

# NEUTROPHIL



Your  
One-in-a-Million  
Bodyguard



Guides You  
Through  
Neutropenia

**Oncology Nursing Society  
ATAQ Community Education Project**

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## **Survival**

To educate is to give power

To give power is to gain control

To gain control is to reduce fear

To reduce fear is to give hope

Hope is life's key to survival

*Virginia Long*

*Cancer Survivor*

*ATAQ Community Education Project*

## Introduction

*NeutroPhil — Your One-in-a-Million Bodyguard Guides You Through Neutropenia* has been developed to help you to understand neutropenia. It is a common side effect of chemotherapy and sometimes radiation. The posters, booklet, and Web site will assist in teaching you about white blood cells and how they protect you from infection. Through Phil, you will learn why neutropenia occurs during cancer treatment and what you can do to help to protect yourself from infection. The series will inform you about the signs of infection and what to do if they occur. You will find a glossary at the end of this booklet to define the medical terms in the text. Also, there is a section where you can record your white blood cell counts and temperatures as you receive treatment.

NeutroPhil is your protector, your bodyguard, and your defender. He is the hero who fights against germs or bacteria that can make you sick. He is also your teacher. His message was designed to reach both children and adults being treated for cancer. He also might bring a smile to your face. He was created to teach the rather complicated topic of treatment-related neutropenia in a clear and enjoyable manner. It is our hope that NeutroPhil will make learning easier and treatment-related neutropenia a better-managed side effect while you are receiving chemotherapy or radiation.

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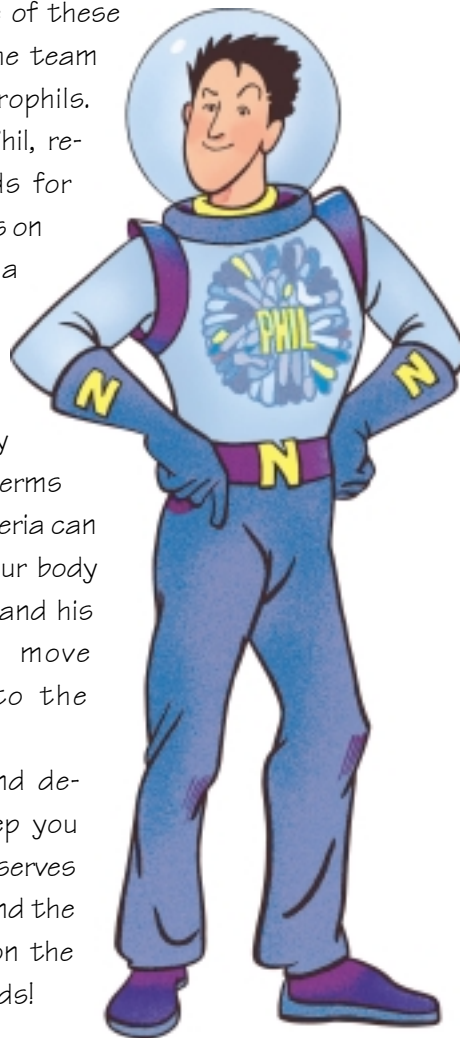
## Who is Phil?

Phil is a **neutrophil** (nu-tro-fil). A neutrophil is one type of **white blood cell**. Neutrophils are made in your **bone marrow**. Your bone marrow is the spongy center of your bones. The bones that make the most neutrophils are your skull, breastbone, ribs, backbone, and pelvis.

Your body makes millions of neutrophils. Phil is just one of these cells. Think of Phil as the team leader for all the neutrophils. When you read about Phil, remember that he stands for the millions of neutrophils on his team. Phil is one in a million!

