



## Eosinophils, Basophils and Monocytes: What Do These Lab Results Mean?

Susan Leclair, PhD, CLS (NCA)

Chancellor Professor, Department of Medical Laboratory Science  
University of Massachusetts, Dartmouth

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### Dr. Leclair:

Hello again. This is Susan Leclair, chancellor professor of the University of Massachusetts Dartmouth, and I'm here to answer a few more of the questions that you've sent in on white cells. In particular today, I'd like to touch on eos, eosinophils, basophils and monocytes because they are—they also contain granules. So I suppose you can consider them as part of the granulocyte population of your peripheral blood, but they have very different functions and very different structures.

So the first slide here that you're going to see is of an eo, and I'm going to start by apologizing that it's not a very good picture. It's not a very good picture, because these cells are camera shy. All of the orange, red-yellowish granules that they have inside their cells are made of a crystal. So when you try and take a picture using a flash, all you get is what you're seeing there. They're not—the color doesn't come out as well. The—they're not as distinct as they should be when you see them under a microscope, because the lighting has changed.

But at any rate, the eos, which typically run somewhere between zero percentage if you're only counting a hundred cells, and maybe 4 percent of the total amount of cells typically are there because of those granules. Those granules contain histamine, and anybody here who is watching this right now while they're blowing their nose or wiping their eyes from their hay fever can thank their eos and the type of histamine that eos have got inside them.

They're the ones that the ads on TV talk about all the time when they're talking hay fever medications or that blocked-up feeling that you get in your head because of springtime allergies. That's an eo thing. During a good allergic outbreak if you've really got a lot of eos, you probably get maybe 15 or 20 percent. So it's not like you're getting a hundred percent of these things, but they will rise in allergic conditions.

So those of you who have allergies or those of you who maybe don't think you do but every now and then you feel kind of blocked up or stuffy, it's probably eos. And if you had your blood drawn that day, there would be a little bit of a pop in the eo numbers just because.

Eos are also something that react to parasites, and I'm very strongly hoping that none of you get involved with any intestinal or blood parasites. But were you to, I can guarantee you that your para—your eo numbers would be maybe as high as 40 to 60 percent. So if you're under 20, not to worry. You don't have an intestinal parasite, you don't have to name it, you don't have to get friendly with it. It's not going to happen, so you don't have to worry about that.

Probably the one that you're going to meet up more often than not isn't going to be the allergy one. It's going to be the fact that eos frequently react to medications. So you happen to be taking an antimicrobial for a bacterial infection, and all of a sudden your eos are now at 9, 10, 11 percent. That's a side effect of the type of medication that you're on, and it will go away when the medication goes away. So you don't actually have to worry about them.

Most eos are pretty self-explanatory. You're sitting there blowing your nose for the eighth time in 5 minutes, it's allergies, and they're going to be up. You're feeling fine, you just changed medication, and your eos are up. It's a medication side effect. So you don't really have to worry about them.

In some myeloproliferative diseases, you might get an increase in them. Eos are born, come from, arise from the same stem cell that your myeloproliferative disease comes from, so it could very well be that you'll see a few more of them in the peripheral blood than you would ordinarily expect. But again, it's probably under 8 percent so it's not a huge number. They will be increased, but they won't be increased to any major extent.

So they're an annoyance. You can blame them for things, you know, blowing your nose and crying inappropriately, but they're not going to really do anything serious to you.

Their counterpart, the baso, on the other hand, they can be dangerous. Basophils look kind of like granulocytes. They have very large, very, very dark blue to almost black granules, and this slide is a pretty good representation of what a baso is going to look like.

They too have histamine, but they have a different kind of histamine in their granules. Their histamine is water soluble. You don't really care about that, but it's not a crystal. That's why it looks different when you try and photograph them. But in particular this histamine acts not on your nose and not on your eyes. It's going to act on your blood pressure. It's going to drop your blood pressure drastically.

Those of you who have ever heard of or seen someone have something called an anaphylactic reaction from a bee sting or peanut butter allergy or something like that, you've seen this in action. People will be standing there, they will look fine, they will be talking, they will be totally in control. The bee will sting—if you're like me, I would faint—and then what will happen is they will crumple to the floor. And their blood pressure will be like 40 over 20. I mean, it's really profound as a drop in blood pressure.

At a lower level, so you're not worried about anaphylaxis, at a lower level of increased basos you get pruritus, which I think most of you recognize as the very long phrase containing single-syllable, politically words followed by the word "itching."

It is the basos that cause the itching when you get into the shower. It is a—the basos that cause the itching when you go outside and it's maybe 3 degrees above 0. It's the basos that cause that unrelenting, unbelievable you want to take a rake to your skin itching that happens in most myeloproliferative disorders.

And basos will be slightly—typically, we find none of them. Sometimes you'll find one in a normal person. For someone with a myeloproliferative disease, you might get three or four, five. And as you start getting higher into that 4 to 5 range, that's enough for the itching to start. So it's not the eos in your allergies that are happening, that are causing this, but it's the basos that are just releasing their—inappropriately, I might add—they're releasing their granules because there's been a change in their environment.

They went from normal temperature to a hot bath. They went from normal temperature to a cold. They went from being relatively calm in your skin to having you briskly dry yourself with a nice, rough towel. They don't like changes in their environment. And when they're agitated already because they come out of a myeloproliferative disease, it's very easy to get them to release their granules. And that's how you get that kind of itching and the dizzy feeling that sometimes happens because your blood pressure's dropping.

So those two are granulocytes in the major sense of the word, and they're kind of the way we think about them. Monos which is the—somebody else asked about and how they come and go with the numbers—monos work with the neutrophils. They're not part of your allergies, yay, but they are eaters. They are the primary reason that you are clean inside. They are the scavengers. They clean up dead and dying normal tissue, which happens every day again.

If there is something abnormal, then they will present that abnormality to the lymphs, who we will talk about at another time, and they will cause the lymphs then to start your immune process to also get rid of this foreign thing. So they're very active, they move around a lot. They don't actually like to be in the blood. They like to be in the tissues, so they use the bloodstream as a kind of quickie, short-cut way to get from where they are to where they need to be in a tissue.

So we don't—we see them erratically in the bloodstream. Sometimes you see none. Sometimes you see 10, that's because you fell. Sometimes we see eight or nine of them. That's because the first time the phlebotomist tried to draw your blood they missed, and you got nervous and annoyed. And then they tried the other side, and you got an increase in monos.

Monos are particularly active when there's particulate material that you breathe in. So smog, dirty air of any kind will cause a lot of those monos to get out into the lungs to protect the lungs against that particulate matter. So you see them really high in situations like Los Angeles might have when they have air quality days or maybe like three-quarters of the people in Beijing have all the time because of their air quality. So they are very erratic in their number. They come and go as needed.

I hope that makes sense because those three that work together, but they work differently at the same time. And if that sounds good to you, maybe next time we'll talk about white cell counts, absolutes and percentage differentials. So remember if you have questions—and I might have confused you, this was a lot in a short amount of time—send your questions to [questions@patientpower.info](mailto:questions@patientpower.info). And remember knowledge is often your best medicine. Until next time, bye.

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