



Module 6

# Anemia and Kidney Disease



## Module 6 – Table of Contents

What Is Anemia?.....	6-3
What Causes Anemia?.....	6-5
Anemia and Iron.....	6-5
Anemia and Your Heart.....	6-5
Treating Anemia.....	6-6
Measuring Anemia.....	6-8
Managing Anemia.....	6-10
Personal Plan.....	6-12
Take the Kidney Quiz!.....	6-13
Additional Resources.....	6-14

### Please Note

Use of Kidney School does not replace the need to talk with your health care team about your care and your options.

### Legal Disclaimer

The information you find on the Life Options website or printed pages, including Kidney School, is provided “as is,” and to the extent permitted by law, the Life Options Rehabilitation Program, the Medical Education Institute, Inc., and their affiliates, employees, officers, board of directors, or shareholders give no warranty of any kind, either express or implied, including without limitation any warranties of condition, quality, performance, merchantability, fitness for a particular purpose, or non-infringement in relation to information, services, or products provided through or in connection with the Life Options website or printed pages. To the extent permitted by law, the Life Options Rehabilitation Program and the Medical Education Institute, Inc. disclaim all liability for any damages or injury caused by any failure of performance, error, omission, deletion, defect, access to, alteration of, or use of record, whether as a result of breach of contract, tortious behavior, negligence, or under any other cause of action. The contents of the Life Options website and printed pages, including, but not limited to text, graphics, and icons, are trademarked materials owned or controlled by the Medical Education Institute, Inc. *No permission is granted here for you to reprint in whole or in part Life Options or Kidney School content, graphics, illustrations, photographs, or icons.* (Revised March, 2015)

---

**1) b**  
**2) a**  
**3) d**  
**4) c**

**Module 6 – Kidney Quiz Answers**  
 Congratulations, you've finished the quiz! Here are the correct answers so you can see how you did:





**V**elma recently learned she has kidney disease. On her visit to the doctor last week, she complained of always feeling tired and worn down.

“My greatest struggle,” she says, “is my lack of energy. I drag myself through each day, barely able to work or even do chores. It doesn’t matter how much sleep I get, I still feel worn out. This is no way to live!”

A simple blood test revealed the source of her fatigue: anemia.

Although her condition had a name, Velma knew little about anemia. What did it have to do with kidney disease? Can anemia be treated so she can feel more normal again? She needed to know more.

And that’s just what we’ll help you do in this module: find out what anemia is, how it relates to kidney disease, how you might know if you have it—and what you can do about it.

If you have anemia right now, the information in this module can help you keep your quality of life at its best. At the end of the module, we will sum up all of the key points for you in a Personal Plan. You can use it for future reference.

Have you felt very tired (or fatigued) in the last week? Sometimes people don’t tell their doctor information that might help them get better care. You might not even think of feeling tired as being a “symptom” you should bother the doctor with. But if your fatigue is caused by anemia, which can be treated, your doctor can help you! At your next clinic visit, ask about blood tests to check for anemia. Later in this module, we’ll tell you what those tests are.

If your health care team has told you that you have anemia, then you know that treatment is needed. Your doctor’s job is to prescribe your treatment. Your job is to:

- Pay attention to how you feel
- Tell your doctor how you feel
- Learn about your lab tests
- Watch your lab results

## What Is Anemia?

To understand anemia, you first have to understand red blood cells.

Think of your red blood cells as delivery trucks—they carry oxygen to every cell in your body. Oxygen is vital to your existence. If, for some reason, the drivers went on strike and oxygen couldn’t reach your organs and muscles, you would die.



Think of anemia as a labor shortage. There aren’t enough delivery trucks to carry oxygen through your body. Anemia is a shortage of oxygen-carrying red blood cells.

When your body doesn’t get the oxygen it needs, it doesn’t work as well. As you have already learned, the most common symptom of anemia is fatigue.



### In Their Own Words: Patients Describe Anemia Symptoms

It's one thing to know the name of a symptom—and another thing to know how it might affect you. Read what these patients say about how anemia makes them feel. Do you notice any of these in your own life?