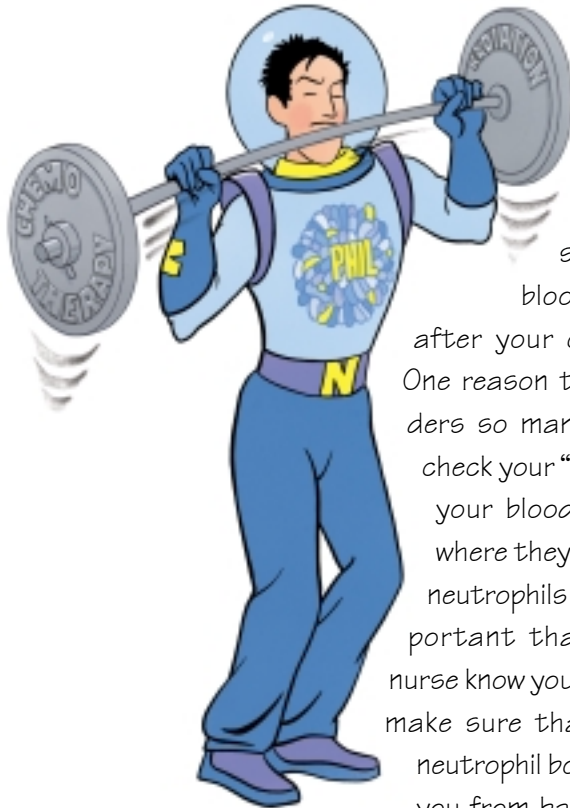
Phil and his team live in your blood. Their job is to find and kill any germs in your body. The germs are called **bacteria**. Bacteria can cause an **infection** in your body and make you sick. Phil and his team of neutrophils move through your blood to the germs and eat them up.

Neutrophils seek and destroy bacteria and keep you healthy. That is how Phil serves and protects you. Phil and the millions of neutrophils on the team are your bodyguards!



## Why is Phil Low?

You already know that Phil and his neutrophil team are white blood cells and that they are made in your bone marrow. **Cancer treatments** like **chemotherapy** and sometimes **radiation** can cause your bone marrow to make fewer neutrophils, especially 10 to 14 days after you have had therapy. This is called **neutropenia** (nu·tro·pee·nee·ah). Neutropenia is a word that means you have less neutrophils than normal. Phil doesn't feel like "one in a million" when you are **neutropenic** (nu·tro·pee·nik).



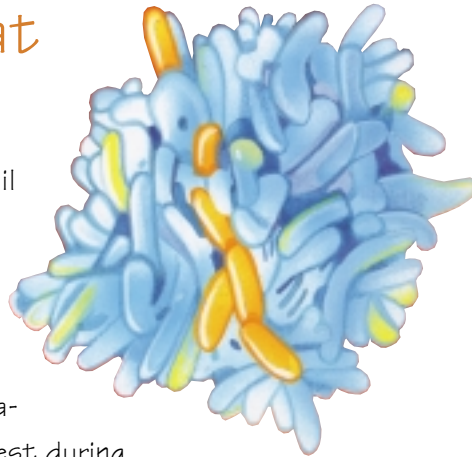
Phil and his team live in your blood and travel through your body looking for germs to kill so that you don't get sick. You have a lot of blood tests before and after your cancer treatments. One reason that your doctor orders so many blood tests is to check your "counts." A sample of your blood is sent to the lab where they count the number of neutrophils in your blood. It is important that your doctor and nurse know your neutrophil count to make sure that you have enough neutrophil bodyguards to protect you from bacteria and infection.

They know that your **counts . . . count!**

## When is Phil at his Lowest?

Phil and the neutrophil bodyguards on his team are at their lowest usually within 10 to 14 days after having most chemotherapy drugs and sometimes after radiation. You will have a blood test during this period to check your counts, which will include the number of neutrophils in your blood. When your blood counts are at their lowest, you are in your **nadir** (nay•der). This is the time when your bone marrow isn't making as many neutrophils, so your blood has fewer traveling through your body. In other words, you can be neutropenic. You have less neutrophil bodyguards to protect you from bacteria, so you are at more risk of getting sick from an infection during this period.

It is expected that your blood counts will become low after chemotherapy. Usually within a few days of your nadir, your bone marrow will start making more neutrophils and your **blood count** numbers will start to come up—then Phil and his team will be better able to protect you from infection. Your doctor will order even more blood tests to check your counts again right before your next chemotherapy treatment. It is important that your nurse and doctor know that you have enough neutrophils in your blood before you receive more treatment.





