



## Understanding Your Complete Blood Count

*This information was developed by your nursing staff to help you understand your complete blood count.*

### Part I: The measurements in a complete blood count

#### *What is a complete blood count?*

A complete blood count, often referred to as a CBC, is a common blood test. A CBC provides detailed information about three types of cells in your blood: red blood cells, white blood cells, and platelets. These blood cells are made in the bone marrow, the spongy tissue filling the center of your bones. Bone marrow in the skull, sternum (breast bone), ribs, vertebral column (backbone), and pelvis produces these blood cells.

Each type of blood cell plays an important role in your body's normal function.

#### *What does a complete blood count measure?*

A complete blood count includes five major measurements:

- *white blood cell (WBC) count*  
White blood cells fight infections. They are measured in thousands per cubic milliliter ( $K/mm^3$ ) of blood.
- *red blood cell (RBC) count*  
Red blood cells carry oxygen to and remove waste products from the body's tissues. These cells also contain hemoglobin. Red blood cells are measured in millions per cubic millimeter ( $mil/mm^3$ ) of blood.

- *hemoglobin (HGB) value*  
Hemoglobin gives red blood cells their color. Hemoglobin carries oxygen from the lungs to the tissues and takes carbon dioxide (the waste products) from the tissues to the lungs. From the lungs, carbon dioxide is exhaled. Hemoglobin is measured in grams per deciliter (g/dL) of blood.
- *hematocrit (HCT) value*  
The hematocrit is the percentage of red blood cells in relation to your total blood volume.
- *platelet count.*  
Platelets help to stop bleeding by forming blood clots. They are measured in thousands per cubic millimeter ( $K/mm^3$ ) of blood.

#### *What are the normal ranges of these measurements?*

Each measurement in a complete blood count has a normal range:

- WBC: 3.4-9.6  $K/mm^3$
- RBC: 3.58-4.99  $mil/mm^3$
- HGB: 11.1-15.0 g/dL
- HCT: 31.8-43.2%
- Platelets: 162-380  $K/mm^3$ .

You will see these ranges on your complete blood count.

## **Part 2: A more detailed look at what the complete blood count measures**

### *White blood cells*

These cells are the mobile units of the body's infection-fighting system. White blood cells travel in the bloodstream to areas of infection and destroy the responsible bacteria.

However, the WBC lab value is not meaningful unless the "differential" is also known.

### *The differential*

The differential measures each of the five types of white blood cells:

- neutrophils (polys and bands)
- basophils
- eosinophils
- lymphocytes
- monocytes.

The differential is usually based on 100 cells counted in a laboratory sample.

### *What are neutrophils?*

Neutrophils are the most numerous white blood cells. They make up about 56 percent of white blood cells. Neutrophils are the "soldiers" that fight infections. They eat or gobble up the infectious particles (bacteria) in your body.

On your lab sheet, you will see the words "polys" and "bands." Polys are mature neutrophils; bands are young polys, which also fight infections.

### *What is the ANC or AGC?*

The absolute neutrophil count (ANC), also called absolute granulocyte count (AGC), is the measure of the number of infection-fighting white blood cells in your blood.

### *How is the ANC calculated?*

To calculate the ANC, the number of white blood cells and the percentage of polys and bands must be known. Then, the number of white blood cells is multiplied by the percentage of polys and bands.

For example, let the number of white blood cells be 300. (This number would be 0.3 on the lab sheet. To get this number, move the decimal three places to the right.) Let the number of polys be 10 percent (0.10), and bands 5 percent (0.05). The ANC is found by doing the following:

$$\begin{aligned} 300 \times (0.10 + 0.05) \\ = 300 \times 0.15 \\ = 45 \end{aligned}$$

The ANC is 45.

Three more examples of these calculations are at the end of this information. The normal ranges shown are based on adult women; adult men's and children's ranges will be slightly different.

### **Part 3: Low blood counts—neutropenia**

*What does it mean to have a low ANC or an ANC lower than 500?*

The normal neutrophil count is 2,500-6,000. When you have 1,000 or fewer neutrophils, your risk of infection is increased. When your ANC is lower than 500, you are at risk for getting a serious infection. This condition is called “neutropenia.”

