



# Living with PNH:

Understanding the treatment options  
for paroxysmal nocturnal hemoglobinuria

If you've been diagnosed with PNH,  
treated for bone marrow disorders  
or told you have anemia,  
**you should read this guide.**



## Proper Diagnosis Is Half the Battle

*PNH is a rare blood disorder that affects 8,000–10,000 people in North America and Europe. Because PNH is rare and its symptoms may vary among patients, it can easily be confused with other disorders and can be difficult for doctors to recognize and diagnose.*

*This guide will help you understand what PNH is, how to spot the symptoms, how to manage the disorder, and what treatments are available to you. It will also tell you how to find a PNH doctor and what questions to ask him or her to ensure that you are properly tested for PNH.*

## The Basics of Living with PNH

### What is PNH?

PNH is a disorder in which red blood cells are prone to destruction by parts of your own immune system. This happens because the red blood cells are lacking a special protein which normally protects them from your immune system. The destruction of red blood cells (also called “hemolysis”) leads to the release of the red blood cell contents into your blood stream which is responsible for many of the symptoms of the disease. Because PNH is thought to come from an injury to a blood stem cell (a cell in your bone marrow which produces other cells), PNH can develop in all three types of blood cells — red blood cells which carry oxygen to your body, white blood cells which help fight infections, and platelets which form clots to stop bleeding. While PNH can exist in all blood cell types, the symptoms caused by PNH are due mostly to the destruction of the *red* blood cells.

### What does PNH stand for?

PNH stands for “paroxysmal nocturnal hemoglobinuria” which means that sometimes there is “hemoglobin” (or part of the red blood cell) in a person’s urine at night. This name is not entirely accurate however. While people with PNH can have hemoglobin in their urine — giving the urine a reddish-brown to black color — hemoglobinuria is only seen in about one quarter of patients with PNH at diagnosis. Plus, the destruction of red blood cells does not happen only at night; it occurs all the time. Because the symptoms of PNH vary in patients, it is important for you to know all of the symptoms that can occur.

### What causes PNH?

Although it is not yet fully known what causes PNH, all patients are less able to produce blood cells. They also have abnormal red blood cells that may be destroyed by their immune system. PNH is a disorder that affects men and women of all races, backgrounds, and ages. Most often, it develops between 20 and 40 years of age. Sometimes people with PNH

have other blood disorders such as aplastic anemia (when the body stops making enough red blood cells).

### How does one test for PNH?

The best way to positively identify PNH is to test for the presence of the abnormal PNH blood cells. For this, your doctor will draw a sample of blood from your arm and check it using a test called “flow cytometry”. This test will help your doctor know the number of normal blood cells versus PNH cells (also known as your “PNH clone size”.)

#### The flow cytometry test is used for the following:

1. To diagnose PNH in people who may have the disease; and
2. To monitor people who have been diagnosed with PNH already.

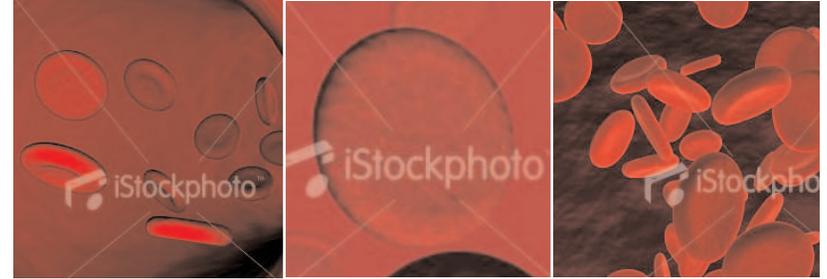
### If I have aplastic anemia, should I be tested for PNH?

People with aplastic anemia and certain types of myelodysplastic syndromes (when the body makes abnormal blood cells) may develop PNH. For this reason, patients with these conditions should be tested for PNH every year.

### What are the symptoms of PNH?

Sometimes people live with PNH for years without knowing it. For this reason, you need to learn the signs of PNH. If you have the disorder, you may have one, some, or all of these symptoms:

- Anemia or lack of red blood cells
- A tired feeling (fatigue)
- Dark-colored urine
- Stomach or abdominal pain
- Difficulty or pain when swallowing
- Erectile dysfunction
- Difficulty breathing
- Jaundice (yellowish-colored skin and/or eyes)
- Blood clots



### What is a blood clot?

A clot (also called “thrombosis”) is formed when some of the liquid parts of the blood come together to form a solid. This can be in response to an injury, such as a cut. Sometimes a clot can get stuck in a blood vessel and slow blood flow. Depending on where they occur, blood clots can be serious and even life-threatening. All people with PNH are at risk of blood clots; African-American and Hispanic PNH patients appear to be at the greatest risk.