## What can happen when Phil is Low?

Hi! Phil . . . the Neutrophil here. I thought I would ask you some questions about what can happen when your neutrophil blood counts are low after your cancer treatments. I'll even give you the answers because we're all on the same team and you are my best friend. Remember, my motto is "To Serve and Protect" you and only you!

**Question:** Why are you at risk to get sick?

**Answer:**

All of us neutrophil bodyguards protect you from infection by killing germs (bacteria) when they get into your body.

When your neutrophil blood counts are low (neutropenia), and especially when you are in your nadir after chemotherapy and sometimes radiation, there often aren't enough neutrophil bodyguards in your bloodstream to protect you from bacteria.

The bacteria that escape my neutrophil team can cause infections and make you sick.



**Question:** How do you know if you have an infection?

**Answer:**

I'll give you a list of things your body may do if you have an infection.

You probably already know some of the signs, but you may learn some new ones, too!

- Fever of 100.5°F or above
- Sweating
- Chills
- Sore throat or mouth sores
- Cough
- Feeling short of breath
- Redness or swelling around skin sores
- Diarrhea or loose stools
- Difficulty or burning with urination
- Vaginal discharge or itch
- General tiredness or body aches
- Flu-like symptoms

**Question:** I know what you are thinking. "I've had fevers before I had cancer and treatments. Isn't it better to just let them run their course?"

**Answer:**

No! Let me remind you that fevers tell you that something is wrong somewhere in your body. They are usually the first important sign of infection. Remember that there sometimes aren't enough of us neutrophils to protect you after chemotherapy and sometimes radiation. *Call your doctor or oncology nurse if your temperature is 100.5°F or whatever temperature your physician uses for a fever.* Don't take any medicines to make your fever go away until after you have talked to your doctor or nurse. Let them help you before you get too sick from germs that cause infection. Like many sicknesses, this can usually be taken care of easily if it is reported to your doctor or nurse early!

**Question:** What can happen to you if you do get sick from an infection?

**Answer:**

Your doctor or nurse will usually have you come to the **oncology** office or clinic so that you can have a blood test to check on your counts. They will want to see how many members of the neutrophil team are on hand in your blood. Sometimes, they will send you home with pills that are called **antibiotics**. Antibiotics are medicines that help to kill germs like my neutrophil team does. It is very important that you take these pills just as your doctor orders and that you take all the pills, even as you start to feel better.

If your neutrophil count is too low or you are too sick, then you might have to go to the hospital for **intravenous** antibiotics, which will go directly into your bloodstream to help the neutrophils fight the infection and kill the germs.

You might also stay in a private

hospital room. Your fam-

ily, friends, nurses, and

doctors sometimes

might wear a mask

and will always

wash their hands

very well to pro-

tect you from

germs.



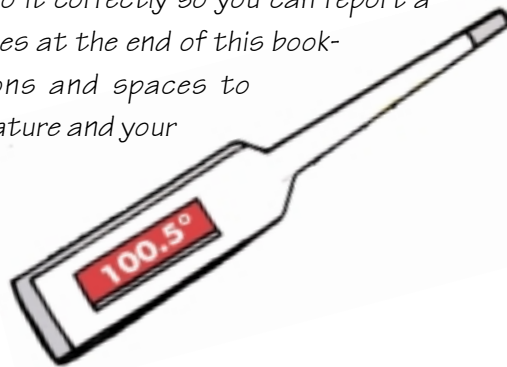
This neutropenia may mean that your chemotherapy or radiation treatments will be delayed until you are better and your counts show that you have enough neutrophils in your blood to serve and protect you again. Also, it may mean that your dose of chemotherapy may be less in future treatments to prevent your counts from going too low again and putting you at risk for another infection.

**Question:** What can you do to help your neutrophil team guard against infection while you are getting cancer treatment?

**Answer:**

Turn to the next page for some tips to help your neutrophil team serve and protect you from germs and keep you healthy so you can get your full dose of chemotherapy or radiation on time.