#### **Fatigue:**

*“It affected me to the point where we had to wait to do things sometimes because I knew I wasn't going to have the energy. My son is on the bowling team, so he had a lot of bowling matches after school. So on those days when I knew he had a bowling match, I wouldn't do anything that whole day. Because I knew if I did something during the day, I would be tired.”*

#### **Feeling cold:**

*“When I get cold, I have to have a lot of covers on me right away, because I feel like I'm having chills.”*

#### **Shortness of breath:**

*“If I was climbing a hill, I'd have to stop every 20 feet and catch my breath for about 5 minutes or so, and everybody else would be 5 miles ahead of me and I'd just have to go slow. I could still do it, I just wouldn't have the stamina to keep going.... You're still able to have short bursts of activity, you just can't maintain it.”*

#### **Trouble concentrating:**

*“My concentration seems to fall off a little bit. I'm an engineer, so I do a lot of technical work. The length of time I can focus on a problem seems to be reduced.”*

If you have felt any of these symptoms and haven't told your doctor yet, make a point to call or write them down to report at your next visit. These symptoms may or may not be related to anemia. If you don't feel any of these symptoms now but notice them in the future, be sure to tell your doctor.

Other symptoms of anemia are listed below. Of course, these symptoms may have other causes besides anemia. Check the ones you have right now:

- Fatigue/loss of energy
  - Feeling cold all the time
  - Shortness of breath/chest pain
  - Pale skin, gums, and fingernail beds
  - Trouble concentrating
  - Dizziness/lightheadedness
  - Headaches
  - Changes in menstrual cycles (women)
  - Difficulty with erections (men)
  - Slower than usual growth (children)
  - Other symptoms not listed above:
- 
- 

Anemia symptoms can become so severe that some people don't have the energy to do chores, shop, or even take the dog for a walk. Some people with kidney disease even quit their jobs—not realizing that what is making them too tired to work may be treatable anemia. As one patient who was not treated for anemia said:

*“I've had a job since I've been 13, and at times in my life I've had two or three jobs at one time. And now I can't hardly get up and go sometimes. I had one unemployment check in my whole life. So I've always worked. And now I'm not working.”*







## What Causes Anemia?

Did you read Module 1? If you did, you know that one of the jobs of healthy kidneys is to make a hormone called *erythropoietin* (a-rith-ro-po-uh-tin), or EPO for short.



**Normal red blood cell count**



**Anemic red blood cell count**

Red blood cells are made *inside your bones* by stem cells in the bone marrow. Normally, when you run low on red blood cells, EPO signals your bone marrow to make more. Your bone marrow gets the message and steps up red blood cell production.

As the kidneys fail, in most cases they make less EPO. Without EPO, your bone marrow doesn't get the message—and you get anemia. There are many other causes of anemia, too, but not enough EPO is the usual cause in people with kidney disease.

## Anemia and Iron

There is another key player in the anemia story besides EPO: **iron**.

Iron is the key building block for making red blood cells. Without enough iron, EPO will still signal the bone marrow, but few blood cells will be made.

We get iron into our bodies by eating foods rich in iron, like liver. But iron in food is not very well-absorbed. In fact, almost all of the iron used to make new red blood cells comes from old red blood cells that are broken down.

When you are already short of red blood cells, every drop of blood counts! Losing small amounts of blood through lab tests or surgery can make anemia worse. People who are on hemodialysis lose a little bit of blood at each treatment.

Now that we've told you about how anemia is caused by kidney disease, try ranking these events in the order they occur (1-5):

- \_\_\_ Fatigue, shortness of breath, and other symptoms
- \_\_\_ Less oxygen to the body
- \_\_\_ Less EPO production
- \_\_\_ Fewer red blood cells (anemia)
- \_\_\_ Kidney disease

How these events are related is not always clear the first time you see this information. Here is the actual order:

- 1 Kidney disease
- 2 Less EPO production
- 3 Fewer red blood cells (anemia)
- 4 Less oxygen to the body
- 5 Fatigue, shortness of breath, and other symptoms

Anemia begins *early* in kidney disease—when the kidneys are still working at about 45% of the normal level. Anemia tends to worsen as kidney disease progresses. Nearly everyone with kidney failure has anemia.