If you are neutropenic and develop a fever or signs of infection, contact your doctor immediately. You may be given antibiotics to fight the infection.

*If I am neutropenic, should I take special care of myself?*

If your ANC is low, be alert for the following signs and symptoms of infection:

- fever (temperature higher than 100.4 degrees Fahrenheit)
- shaking chills
- flushed skin
- sweating
- frequent urination or burning when urinating
- redness, tenderness, or pain anywhere on the body
- general feeling of tiredness or flu-like symptoms (sore throat, sneezing, runny nose, coughing, nausea, vomiting, diarrhea, shortness of breath, chest discomfort).

If you are neutropenic and have any of these signs or symptoms, contact your doctor immediately.

*If I am neutropenic, how can I prevent myself from getting infections?*

The following list contains information to help you care for yourself while you are neutropenic.

#### *Neutropenia precautions list*

To prevent or detect infections, follow these precautions.

#### *General precautions*

- Check your temperature three times a day when you are neutropenic. If your temperature is 101.3 °F\* or greater once, or if your temperature is 100.4 °F or greater two times in 24 hours, notify your nurse or doctor. Take Tylenol only on your doctor’s advice. Do not take aspirin.
- Check for signs of infection in such areas as the site of a Hickman catheter or Port-a-Cath, or any tube or catheter site. Also check the mouth, groin, and perineum (the area between the penis and the rectum in men, and between the vagina and rectum in women). Signs of infection include redness, swelling, tenderness, drainage, or odor. If you have any signs of infection, notify your nurse or doctor.

#### *Personal hygiene*

- Shower or bathe daily. Give extra attention to washing the underarms, groin, and perineum. These areas are moist and may harbor germs. If your skin becomes dry, use lotion or oils to soften it and prevent cracking.

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\* °F means degrees Fahrenheit.

- Perform mouth care every 4 hours, especially before and after meals.

#### *Mouth care checklist*

- Rinse with a baking soda mouth rinse (1 teaspoon of baking soda in an 8-ounce glass of water).
- Use a soft toothbrush and floss gently. Floss only if your platelet count is greater than 50,000.
- Use a lubricant (such as A & D ointment) on the lips to prevent chapping.
- Wear well-fitting dentures.
- Have dental work done only if you first consult your NIH doctor.

- Wash your hands before eating and after using the toilet, blowing your nose, coughing, or sneezing.
- Wear shoes in the hospital and at home.
- Do not have manicures or pedicures.
- Do not have nail tips or false nails applied.

#### *Precautions to take during daily activities*

- Avoid having contact with crowds, and people with infections.
- Use gloves when you do gardening.
- Avoid cleaning bird cages, cat litter boxes, and fish tanks.
- To promote hygiene during sexual activity, avoid excessive friction during intercourse by using a water-based lubricant. Avoid rec-

tal intercourse. Use a birth control method recommended by your nurse or doctor.

- Avoid hot tubs and Jacuzzis. Swim only in chlorinated swimming pools.

#### *Other ways to prevent infection*

- Avoid immunizations.
- Limit your exposure to pet excrement, fresh flowers, house plants, and stagnant water. Wash your hands after touching any of these items.
- If you cut or scrape your skin, clean the area immediately with soap and warm water. Then apply a bandage.
- Use an electric shaver rather than a razor.
- Avoid using enemas, rectal thermometers, and suppositories. Women should not douche or use tampons or vaginal suppositories.

## **Anemia**

### *What happens when I don't have enough red blood cells?*

When you do not have enough red blood cells, you develop a condition called “anemia.” When you are anemic, your hematocrit and hemoglobin levels will be below normal. You may feel weak and tired, and you may also have these symptoms:

- dizziness
- shortness of breath
- heart palpitations (racing heartbeat)
- pounding in your head
- ringing in your ears.

### *Anemia precautions list*

By following these suggestions, you can lessen or prevent some of the symptoms of anemia.