*I almost forgot to tell you that if you need help to learn how to read a thermometer, just ask your doctor or nurse to take a few minutes to show you how to do it! It is important that you learn to do it correctly so you can report a fever. You'll find pages at the end of this booklet with instructions and spaces to record your temperature and your white blood count.*



## How can you help Phil when he is low?

Phil has made a list of tips that you can use to help him and his team of neutrophil bodyguards protect you from an infection.

Most of the tips are good habits for everyone to practice, but all of them are very important to you as a patient with cancer when your neutrophil blood counts are low after chemotherapy or radiation.

### Germs

#### *Keeping your skin, mouth, and teeth clean*

- Handwashing, Handwashing, Handwashing, Handwashing
- Wash your hands often with warm water and soap. If soap is not available, use a waterless hand cleaner.
- Make sure you always wash your hands before eating and after using the bathroom.
- Take a warm shower each day and pat your skin dry.
- Rinse your mouth often and brush your teeth with a soft toothbrush after meals.



#### *Protecting your skin from scrapes and cuts*

- Don't go barefoot.
- Use an electric shaver, not a razor.
- Use lotions or oils for dry skin.
- Don't pick pimples or scratch sores.



- Wear gloves to wash dishes or to garden. You could inhale germs when cleaning up after pets, so ask others to do this for you.

### *Foods and diet*

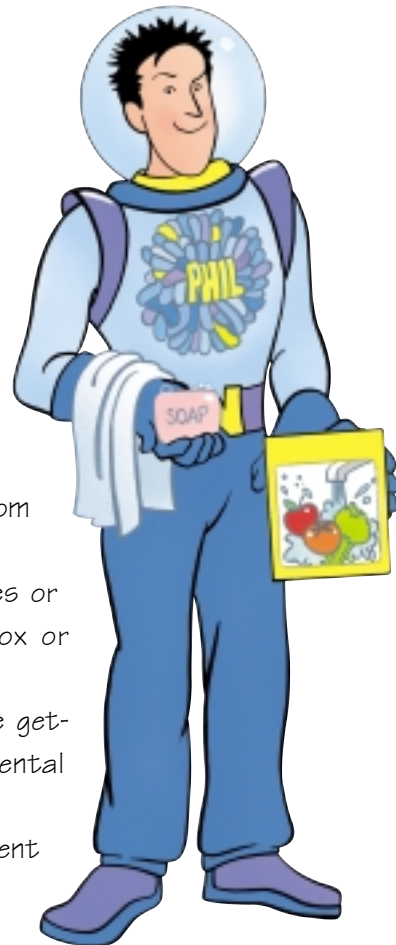
- Clean and cook all foods well.
- Ask family members to peel the skin off fresh fruits and vegetables to be sure that all the germs are removed. You should not be peeling fruits and vegetables.
- Only add dried herbs and spices while cooking, not after the food has been prepared.
- Eat a well-balanced diet.
- Drink plenty of fluids.

### *Bathroom habits*

- Avoid constipation.
- Wipe yourself from front to back.
- Again, wash your hands after using the bathroom.

### *What to avoid*

- Stay out of crowds and away from people who have colds.
- Avoid adults who have shingles or children who have chicken pox or measles.
- Check with your doctor before getting immunization shots or dental work.
- Avoid children who have had recent immunizations.



## Fever

- Check your **temperature** at the same time each day if counts are low.
- Call your doctor or nurse immediately if your temperature is 100.5°F or above.
- Don't take any medication for the fever unless it is ordered by your doctor.
- Know the signs and **symptoms** of infection, which are listed in this booklet under "What Happens When Phil Is Low?"
- Be sure to call your doctor or nurse right away if you think that you have an infection. Don't wait!



*Your doctor may need to help Phil when he is low, too!*

- The doctor may order a medicine to help your bone marrow make more neutrophils after your cancer treatment.
- It is given by **injection** with a tiny needle.
- Many patients learn to give themselves the shot.
- The medicine can be started 24 hours after your chemotherapy treatment and is usually given for 10 days.
- The injections can help prevent infections and also prevent delays in your chemotherapy schedule or lowering of your chemotherapy dose.