### To avoid blood clots, should I take an anticoagulant?

If you have a blood clot, your doctor may ask you to take an “anticoagulant.” Anticoagulants are drugs that thin your blood so that your blood remains fluid and is less likely to form clots. Some people with PNH may wish to take anticoagulants as a way to reduce the risk of blood clots. Since the use of anticoagulants can be risky, you should ask your doctor if they are right for you.

### Is PNH hereditary?

PNH is not inherited, which means that you did not get it from your parents, and you cannot pass PNH on to your children.

### Can I have children if I have PNH?

It is possible for women with PNH to become pregnant, but it can be dangerous for both the mother and infant. If you have PNH and wish to become pregnant, you should discuss this with your partner, your PNH doctor and a doctor who specializes in high-risk pregnancies. It is important to understand the risks *before* you become pregnant. If you do become pregnant, you should be very closely monitored by your doctors.

## Can I manage my PNH through diet?

While you don't need a special diet, you will benefit from eating a healthy diet. In addition, you should talk to your doctor about taking folic acid and iron. Both of these supplements help the body make red blood cells. Your doctor will be able to tell you if these supplements are right for you and how much of each you should take.

## The Options For Treating PNH

Although there are no approved therapies to treat PNH, there are several treatments currently being used. There are also new

therapies being studied in clinical trials to treat the disorder. The chart below highlights current and developing treatments and some of the benefits and risks of each. Before starting any one therapy, it is not unusual to seek the opinion of two to three doctors who have experience with PNH treatments. Try to talk to several doctors who specialize in blood disorders (called "hematologists") and ask many questions. The better you understand your options, the sooner you will be able to begin the treatment that best suits your needs and lifestyle.

### Treatment Options for PNH

THE TREATMENT	THE TREATMENT DEFINED	POTENTIAL BENEFITS	COMMON RISKS AND CONSIDERATIONS*
<b>APPROVED THERAPIES AND PROCEDURES</b>			
<b>Blood transfusion</b>	A procedure whereby a person's red blood cells are replaced with normal red blood cells from a donor.	<p>Patient may feel better overall.</p> <p>Fatigue may decrease.</p> <p>Procedure is usually safe.</p>	<p>Fever, itching, allergic reaction may result from infusion of new blood.</p> <p>There is a slight risk of infections from contaminated blood.</p> <p>Some patients have hemolytic reaction (breakdown of red cells) at first.</p> <p>Procedure takes 2-8 hours to complete.</p> <p>Repeat transfusions could lead to too much iron in the body which can damage organs.</p>
<b>Bone marrow transplantation</b>	A procedure whereby a person's current bone marrow is replaced with healthy marrow from a donor. The donor must have an exact match to the patient's own marrow. Otherwise, the patient's body will reject the new marrow.	If the procedure is successful, the patient may be cured of PNH.	<p>Procedure is highly risky and is usually done on only the sickest patients who have no other options.</p> <p>Finding a person with an exact marrow match can be difficult; sometimes matches can be found with direct family members.</p> <p>Procedure is most successful for patients under 55 years of age.</p>

\* Ask your doctor for a complete list of each treatment's risks and side effects.