- Rest often during the day and sleep enough at night.
- Rest between activities.
- Get up slowly from a sitting or reclining position. This will lessen dizziness.

You may need blood transfusions if your hematocrit or hemoglobin is too low.

### **Thrombocytopenia**

#### *What happens when I don't have enough platelets?*

When you do not have enough platelets, you have a condition called “thrombocytopenia.”

You may bruise easily, and you may also have some of the following signs:

- tiny, pinpoint-sized red or purple spots on your skin (petechiae)
- nose bleeds
- bleeding gums
- prolonged bleeding from a cut
- black or bloody stool
- brown or red urine
- increased vaginal bleeding.

#### *Thrombocytopenia precautions list*

Many over-the-counter drugs contain aspirin, and aspirin prevents platelets from working as they should. Avoid taking any drug that contains aspirin. (The table included in this information lists common aspirin-containing products.) Speak with your doctor before taking medication.

You can also observe the following precautions to prevent bleeding when your platelets are low:

#### *Personal hygiene*

- Use a soft toothbrush. If your gums bleed during brushing, use Toothettes instead of a toothbrush. *Do not floss.*
- Use an electric shaver rather than a razor, especially if your platelet count is lower than 20,000.
- Wear shoes in the hospital and at home.
- When you blow your nose, do it gently.
- Avoid using enemas, rectal thermometers, and suppositories. Women should not douche or use tampons or vaginal suppositories.
- Eat properly so that you do not become constipated.
- Avoid eating irritating foods such as popcorn or apple peels.

#### *Precautions to take during daily activities*

- Avoid wearing tight-fitting clothing. For example, do not wear shirts with elastic wristbands, or skirts or slacks with tight waist-bands.
- Avoid cutting with sharp knives or working with sharp blades. Wear gloves when gardening.
- Avoid contact sports such as football and hockey.
- Speak with your doctor about sexual intercourse. If your platelet count is too low, sexual intercourse may not be advisable.

If you have sexual intercourse, use water-based lubricants as needed.

*Other ways to prevent bleeding*

- Notify your nurse or doctor if you notice new petechiae or bruises.
- Notify your nurse or doctor immediately if

you have a nosebleed, bleeding gums, bleeding from a procedure or incision site, or blood in your urine or stool.

- Notify your nurse or doctor if you have headaches, extreme drowsiness (unrelated to medication), confusion, or falls.

**Sample complete blood counts**

**Example 1: CBC WHL BLD\***  
(Complete Blood Count Whole Blood)

Lab Value		Normal Range
WBC	2.2 K/mm <sup>3</sup>	3.4-9.6
RBC	3.6 m/mm <sup>3</sup>	3.58-4.99
HGB	11.1 g/dL	11.1-15
HCT	32.6%	31.8-43.2
MCV	91 CU MICR	77-99
MCH	30.8 UUG	26-35
MCHC	34.0 g/dL	34-36
Platelets	8 K/mm <sup>3</sup>	162-380

  

Differential			Normal Range
Lab Value			
cell count	100		
NUC RBC	0		
polys	14%		38-78
bands	0 (0.14+0 = 0.14)		0-4
lymphocytes	79		14-51
monocytes	7		1-12
eosinophils	0		0-8
basophils	0		0-3
atyp lymph			

  

*How to figure out the ANC*

2200 (WBCs) x 0.14 (polys plus bands) = 308.00  
= ANC

\* The abbreviations used are the ones you will see on your CBC lab report.

**Example 2: CBC WHL BLD\***  
(Complete Blood Count Whole Blood)

Lab Value		Normal Range
WBC	1.1 K/mm <sup>3</sup>	3.4-9.6
RBC	2.41 m/mm <sup>3</sup>	3.58-4.99
HGB	7.9 g/dL	11.1-15
HCT	23%	31.8-43.2
MCV	97 CU MICR	77-99
MCH	32.8 UUG	26-35
MCHC	33.8 g/dL	34-36
Platelets	16 K/mm <sup>3</sup>	162-380

  

Differential			Normal Range
Lab Value			
cell count	50		
NUC RBC	0		
polys	84%		38-78
bands	10% (0.84+0.10 = 0.94)		0-4
lymphocytes	6		14-51
monocytes	0		1-12
eosinophils	0		0-8
basophils	0		0-3
atyp lymph			

  

*How to figure out the ANC*

1100 (WBCs) x 0.94 (polys plus bands) = 1034.00  
= ANC

\* The abbreviations used are the ones you will see on your CBC lab report.

