

## Does a high WBC count signal infection?

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THE WHITE BLOOD CELL (WBC) count can indicate disorders such as an infection or inflammation. But taken alone, the WBC count may have little value unless you correlate it to the patient's clinical condition and analyze the WBC differential—the percentage of different WBC types. (See *A closer look at white blood cells.*) Here, we'll discuss how the WBC differential helps you assess your patient's condition.

### Normal or not?

Normally the total WBC count for an adult ranges from 5,000 to 10,000/mm<sup>3</sup>. *Leukocytosis* (WBC > 10,000/mm<sup>3</sup>) can indicate infection, inflammation (possibly from allergies), tissue damage or burns, dehydration, thyroid storm, leukemia, stress, or steroid use. The degree of leukocytosis depends on the severity of the disorder, the patient's age and general health, and bone marrow health.

In contrast, *leukopenia* (WBC < 4,000/mm<sup>3</sup>) can indicate a viral infection or some bacterial infections, including overwhelming ones; bone marrow failure; collagen or vascular diseases such as lupus; liver or spleen disease; radiation; drug toxicity; autoimmune disease; or dietary deficiency, such as vitamin B<sub>12</sub> deficiency.

But the total WBC count tells only part of the story. To get the full picture, you must also evaluate the differential count, which varies during the course of an infection.

### The bands march in

When the body responds to an acute infection, many immature WBCs, called *bands*, develop. Normally

### A closer look at white blood cells

White blood cell type	Normal values
<b>Granulocytes</b> (polymorphonuclear leukocytes)	
<b>Neutrophils</b> (made up of bands and segmented neutrophils, or segs)	55%-70%; 2,500-8,000/mm <sup>3</sup> (Bands are normally < 10%)
<b>Eosinophils</b>	1%-4%; 50-500/mm <sup>3</sup>
<b>Basophils</b>	0.5%-1%; 25-100/mm <sup>3</sup>
<b>Agranulocytes</b> (mononuclear leukocytes)	
<b>Lymphocytes</b>	20%-40%; 1,000-4,000/mm <sup>3</sup>
<b>Monocytes</b>	2%-8%; 100-700/mm <sup>3</sup>

making up 3% to 5% of WBCs, bands circulate for about 6 hours before they mature to segmented neutrophils (segs), so-called because of the appearance of their nuclei.

Early in an infection, the differential reveals a percentage of bands that's much higher than normal. The percentage of segs may be normal at first, but this increases as bands mature to segs.

If the infection is prolonged, the percentage of bands and segs may stay elevated for some time. As the infection subsides, the percentage of bands returns to normal first, followed by the percentage of segs.

### Which patient has an infection?

The following case studies illustrate how the WBC differential helps you assess a patient's condition.

Carol Stein, 58, was admitted from a long-term-care facility with a diagnosis of a persistent low-grade fever of 3 days duration and hypotension, with these vital signs: BP, 88/64; heart rate (HR), 110; respiratory rate (RR), 28; and temperature, 99.3° F (37.4° C). Suspecting sepsis, the ED health care provider ordered a com-

plete blood cell count with differential and blood and urine cultures. Her WBC is 14,000/mm<sup>3</sup> with this differential: bands, 34%, neutrophils, 56%. Six hours later, her vital signs and lab work are BP, 108/65; HR, 98; RR, 24; temperature, 99° F (37.2° C); WBC, 13,000/mm<sup>3</sup>; bands, 1%; and neutrophils, 79%.

Peter Chen, 67, was seen in the ED for fever, tachycardia, and hypertension after an outpatient dental procedure. He was admitted with these vital signs: BP, 175/92; HR, 154; RR, 28; temperature, 101.7° F (38.7° C); WBC, 17,000/mm<sup>3</sup>; bands, 6%; and neutrophils, 48%. Six hours later, his vital signs and differential results are as follows: BP, 122/69; HR, 90; RR, 20; temperature, 99.9° F (37.7° C); WBC, 15,000/mm<sup>3</sup>; bands, 4%; and neutrophils, 42%.

Which patient has the infection?

Mrs. Stein has a high total WBC count, which is often associated with infections, but this by itself isn't enough to indicate an infection. The WBC differential and culture results are needed to complete her story.

Mrs. Stein doesn't have a fever, but based on her WBC differential

results, she has a urinary tract infection requiring treatment. Her neutrophil count increased due to the bands maturing and the positive urine culture results supported the diagnosis of infection.

Mr. Chen is febrile, hypertensive, and tachycardic. His admission differential reveals an elevated WBC total count, but his percentage of bands and neutrophils is low. After 6 hours, even though his WBC count is still elevated, his percentage of bands hasn't increased at all, indicat-

**To get the full picture, you must also evaluate the differential count, which varies during the course of an infection.**

essarily indicate an infection. Use the components of the WBC differential—the percentage of bands and neutrophils—to get a full picture of your patient's condition. **Q**

ing that he doesn't have an infection. Mr. Chen has an allergic reaction to the preprocedural antibiotics that he took.

#### **The end of the story**

As you can see from these two case studies, fever and a high total WBC count don't nec-

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