THE TREATMENT	THE TREATMENT DEFINED	POTENTIAL BENEFITS	COMMON RISKS AND CONSIDERATIONS*
<b>COMMON TREATMENTS</b>			
<p><b>Androgens</b></p> <p>Brand names:</p> <p>Halotestin® (fluoxymesterone)</p> <p>Anadrol® (oxymetholone)</p> <p>Winstrol® (stanozolol)</p> <p>Danacrine® (danazol)</p>	<p>Androgens are natural male hormones.</p>	<p>These hormones may increase the number of blood cells.</p> <p>Patient may feel less tired and have more energy.</p>	<p>Side effects exist and differ by drug.</p> <p>Female patients may experience hair growth, lower voice, and increase in muscle mass.</p> <p>Male patients may experience enlarged prostate gland, worsening prostate cancer, and growth of breast muscles.</p> <p>Other possible side effects include jaundice, liver damage, and acne.</p> <p>Treatment requires strict monitoring by a doctor.</p>
<p><b>Blood-forming growth factors</b></p> <p>Brand names:</p> <p>Neupogen® (filgrastim)</p> <p>Leukine® (sargramostim)</p>	<p>Filgrastim and sargramostim are man-made versions of blood-forming growth factors normally found in the body.</p> <p>Both drugs are being studied for their use with other therapies for bone marrow disorders.</p>	<p>Drugs encourage bone marrow to create more white blood cells; more white cells protect the body from infections.</p>	<p>Side effects of Neupogen include headaches, bone and joint pain, muscle pain, nausea, and vomiting.</p> <p>Side effects of Leukine include faintness and hot face after first dose of drug, as well as weakness.</p>
<p><b>Immunosuppressants</b></p> <p>Anti-thymocyte globulin (ATG)</p> <p>Cyclosporine</p>	<p>These drugs are used to suppress, or hold back, the immune system. ATG is usually given alone but is sometimes given in combination with cyclosporine.</p>	<p>Treatment may increase the production of blood cells by preventing their destruction.</p> <p>Patient may feel less tired and have more energy.</p>	<p>It could take a patient up to 6 months to respond to ATG treatment.</p> <p>Hemolysis (destruction of red blood cells) can occur when treatment ends.</p> <p>Side effects of ATG include infection, fever, chills, hives and high blood pressure.</p> <p>Side effects of cyclosporine include infections, kidney problems, nausea, and high blood pressure.</p> <p>Patient may need to take antibiotics due to infection.</p>
<p><b>Erythropoietin</b></p> <p>Brand names:</p> <p>Procrit® (epoetin alpha)</p> <p>Epogen® (epoetin alpha)</p> <p>Aranesp® (darbepoetin alfa)</p>	<p>A naturally-derived protein—given by injection—that encourages bone marrow to make red blood cells.</p>	<p>Treatment may reduce the need for blood transfusions.</p> <p>Patient may feel less tired and have more energy.</p>	<p>Treatment in PNH patients can result in an increase in destruction of red blood cells, thereby making symptoms worse.</p> <p>Patient must be closely monitored by a doctor.</p> <p>Treatment requires weekly injection (Aranesp requires less frequent injections).</p> <p>Procrit, Epogen, and Aranesp all have side effects that vary by drug brand.</p>

\* Ask your doctor for a complete list of each treatment's risks and side effects.

THE TREATMENT	THE TREATMENT DEFINED	POTENTIAL BENEFITS	COMMON RISKS AND CONSIDERATIONS*
<b>COMMON TREATMENTS</b> (continued)			
<b>Prednisone</b>	A steroid or man-made hormone.	Steroids have been reported to slow the breakdown of red blood cells.  Patient may feel less tired and have more energy.	Side effects include skin rash, swollen face, legs and ankles, infection and muscle weakness.  Some doctors feel prednisone is ineffective, or that the benefits do not outweigh the risks.
<b>TREATMENT IN CLINICAL TRIALS FOR PNH</b>			
<b>Eculizumab</b>	Eculizumab is a protein-based drug given intravenously that prevents the immune system from destroying the red blood cells.	Eculizumab prevents the destruction of red blood cells.  Many patients have less fatigue (more energy) and experience an improvement in quality of life.  Most patients need blood transfusions less often or not at all.  Eculizumab appears to be safe and well-tolerated.  Initial studies suggest that eculizumab may reduce the risk of blood clots in patients with PNH.	Drug does not increase blood cell production.  If treatment is stopped, there is a risk of increased hemolysis.  Patient must be treated every two weeks.  Most common side effects include headache, head-cold, upper respiratory infections, and back pain.  There is a potential risk of meningococcal infections during treatment with eculizumab, and vaccination is required.

\* Ask your doctor for a complete list of each treatment's risks and side effects.

## How To Find a PNH Doctor

PNH is a rare disorder and many doctors have never treated a patient with it. If your doctor does not have experience with PNH, you should find a doctor who does. Below are some questions to help you determine if your doctor has treated other PNH patients. (*Take this brochure with you to the doctor's office so you don't forget any questions.*)

To learn about your doctor's PNH experience, ask:

- Have you treated any PNH patients?
- How many patients have you treated for PNH?
- How many years have you been treating PNH patients?
- Are you currently treating PNH patients? If not, when was the last time you treated a patient with PNH?

If your doctor does not have PNH experience, ask:

- Can you refer me to a doctor who specializes in treating people with bone marrow failure disorders?
- Do you know of any teaching hospitals or medical schools that may have doctors who treat PNH patients?

If your doctor cannot help you find a PNH doctor, contact:

- Aplastic Anemia & MDS International Foundation, Inc.; 1.800.747.2820 or [www.aamds.org](http://www.aamds.org)
- PNH Research and Support Foundation; 1.603.205.4633 or [www.pnhfoundation.org](http://www.pnhfoundation.org)
- PNH Support Group. Find a chat room with hundreds of other PNH patients at [www.pnhdisease.org](http://www.pnhdisease.org)

## Questions To Ask Once You Do Find a PNH Doctor

Learning that you have a disease can be upsetting and confusing. But the sooner you understand your condition, the faster you will feel in control of your life again. Below are some questions to help guide you through a talk with your doctor.