Phil and his neutrophil bodyguards want you on their team! You can help them to protect you from infections by learning these tips and by working with your doctor and nurse. The goal is to keep you healthy while you are being treated for cancer.

# GLOSSARY

**ANTIBIOTIC** (ant-i-byu-ot-ic): a drug given by mouth or through a vein (IV) to treat infection. Penicillin is an example of an antibiotic.

**BACTERIA** (bac-teer-ee-ah): a germ that can cause an infection and make you sick, especially when the immune system is not as strong as it should be because of cancer treatments.

**BLOOD CELLS:** cells that make up the blood, such as white blood cells, red blood cells, and platelets. These cells are made in the bone marrow.

**BLOOD COUNT:** this is the number of white blood cells, red blood cells, and platelets that are counted in a sample of your blood.

**BLOODSTREAM:** the route your blood flows via veins and arteries (circulation) to provide food and oxygen to organs and body tissues. Chemotherapy travels or circulates through your bloodstream.

**BONE MARROW:** the soft, spongy center of your bones. This is where most of your blood cells are made before they enter the bloodstream.

**CANCER:** a disease of abnormal, malignant cells that have no growth control. These cells can spread to other parts of the body.

**CANCER TREATMENT:** this can be chemotherapy, radiation, or surgery, which are given either alone or in combination. Cancer treatments are given to cure, control, or treat symptoms of cancer.

**CELL:** the most basic unit, which makes all living things. Cells can be seen only under a microscope.

**CHEMOTHERAPY:** a type of cancer treatment, that uses drugs or chemicals to treat or destroy cancer cells.

**CHEMOTHERAPY CYCLE:** chemotherapy treatment schedules. A cycle is set according to the drugs used.

**CHILLS:** a feeling of being cold, with or without shaking. This may happen with fevers.

**CONSTIPATION** (con-sti-pay-shun): occurs when you can't move your bowels. Report if you have not had a bowel movement for three days. Narcotic pain medicines, some chemotherapy drugs, and changes in diet can cause constipation.

**DIAGNOSIS** (di·ag·no·sis): The name of the disease that a patient has. A diagnosis is made from a complete health history, physical exam, and test results. In oncology, it is important to identify the type of cancer early and start treatment for the best chance at cure.

**DIARRHEA:** a change in the consistency or form of your stools. They may become very loose or watery and occur more frequently. You may or may not have stomach cramps with this. Diarrhea may start after cancer treatment or from the type of cancer. Notify your doctor or nurse if you have a change in bowel habits, if stools are bloody, if antidiarrhea medication (ex., Immodium®) has no effect, or if you develop diarrhea after eating or drinking.

**DOSE:** the amount of medication you receive. Chemotherapy doses are usually based on your height and weight, which is called body surface area, or M<sup>2</sup>.

**FEVER:** a body temperature above 98.6°F. It is very important to call your doctor or nurse if your temperature is above 100.5°F if you are receiving cancer treatments.

**FLUIDS:** any liquid taken by mouth. Water is a fluid. Fluids can also be given directly into the vein through an IV.

**FLU-LIKE SYMPTOMS:** include muscle aches, shakes, chills, fever, headache, weakness, upset stomach, and diarrhea. These symptoms can be a sign that you are ill or a side-effect from some chemotherapy drugs.

**IMMUNE SYSTEM** (immunity): is your body's ability to fight infection and disease. Your immune system defends and protects you from bacteria and germs.

**IMMUNIZATION:** a vaccine to protect us from disease (ex., measles, chicken pox). These vaccines are given to children before starting school to protect them from certain diseases. People who are receiving cancer treatments may catch the illness from a child who has recently had the vaccine. Some of these vaccines are made from the actual bacteria so that children's bodies can develop antibodies to the bacteria and protect them from disease in the future. Because a patient's immune system is sometimes weak from cancer treatment or the cancer, his or her immune system may not be able to fight off the infection from immunization.