## Anemia and Your Heart

When you have untreated anemia, your muscles do not get enough oxygen. They have to work harder to do the same tasks you did before anemia. That's why you may get so tired.



### Injections? Me??

If you had a choice, would you want injections of a drug? Maybe not. But what if the drug would give you more energy so you could get your life back—and injections were the only way you could take it? You would probably get used to it!

*Erythropoiesis stimulating agents* (ESAs) are one such drug. Some people inject ESAs themselves; others go to a clinic. If you have chronic kidney disease, ESAs may be paid for if your blood tests show anemia and you have symptoms. Even if these conditions are met, ESAs may only be paid for if they are given at a clinic or doctor's office.

People on dialysis get ESAs while they are treated, and they may have the drug injected into the dialysis tubing. ESAs are costly drugs, so some negotiation may be needed to get insurance to pay for them. For people who are on dialysis, ESAs are paid for by Medicare.

Here's what some patients have said about how ESA treatment makes them feel:

*"I couldn't walk across the street. I could not walk up a slanted driveway, not even 50 feet. I could not. I took the elevator from the ground floor to the first floor. I could not walk it. With Epoetin shots—you feel really great. I did the Revlon® walk, 5K. That makes your life worth living, when you have something like that."*

*"Before I started taking EPO I had to walk with a stick or cane, because if I'd walk 25 yards or so, I was buffing and puffing and I would have to lean on the cane and rest. After probably the 4th injection, I could walk maybe 50 yards and I didn't buff and puff. I didn't know what to expect until after I started feeling better, and I said, 'Maybe there is life!'"*

If you are too tired to walk up steps or go to the store, your other muscles can rest. But your heart is a muscle, too, and it must keep beating to keep you alive. In fact, with anemia, your heart works even *harder* than usual. It tries to pump your blood around your body faster to make up for less oxygen.

With all this extra work, one of the four pumping chambers of your heart (the left ventricle) gets bigger and bigger. This condition is called *left ventricular hypertrophy*, or LVH for short (hypertrophy means enlarged).

LVH usually starts when the kidneys are failing, after anemia has developed. This problem is very common. By the time kidney failure occurs, nearly 75% of people already have LVH. LVH is a major reason why heart problems are the leading cause of death in people with kidney failure.

The good news is, anemia can be treated. And that's where we head next.

### Treating Anemia

Now you've learned that the hormone EPO (made by the kidneys) tells your bone marrow to make more red blood cells. But if your kidneys don't make enough EPO, how can you escape anemia?

Before 1989, you would have needed many blood transfusions. That was the year synthetic (man-made) erythropoiesis stimulating agents (ESAs) first came out for people with kidney disease. Since 1989, people with kidney disease have had a better quality of life because of ESAs. ESAs help your body to make its own red blood cells.

You may know ESAs as EPOGEN® (Epoetin alfa, Amgen Inc.), PROCRT® (Epoetin alfa, Ortho Biotech), or Aranesp™ (darbepoetin alfa, Amgen Inc.). ESAs reduce fatigue, increase appetite, and improve endurance. They have become a standard





treatment for people with kidney disease and anemia. If you receive an ESA, be sure you know your dose and medication schedule.

In late 2007, the U.S. Food and Drug Administration (FDA) issued a warning about the use of ESAs. It states that ESAs should be used to maintain a hemoglobin level between 10 and 12 g/dL, *and* warns that higher hemoglobin levels in patients with chronic kidney failure may increase the risk of death. Scientists have said the studies that caused the FDA to issue this warning were flawed, but the warning remains. Talk to your doctor about the risks and benefits of taking an ESA.

In addition to an ESA, your doctor may prescribe iron. If your iron levels are too low, then EPO alone won't help. EPO needs iron to do its job.

Some iron can be added to your diet by eating iron-rich foods or cooking in a cast-iron skillet. Most of the time, an iron supplement is needed. Your doctor will suggest or prescribe one if you need it. Iron can be taken by mouth as pills or elixirs (liquid medicines), or given intravenously (into a vein).



A nurse or doctor will give you a test dose, because a very small number of people (less than 1%) have a bad reaction to some types of iron injections. If you begin to wheeze or have trouble breathing, your health care provider can give you epinephrine or corticosteroids to fight the reaction. Even though the risk is small, you may be asked to sign a form stating that you understand the possible reaction and that you agree to have the treatment. Talk to your health care provider if you have any questions.

