

## Eosinophils

Eosinophils are a type of white blood cell. A normal eosinophil count is less than 350 cells per microliter of blood. The exact role of eosinophils in your body is unclear, but eosinophils are usually associated with allergic diseases and certain infections. Potential causes of a high eosinophil count include:

- Eczema
- Leukemia
- Autoimmune diseases
- Asthma
- Hay fever (allergic rhinitis)
- Parasitic infestations

Side effect of drugs, such as amphetamines, tranquilizers, bulk-type laxatives containing psyllium and certain antibiotics

*Eosinophils* are a type of white blood cell (corpuscle) and take up the red dye eosin when blood is examined under a microscope by the commonest method.

They accumulate wherever allergic reactions like those in asthma take place. Their natural role is to defend us against parasites. In fact allergies such as asthma are probably a malfunction of our protective mechanism against parasites.

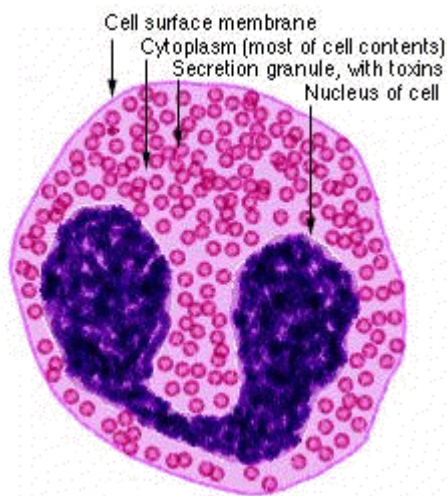


Diagram of eosinophil as seen under the microscope after staining a blood smear with the red dye eosin, which stains the granules in the cytoplasm and with haematoxylin, which stains the nucleus blue. In the body all these things are colourless, of course. The nucleus consists of two lobes. The red-stained granules contain toxic proteins, ready for secretion from the cell.

The toxins from the granules are important for killing parasites, but in asthma they are released inappropriately and damage the lining of the air passages.

It is one of the objectives of asthma treatment to stop eosinophils from accumulating in your lungs and to stop those already there from causing damage. Steroid inhalers have a key role in doing this.

In normal blood, eosinophils amount to about 0 to 3 percent of the white blood cells, but this is not such a good guide because variation in the number of other cells alters this figure. A figure of 0 percent normally just means that there were no eosinophils among the limited number of white blood cells examined by the technician, and this is quite normal. If the counting is done by machine, eosinophils are normally not counted at all, perhaps giving the false impression that there are none.

Normally there are very few eosinophils in the blood, just a few percent of all the white blood cells. Neutrophils and lymphocytes are far more numerous. The number of eosinophils goes up in allergic diseases such as asthma and atopic eczema, and in some people who have non-allergic asthma. It also goes up in people who have parasite infestations.

There are however quite a few other illnesses, a number of which involve the lungs, which can cause eosinophils to increase in numbers. Finding the cause can be a real challenge for doctors unless

the cause is common and obvious. Quite often no doctor can find a reason why someone has unusually large numbers of eosinophils in the blood.

Two forms of asthma cause particularly high eosinophil counts in the blood. Both are rare, unlike ordinary forms of asthma, which are very common.

The first of these forms of asthma is *bronchopulmonary aspergillosis*, a serious allergy to a common fungus which can grow inside the lungs. We can recognise this by skin and blood tests: most doctors rely on the blood test for 'Aspergillus precipitins'.

An X-ray of the lungs shows shadows which may change a lot with time, and we do not see such shadows in ordinary asthma. Special cross-sectional x-rays (CAT scans) may show other changes which do not happen in ordinary asthma.

Bronchopulmonary aspergillosis needs quite a different approach to treatment. This is because it can damage the lungs in a different and more severe way than plain asthma, and because the right treatment will prevent this to a large extent. So it is important to diagnose it as early as possible, and doctors will test many patients with asthma just in case this is the diagnosis. Bronchopulmonary aspergillosis looks just like ordinary asthma in the early stages, though an unusually high eosinophil count in the blood compared to most asthma should make us suspicious. Unavoidably, people with bronchopulmonary aspergillosis will have a diagnosis of ordinary asthma in the early stages.

The second rare form of asthma with particularly high eosinophil counts is '*Churg-Strauss syndrome*'. This also usually starts out looking exactly like ordinary asthma, and there may be a long period during which even the best asthma specialist will not suspect or be sure of the diagnosis.

What usually gives the game away is that unmistakable numbness or weakness of some part of the body shows that there is more to it. It is damage to the nerves which causes numbness or weakness and Churg-Strauss syndrome can affect quite a number of parts of the body other than the lungs seriously in yet other ways.

This rare serious illness needs prompt treatment, usually using steroid tablets and special 'immunosuppressive' drugs. Most patients do very well on these treatments, but will need careful health checks for many years afterwards.

A very few people who have taken asthma treatment tablets called 'leukotriene receptor antagonists' have turned out to have Churg-Strauss syndrome. The 'leukotriene receptor antagonists' are montelukast (Singulair) and zafirlukast (Accolate).

At the moment (May 2001) it looks as if this happened because these people really had unrecognized Churg-Strauss syndrome in the first place and the drugs were not to blame. Since it is quite a long time since the suspicion was raised, it now seems most unlikely that there is a problem here which need deter any one from taking these medicines.

Amongst yet other illnesses with a high number of eosinophils in the blood is '*tropical eosinophilia*', an illness involving the lungs and caused by parasites called *Microfilaria* in people who have lived in tropical countries. Treatment is with an anti-parasite drug.

Some reactions to drug treatments can cause high eosinophil counts in the blood.

