patient care decisions are the prerogative of the patient, family, and healthcare provider.

No endorsement of any specific tests, products, or procedures is made by Informational Content, the Children's Oncology Group, or affiliated party or member of the Children's Oncology Group.

**No Claim to Accuracy or Completeness:** While the Children's Oncology Group has made every attempt to assure that the Informational Content is accurate and complete as of the date of publication, no warranty or representation, express or implied, is made as to the accuracy, reliability, completeness, relevance, or timeliness of such Informational Content.

**No Liability on Part of Children's Oncology Group and Related Parties/ Agreement to Indemnify and Hold Harmless the Children's Oncology Group and Related Parties:** No liability is assumed by the Children's Oncology Group or any affiliated party or member thereof for damage resulting from the use, review, or access of the Informational Content.

You agree to the following terms of indemnification: (i) "Indemnified Parties" include authors and contributors to the Informational Content, all officers, directors, representatives, employees, agents, and members of the Children's Oncology Group and affiliated organizations; (ii) by using, reviewing, or accessing the Informational Content, you agree, at your own expense, to indemnify, defend and hold harmless Indemnified Parties from any and all losses, liabilities, or damages (including attorneys' fees and costs) resulting from any and all claims, causes of action, suits, proceedings, or demands related to or arising out of use, review or access of the Informational Content.

**Proprietary Rights:** The Informational Content is subject to protection under the copyright law and other intellectual property law in the United States and worldwide. The Children's Oncology Group retains exclusive copyright and other right, title, and interest to the Informational Content and claims all intellectual property rights available under law. You hereby agree to help the Children's Oncology Group secure all copyright and intellectual property rights for the benefit of the Children's Oncology Group by taking additional action at a later time, action which could include signing consents and legal documents and limiting dissemination or reproduction of Informational Content.