### Once you find a doctor who treats PNH patients, ask:

- What tests will you use to determine if I have PNH?
- How do the tests work?
- If it is determined that I have PNH, what is the next step?
- How serious is my PNH?
- What are my treatment options?
- Which treatment is best for me? Why?
- How will the treatments impact my daily life?
- Am I a candidate for bone marrow transplantation?
- How much do these treatments cost and how can I learn if my insurance covers them?
- If I do not have health insurance, does that mean I cannot have the treatment?
- Am I eligible for a clinical trial?
- Can you put me in touch with other PNH patients?
- Should I begin taking supplements like iron and folic acid? How much of each? What is the danger of taking too many supplements?
- I think I may be pregnant. How will PNH affect my pregnancy, and how will my pregnancy affect my PNH?
- I am not pregnant now, but would like to have children. What do I need to know to have a healthy pregnancy with PNH?
- What percentage of my total blood cells are normal cells versus PNH cells? Or what is my “PNH clone size?”
- Should I take an anticoagulant to avoid blood clots?
- When I feel sick, how will I know if I should call you or 911?



Take this brochure with you to the doctor's office so you don't forget any questions.

## Your PNH Support System

This brochure cannot provide all the answers to questions you will have about PNH. After talking to your doctor, you may also want to seek more information from support groups to better understand how to manage your condition, find clinical trials, meet other PNH patients, and stay up to date on new treatments.



### **PNH Patient Support Groups**

#### **Aplastic Anemia & MDS International Foundation**

P.O. Box 310

Churchton, MD 20733

Phone: (800) 747-2820 or (410) 867-0242

Fax: (410) 867-0240

E-mail: [help@aamds.org](mailto:help@aamds.org)

Web site: [www.aamds.org](http://www.aamds.org)

### **PNH Research and Support Foundation**

PO Box 326

Eliot, ME 03903

Phone: (603) 205-4633

E-mail: [sara@pnhfoundation.org](mailto:sara@pnhfoundation.org)

Web site: [www.pnhfoundation.org](http://www.pnhfoundation.org)

### **PNH Support Group** (online resource only)

Web site: [www.pnhdisease.org](http://www.pnhdisease.org)

### **Other Related Support Groups**

#### **National Alliance for Thrombosis and Thrombophilia**

PO Box 66018

Washington, DC 20035-6018

E-mail: [nattinfo@yahoo.com](mailto:nattinfo@yahoo.com)

Web site: [www.nattinfo.org](http://www.nattinfo.org)

#### **National Organization for Rare Disorders®**

55 Kenosia Avenue

PO Box 1968

Danbury, CT 06813-1968

Phone: (203) 744-0100

Toll-free: (800) 999-6673

Phone for Hearing Impaired: (203) 797-9590

Web site: [www.rarediseases.org](http://www.rarediseases.org)

## **PNH Clinical Trials**

To learn about PNH clinical trials in the United States, contact these organizations:

### **Clinical Trials.gov**

Telephone: (301) 594-5983; Toll-free: (888) FIND-NLM or (888) 346-3656  
Web site: [www.clinicaltrials.gov](http://www.clinicaltrials.gov)

### **CenterWatch**

Telephone: (617) 856-5900  
Web site: [www.centerwatch.com/patient/trials.html](http://www.centerwatch.com/patient/trials.html)

### **National Heart, Lung and Blood Institute**

National Institutes of Health  
Bethesda, Maryland 20892-2655  
Telephone: (301) 592-8573

### **PNH Support Group**

Web site: [www.pnhdisease.org](http://www.pnhdisease.org)

## **PNH Patient Registries**

It is helpful for scientists who are studying PNH to have a database, or list, of patients who have the disorder. To learn more about how these databases work, or to sign up, contact:

### **International PNH Registry**

Available at: [www.pnhregistry.org](http://www.pnhregistry.org)

### **PNH Source Patient Registry**

Available at: [www.PNHSource.com/f/15](http://www.PNHSource.com/f/15)

### **Rare Thrombotic Diseases Consortium**

Available at:  
<http://rarediseasesnetwork.epi.usf.edu/rtdc/takeaction/registrymenu.htm>

## **PNH Reading List**

*About PNH.* Available at: [www.PNHSource.com/f/6](http://www.PNHSource.com/f/6)

*Paroxysmal Nocturnal Hemoglobinuria (PNH) Basic Explanations.*

Available at: [www.aamds.org](http://www.aamds.org) or (800) 747-2820

*What is PNH?: A Guide for Patients.*

Available at: [www.pnhdisease.org](http://www.pnhdisease.org)