## Fast Facts About Iron

### Did you know...

- Liver (all kinds), iron-fortified cereals, beef, pork chops, poultry, lima beans, and kidney beans are the food sources with the most iron? Some of these foods may not be good choices for people with kidney disease, so talk to a dietitian before making any food changes.
- One out of every 200 to 300 people has a genetic problem called *hemochromatosis*, which causes a build up of too much iron? The treatment: removing some blood.
- Vitamin C helps you absorb more iron, when you take them together? (NOTE: People on dialysis should limit Vitamin C to 60 mg/day.)
- Combining iron with coffee or a high-fiber diet means you absorb less?
- Iron pills or vitamins containing iron are the number one cause of poisoning deaths in children under 6—even with childproof caps? (As with all of your drugs, keep iron pills out of the reach of children.)



At this point you may be wondering: How do I know when my blood and iron levels are too low? Let's move on to some important tests that will help you understand what's going on with your blood.

### Measuring Anemia

The easiest way for your doctor to tell if your red blood cells are healthy is to perform a simple blood test called a *complete blood count*, or CBC.

#### Testing for Anemia: What Will the Doctor Do?

If your doctor believes you may have anemia, the first place that he or she will look will be your blood. Blood will be drawn to measure:

- **Hemoglobin**
- **Hematocrit**
- **Reticulocyte count** (the number of new red blood cells)
- **Iron levels** (we'll talk about these a little later on)

Sometimes people are anemic because they are losing blood from their intestines, often without even knowing it. Another test the doctor should ask for is a check of your stool for occult (hidden) blood. To do this, a sample of your stool is collected, usually in a plastic "hat" that fits into the toilet. A tiny bit of stool is taken from several spots and smeared onto a special card. In the lab, a solution is dripped onto the card and it changes color if blood is present.

This screening includes two tests to detect anemia:

- The first measures *Hemoglobin* (Hgb or Hb)
- The second measures *Hematocrit* (Hct or "crit")

Together, sometimes these tests have the nickname "H & H."

Hemoglobin is the iron-based, oxygen-carrying protein in red blood cells that gives blood its red color. When hemoglobin levels are normal, red blood cells are round and red. They carry the right amount of oxygen to the organs and muscles.



Normal red blood cell



Anemic red blood cell

When hemoglobin levels are low, they lose their vibrant red color and appear pale and misshapen. Red blood cells in this condition cannot carry the needed oxygen to the body.

Ask for copies of your lab test results! Your lab tests may tell you the amount of hemoglobin in your red blood cells. But what do the numbers mean?

Normal hemoglobin (abbreviated as Hgb or Hb on the lab results) should range from:

- 14 to 18 g/dL for healthy men
- 12 to 16 g/dL for healthy women

The target hemoglobin for men and women with kidney disease is 10-12 g/dL (even though normal in the absence of kidney disease is a little higher).

The g/dL is simply how the numbers are measured. It stands for grams per deciliter. The important







part for you to know is *your* actual number and how it changes over time and with treatment.

Blood is made up of plasma fluid, red blood cells, white blood cells, and other types of cells. Hematocrit measures the percent of the blood that is made up of red blood cells. When the percent of red blood cells is low, fewer delivery trucks are on hand to carry oxygen throughout the body.

The normal range for hematocrit (Hct) is:

- 40% to 50% for healthy men
- 36% to 44% for healthy women

The target Hct for men and women with kidney disease is 33% to 36%.

Your hemoglobin and hematocrit levels are important. Your doctor uses them to diagnose anemia and to adjust your treatment if you have anemia.

If you are just starting an ESA, you will probably have blood tests often to measure your response to the medicine. Once your Hgb/Hct increases to the desired level, the tests will be less frequent.

Can you fill in your most recent hemoglobin and hematocrit numbers?

My hemoglobin is \_\_\_\_\_ g/dL

My hematocrit is \_\_\_\_\_ %

If you can fill in these levels, great! Tracking your lab test values is a key part of taking an active role in your health care. This knowledge can help you to talk with your health care team. Knowing your levels also gives you a goal if your readings are outside the range your doctor sets for you.