**INFECTION** (in·fec·shun): a germ/bacteria that enters the body. People receiving cancer treatments may not be able to fight off the germ/bacteria that can cause an infection. Some signs of infection (symptoms) include chills, shakes, muscle aches, fatigue, or fever.



**INJECTION:** giving medication using a needle into the muscle, under the skin, or into a vein.

**INTRAVENOUS** (in-tra-vee-nus): giving fluid or medicine into a vein through a needle. Also called IV.

**MALIGNANT** (ma-lig-nant): a tumor that is made up of cancer cells that can spread to other parts of the body. This type of tumor needs treatment.

**NADIR** (nay-der): the period of time after you get a chemotherapy treatment when your blood counts are at their lowest number. This is the period when the chance of getting an infection is the highest and when you need to be most careful.

**NEUTROPENIA** (nu-tro-pee-nee-ah): the medical term used to describe the condition when the number of neutrophils in blood counts are low.

**NEUTROPENIC** (nu-tro-pee-nik): the medical term used to describe the patient when the number of neutrophils in the blood counts are low.

**NEUTROPHIL** (nu-tro-fil): a type of white blood cell that kills bacteria. NeutroPhil is your bodyguard.

**ONCOLOGIST** (on-call-oh-jist): a doctor who takes care of patients with cancer.

**ONCOLOGY** (on-call-oh-gee): the study of cancer. The specialty in medicine that cares for patients with cancer.

**PLATELET** (plate-let): a type of blood cell that helps your blood to clot. Cancer treatments can lower your platelet count.

**RADIATION THERAPY** (ray-dee-ay-shun ther-ah-pee): cancer treatment that kills or damages cancer cells using special x-ray machines. Radiation therapy affects only the area (field) that is being treated. Radiation and surgery are localized cancer treatments.

**RED BLOOD CELL:** the cells in your body that carry oxygen to your organs and tissues and take carbon dioxide away. Anemia is the medical term for a low red blood cell count.

**SIDE EFFECT:** a symptom or a reaction that you may have from your cancer treatments. Everyone is different and may have different side effects of treatment.

**SWELLING:** fluid filling the spaces between the cells in certain areas of your body. Many people have swelling (edema) in their ankles and feet. Swelling can also be a sign of infection.

**SUBCUTANEOUS** (sub·cue·tay·nee·us): under the skin. Neupogen® is a subcutaneous injection that is given just under the skin.

**SYMPTOM:** any change in the body or its function that would indicate disease or a reaction from cancer treatments.

**TEMPERATURE** (tem·pur·ah·chur): how hot your body gets. The normal body temperature is 98.6°F (Fahrenheit). Call your doctor or nurse if your temperature goes above 100.5°F while you are receiving cancer treatments. This could be the first sign of an infection.

**THERMOMETER** (thur·mom·et·er): a tool used to check your temperature. There are now many types of thermometers, and you should talk to your doctor or nurse about the best type for you to use. They will teach you how to use it. While receiving cancer treatments, it is important to keep a record of your temperatures on the chart in this booklet. It is best to take it at the same time every day, usually in the afternoon when most people's temperatures are at their highest.

**TUMOR** (too·more): abnormal overgrowth of cells. These cells serve no purpose in your body and many times compete with the normal body cells for blood supply and food. There are some tumors that are not cancerous. They are called benign (bee·nine) tumors. Cancerous tumors are called malignant tumors.

**URINATION** (yur·i·nay·shun): emptying of urine from the bladder ("passing water").

**VAGINAL DISCHARGE** (vaj·in·ahl dis·charge): mucus or fluid that leaks from the birth canal or vagina. This discharge may have a strong odor, which is a sign of infection.

**VENIPUNCTURE** (veen·i·punk·shur): placing a needle into a vein to obtain a blood sample or start an IV.

**WHITE BLOOD CELL:** cells in your blood that fight infection or germs. Neutrophils are one type of white blood cell.







WHITE COUNT CHART		
DATE	COUNT	COMMENTS





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