**Example 3: CBC WHL BLD\***  
(Complete Blood Count Whole Blood)

Lab Value	Normal Range
WBC 3.2 K/mm <sup>3</sup>	3.4-9.6
RBC 2.56 m/mm <sup>3</sup>	3.58-4.99
HGB 8.4 g/dL	11.1-15.0
HCT 25%	31.8-43.2
MCV 98 CU MICR	77-99
MCH 32.8 UUG	26-35
MCHC 33.66 g/dL	34-36
Platelets 16 K/mm <sup>3</sup>	162-380

Differential Lab Value	Normal Range
cell count 100	
NUC RBC 0	
polys 16%	(0.16+0.01 = 0.17)
bands 1%	
lymphocytes 78	38-78
monocytes 4	0-4
eosinophils 1	14-51
basophils 0	1-12
atyp lymph 0	0-8
	0-3

*How to figure out the ANC*  
3200 (WBCs) x 0.17 (polys plus bands) = 544.00  
= ANC

\* The abbreviations used are the ones you will see on your CBC lab report.

**Common Aspirin-Containing Products**

Acetylsalicylic acid  
A.P.C. tablets and capsules  
ASA  
A.S.A. compounds  
A.S.A. tablets and capsules  
Adult Analgesic Pain Reliever

Alka Seltzer products  
Anacin  
Anacin Maximum Strength  
Analgestine Forte  
Anodynos  
Arthritis Bayer  
Arthritis Foundation Pain Reliever  
Arthritis Pain Formula  
ASA Enseals  
Ascriptin  
Ascriptin A/D  
Ascriptin Extra Strength  
Ascriptin with codeine  
Aspercine  
Aspercine Extra  
Asperein  
Aspergum  
aspirin  
Aspermin  
Aspirtab  
Asprimox  
Azdone  
Back-Quell  
Bayer products  
BC Powder  
Bexophene  
Buf-Tabs  
Buff-A  
Buffaprin  
Buffaprin Extra  
Buffasal  
Buffasal Max  
Bufferin  
Buffets  
Buffex  
Buffinol  
Cama

Capron	McNess Pain
Congespirin	Measurin Time Release
Cope	Midol tablets or capsules
Coralsone Modified	Momentum
Coricidin	Norgesic
Cospirin	Norgesic Forte
Counterpain	Norwich Extra Strength
Damason Prep	PAC Analgesic
Dasin	PAC tablets and capsules
Derfort	Pain Reliever
Derfule	Panodynes Analgesic
Dolcin	Pap capsules
Dolor	Pepto-Bismol
Duradyne	Percodan
Dynosal	Persistin
Easprin	Phenacaps
Ecotrin	Phensal
Emagrin Forte	Presalin
Emagrin	Quiet World
Empirin	Robaxisal
Empirin with codeine	Salatin
Equagesic	Saleto
Excedrin	Salocol
Excedrin P.M.	Scrip-Dyne Compound
Excedrin tablets and capsules	Sine-Off
Fiorinal tablets and capsules	Soma Compound
Four, 4-Way	Soma Compound with codein
Gemnisyn	St. Joseph Children's Aspirin
Gensprin	St. Joseph Cold tablets for children
Gensan	St. Joseph Low Dose Adult Aspirin
Goody's Extra Strength	Stanback powder and tablets
Goody's Headache Powder	Supac
Halfprin	Synalgos-DC
Heartline	Talwin compound
Liquidprin tablets	Triaminicin
Lortab ASA	Trigesic
Magnaprin	Tri-Pain

Ursinus Inlay Tabs  
Valesin  
Vanquish  
Verin  
Wesprin  
Zorprin



4/00

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