## Hemoglobin and Hematocrit in People on Dialysis

For people who are *on dialysis*, Medicare will only pay for ESA treatment that will bring the Hgb/Hb and Hct up to lower-than-normal levels:

- 10 to 12 g/dL (Hgb/Hb)
- 33% to 36% for both men and women (Hct)

Research suggests that higher levels of Hgb/Hb and Hct may be harmful in people with chronic kidney disease. Talk with your doctor about your Hgb/Hb and Hct levels and how well you feel.

If you didn't know what your levels were, be sure to ask for results the next time you have your blood tested. Now that you know how to read the numbers for hemoglobin (Hgb/Hb) and hematocrit (Hct), you can follow your progress over time. (For more information on being your own manager, see Module 3—*Working with Your Health Care Team*).

Besides hemoglobin and hematocrit, there are two other tests that relate to anemia and are important for you to know about. Both measure iron levels in your blood. Iron is needed as a building block to make red blood cells, so it is not enough to have EPO—you need iron, too.

- The first test is called *Ferritin* or *Serum Ferritin*.
- The second test is called *Transferrin Saturation* (TSAT).

Let's look at ferritin first. Because iron is so important for healthy blood cells, the body has a way to save extra iron for a "rainy day." Iron that isn't needed right away is stored in a protein



## A Word About Lab Tests

We have given you information about “normal” ranges for lab tests, and ranges used for people on dialysis. When possible, we used research-based clinical practice guidelines to provide lab test ranges.

Testing laboratories are each a little bit different. The laboratory used by your doctor may have different “normal” ranges than the ones provided here. If so, please use the ranges your doctor gives you, as they may be better suited to your age, gender, altitude, or health condition.

called ferritin. A blood test for ferritin measures how much iron is stored in your body.

In healthy people, a normal ferritin range is from 30 to 300 ng/mL (nanograms per milliliter of blood). For people on dialysis, the target range of ferritin is 100 to 1,200 ng/mL. Keeping the ferritin in this range assures enough—but not too much—iron.

A little stored iron is a good thing. Too much iron in the body is not. Iron can build up in tissues and organs, causing damage or even death, so it’s important to keep an eye on your ferritin level and be sure it is not too high.

The second test is called transferrin saturation, or TSAT for short. TSAT measures how many “building blocks” of iron are in your body to make red blood cells. Low TSAT levels mean iron deficiency (often due to blood loss) or problems with your body releasing stored iron when it is needed.

Like Hct, TSAT is measured in percentages. The normal range of TSAT is about 20% to 50%—the same range as for people not on dialysis.

## Managing Anemia

While it may not be possible to completely avoid anemia with kidney disease, there is much you can do along with your health care team to manage it. The chart on the next page will give you some ideas of what you can do and how it will help you.

It’s time to wrap up this module on anemia and kidney disease. But before we do, we want to give you a Personal Plan to help you get a start on some of the most important ideas in this module. We encourage you to put it where it will remind you of the goals toward which you’re working.

### Try This Quick Review...

Match each test with what it measures.

- |  |  |
|--|--|
| ___ <b>Hemoglobin (Hgb/Hb)</b>           | 1 – Iron stored in the body                      |
| ___ <b>Hematocrit (Hct)</b>              | 2 – Oxygen-carrying protein in red blood cells   |
| ___ <b>Ferritin</b>                      | 3 – Percentage of red blood cells                |
| ___ <b>Transferrin saturation (TSAT)</b> | 4 – Iron building blocks to make red blood cells |

How did you do? Here are the correct answers:

Hemoglobin (Hgb) – 2  
 Hematocrit (Hct) – 3  
 Ferritin – 1  
 Transferrin saturation (TSAT) – 4





## Managing Anemia

How you can manage anemia	How it will help you
<ul style="list-style-type: none"> <li>■ Always ask to see your lab test results, and track them in a file or notebook.</li> </ul>	<ul style="list-style-type: none"> <li>■ You can talk with your care team in an informed way.</li> <li>■ You can know what is going on inside your body.</li> <li>■ You can follow progress over time.</li> </ul>
<ul style="list-style-type: none"> <li>■ Ask your doctor what your target levels are for each test.</li> </ul>	<ul style="list-style-type: none"> <li>■ You will know what you are aiming for and if you are succeeding.</li> </ul>
<ul style="list-style-type: none"> <li>■ Ask your doctor to explain how to bring your lab tests back into the target range if they are outside of it.</li> </ul>	<ul style="list-style-type: none"> <li>■ You will learn what you can do.</li> <li>■ You will let your doctor know that staying healthy is something you are willing to work at.</li> </ul>
<ul style="list-style-type: none"> <li>■ Keep a diary of your symptoms. What are they? When do they occur? What makes them better or worse? (This can be done in the same notebook with your lab test results.)</li> </ul>	<ul style="list-style-type: none"> <li>■ You can bring the diary to the clinic to remind you of things to ask the health care team.</li> <li>■ You can see if your symptoms relate to anything you do or eat, or to medications you take.</li> <li>■ You can see if your symptoms change as your lab test results do.</li> </ul>
<ul style="list-style-type: none"> <li>■ If you are diagnosed with anemia, but are not being treated with an ESA and iron, ask your doctor why.</li> </ul>	<ul style="list-style-type: none"> <li>■ You will help to get yourself the best care possible.</li> </ul>
<ul style="list-style-type: none"> <li>■ Keep track of your dosages of ESAs and iron, if you receive them.</li> </ul>	<ul style="list-style-type: none"> <li>■ You will be an informed patient who knows about medications.</li> </ul>
<ul style="list-style-type: none"> <li>■ Take your medications in the right dose, at the right time, in the right way.</li> </ul>	<ul style="list-style-type: none"> <li>■ Your medications will be more effective.</li> <li>■ You may avoid some side effects.</li> </ul>
<ul style="list-style-type: none"> <li>■ Tell your care team if your anemia symptoms do not improve.</li> </ul>	<ul style="list-style-type: none"> <li>■ Your medications may need to be adjusted, so you feel better and have more energy.</li> </ul>



### Personal Plan for \_\_\_\_\_

#### *Anemia and Kidney Disease*

Anemia is a shortage of oxygen-carrying red blood cells.

#### **Anemia and Kidney Disease**

Healthy kidneys make a hormone called erythropoietin (EPO), which signals the bone marrow to make red blood cells. When the kidneys fail, they make less EPO. Without EPO—and iron for building blocks—too few red blood cells are made. Blood loss makes anemia worse, because of iron lost through the lack of red blood cells.

#### **Symptoms of Anemia**

Common symptoms of anemia include:

- Fatigue/loss of energy
- Feeling cold all the time
- Shortness of breath/chest pain
- Pale skin, gums, and fingernail beds
- Trouble concentrating
- Dizziness/lightheadedness
- Headaches
- Changes in menstrual cycles (women)
- Difficulty with erections (men)
- Slower than usual growth (children)

If I have felt any of these symptoms and haven't told my doctor, I will call him or her to report my concerns or discuss them at my next visit.

#### **Anemia Treatment**

Standard treatment for anemia due to kidney disease includes injections of ESAs (EPOGEN®, PROCRT®, or Aranesp™) and iron supplements (pills, elixirs, or intravenous iron).

#### **Anemia Blood Tests**

Four tests are important for assessing anemia:

- **Hemoglobin** (Hgb/Hb) measures how much oxygen-carrying protein is in my red blood cells. Normal Hgb/Hb levels are 14 to 18 g/dL for healthy men and 12 to 16 g/dl for healthy women. The target Hgb/Hb for both men and women on dialysis is 10 to 12 g/dl.
- **Hematocrit** (Hct, “crit”) measures the percentage of my blood that is made up of red blood cells. Normal Hct levels are 40% to 50% for healthy men and 36% to 44% for healthy women. The target Hct for both men and women on dialysis is 33% to 36%.
- **Ferritin** measures how much iron is stored in my body. Normal ferritin in healthy people is from 30 to 300 ng/mL. The dialysis target ferritin range is 100 to 1,200 ng/ml.
- **Transferrin Saturation** (TSAT) measures how much iron is available to make my red blood cells. The normal range of TSAT is 20% to 50%. The dialysis range is the same.







## Take the Kidney Quiz!

You'll see how much you're learning if you take our quick kidney quiz. It's just 7 questions. How about it? (*Answers are on page 6-2.*)

**1. Anemia is a shortage of:**

- a) Fluid-loaded blood plasma
- b) Oxygen-carrying red blood cells
- c) Infection-fighting white blood cells
- d) Blood clotting factors

**2. Anemia develops:**

- a) Early in kidney disease
- b) Rarely in people with kidney disease
- c) When dialysis or a kidney transplant is needed
- d) Only after years of dialysis treatment

**3. Anemia is a problem for people with kidney disease because:**

- a) They urinate out red blood cells and don't have enough
- b) Their red blood cells explode from kidney toxins
- c) They have enough red blood cells, but their bodies can't use them
- d) Their bodies do not make enough erythropoietin

**4. The hormone that triggers the bone marrow to make red blood cells is called:**

- a) LEO
- b) HEMO
- c) EPO
- d) PETO

**5. Which of the following is NOT a symptom of anemia?**

- a) Feeling cold all the time
- b) Fatigue and lack of energy
- c) Shortness of breath and chest pain
- d) Developing a skin rash

**6. Usual treatment for anemia includes:**

- a) Injections of EPOGEN<sup>®</sup>, PROCIT<sup>®</sup>, or Aranesp<sup>™</sup> and iron supplements
- b) Injections of EPOGEN<sup>®</sup>, PROCIT<sup>®</sup>, or Aranesp<sup>™</sup> and vitamin D pills
- c) Iron supplements and blood transfusions
- d) Iron supplements and vitamin D pills

**7. Which blood test measures the percentage of the blood that is made up of red blood cells?**

- a) Ferritin
- b) Hematocrit
- c) TSAT
- d) Hemoglobin



### Additional Resources

In addition to the free Life Options materials you can find at [www.lifeoptions.org](http://www.lifeoptions.org), the resources below may help you learn more about the topics in this module of Kidney School.

PLEASE NOTE: Life Options does not endorse these materials. Rather, we believe you are the best person to choose what will meet your needs from these or other resources you find. Please check with your local library, bookstore, or the internet to find these items.

#### Books:

- 1 ***Help, I Need Dialysis!*** by Dori Schatell, MS, and Dr. John Agar  
(Medical Education Institute, 2012, [http://www.lifeoptions.org/help\\_book](http://www.lifeoptions.org/help_book), ISBN-13: 978-1937886004)  
Easy to read, fully referenced book covers the lifestyle impact of each type of dialysis—including information on anemia . . .and how to manage it.
- 2 ***Everything You Need to Know About Anemia (Need to Know Library)***,  
by Allison J. Ross (Rosen Publishing Group, August 2000, ISBN-13: 978-0823932184)  
This book provides general information about anemia.

#### Audiovisual item:

- 1 ***EPO: Treating Anemia in Chronic Renal Failure*** by the National Kidney Foundation.  
If you would like more information, please call (800) 622-9010 or visit their website at [www.kidney.org/atoz/atozItem.cfm?id=60](http://www.kidney.org/atoz/atozItem.cfm?id=60).

#### Website:

- 1 ***Anemia Institute for Research and Education*** –  
[www.anemiainstitute.org/index.php/en/Patient](http://www.anemiainstitute.org/index.php/en/Patient). This website from a Canadian non-profit group has information about kidney disease and anemia.

#### Other materials:

- 1 ***Anemia in Kidney Disease and Dialysis***, by the National Kidney and Urologic Diseases Information Clearinghouse (NKUDIC). If you would like more information, please call (800) 891-5390, email [nkudic@info.niddk.nih.gov](mailto:nkudic@info.niddk.nih.gov), or visit their website at [www.niddk.nih.gov](http://www.niddk.nih.gov).
- 2 ***The Iron Story***, by the American Association of Kidney Patients (AAKP). If you would like more information, or to obtain this brochure in either English or Spanish, call (800)749-2257 or download a copy from their website at [www.aakp.org/brochures/iron-story/](http://www.aakp.org/brochures/iron-story/).