Most of these other illnesses do not really cause asthma symptoms, though some do.

In healthy people there are so few eosinophils in the blood that it can happen that the person counting the cells under a microscope does not find any. Nowadays we mostly use machines for this work, and

the machines normally cannot count eosinophils at all. So the printed blood report seems to say there are none, but this is meaningless.

In fact a low or zero eosinophil count, if it has been done by a human being instead of a machine, is a good sign. It argues against severe forms of diseases which raise the eosinophil count, including the kind of allergy which can raise the count. Far from being a sign of illness, it could be a sign of good health.

Rarely, your eosinophil count increases for no apparent reason. Doctors refer to this as hypereosinophilic syndrome (HES).

Treatment of a high eosinophil count depends on the underlying cause, if known. Some people with HES who have eosinophil counts benefit from Imatinib (Gleevec). Without treatment, high numbers of eosinophils can accumulate in the heart and other organs, which can lead to nerve damage, heart failure, lung disease and blood clots.

### *Causes of Eosinophilia*

There are a variety of disorders that can cause eosinophilia ranging from simple hay fever to life threatening tumor. Most common cause for eosinophilia are parasitic infections (such as hookworm, schistosomiasis), allergic conditions (such asthma and hay fever) and certain types of drug reactions. Few other rarer causes include:

Lung diseases (e.g., Loeffler's Syndrome)

Due to inflammation of blood vessels (e.g., Churg-Strauss syndrome)

Certain malignant tumors (e.g., lymphoma)

Due to certain types of antibody deficiencies

Certain types of skin diseases (e.g., dermatitis herpetiformis), Etc.

Eosinophilia in children is more difficult to diagnose as the range of probable causes is much wider in this case compared to adults.`

### *Symptoms of Eosinophilia*

Symptoms of eosinophilia vary based on the underlying conditions.

For example, frequent wheezing and breathlessness are symptoms typical to eosinophilia caused due to asthma. In case of eosinophilia due to parasitic infections symptoms may range between abdominal pain, diarrhoea, fever, cough and rashes. Frequent infections, abscesses, pneumonia, mouth sores can also be considered as indicators of eosinophilia. Few other symptoms of eosinophilia include weight loss, night sweats, enlargement of lymph nodes, skin rashes, tingling and numbness due to nerve damage, etc. These symptoms however occur rarely.

Eosinophilia in the bloodstream can be diagnosed by a simple blood test. If problem exists in body tissues then diagnoses will involve examination of the relevant tissue. Your physician performs a biopsy of the relevant tissue in order to diagnose the condition. Certain times a lumbar puncture is performed to examine spinal fluid if there are causes to suspect CSF eosinophilia.

Lab studies can be in the following lines:

A complete blood count may be conducted in order to identify if problem exists.

A spinal fluid examination is carried out in order to diagnose eosinophilia due to worm infections.

Imaging studies can be carried out via CT scan of the lungs, abdomen, pelvis, etc depending on symptoms and cause of eosinophilia.

### ***Treatment***

When eosinophilia is diagnosed treatment will proceed in lines of trying to identify cause of the disorder. Physician may perform simple skin / blood tests in order to identify the specific allergy causing the problem (such as pollen or dust mite allergy, or any other as may be determined). Parasitic infections can be detected by analyzing blood and stool samples.

Physician may require following information in the course of administering treatment:

Diet history and details of medication in order to detect any specific allergic reactions. Information pertaining to travel history to identify if infection occurred due to travel to any infection endemic area.

Detailed history of symptoms

As part of treatment physician may also carry out detailed examination of skin, eyes, brain, lymph nodes, heart, liver, spleen, intestine, bone and nervous system.

Physician then proceeds with the treatment primarily on lines of reducing symptoms. Initially treatments are mostly oral. A general prescription consists of corticosteroid therapy (beginning with prednisolone both inhaled and topical). Systemic (oral, intramuscular, intravenous) may also be used to treat allergic conditions.

Treatment of a high eosinophil count depends on the underlying cause, if known. Some people with HES who have eosinophil counts benefit from Imatinib (Gleevec). Without treatment, high numbers of eosinophils can accumulate in the heart and other organs, which can lead to nerve damage, heart failure, lung disease and blood clots.

In most cases treatments help to significantly reduce symptoms of eosinophilia enabling persons to lead normal life.

## **Eosinophil count - absolute**

### *Definition*

An absolute eosinophil count is a blood test that measures the number of white blood cells called eosinophils. Eosinophils become

active when you have certain allergic diseases, infections, and other medical conditions.

This test may help diagnose:

- Acute hypereosinophilic syndrome (a rare but sometimes fatal leukemia-like condition)
- An allergic reaction (can also reveal how severe the reaction is)
- Early stages of Cushing's disease
- Infection by a parasite

In the laboratory, the blood is placed on a microscope slide. A stain added to the sample causes eosinophils to show as orange-red granules. The technician then counts how many eosinophils are present per 100 cells. The percentage of eosinophils is multiplied by the white blood cell count to give the absolute eosinophil count.

No special preparation is necessary for adults.

Certain medicines may cause you to have an increase in eosinophils. Such medicines include:

- Amphetamines (appetite suppressants)
- Certain laxatives containing psyllium
- Certain antibiotics
- Interferon
- Tranquilizers

The eosinophil count usually helps confirm, rather than make, a diagnosis. It can not tell if an increase is caused by allergy or parasite infection.

#### *What Abnormal Results Mean*

High numbers of eosinophils (eosinophilia) are usually associated with allergic diseases and infections from parasites such as worms. A high eosinophil count may be due to:



- Asthma
- Autoimmune diseases
- Eczema
- Hay fever
- Leukemia

A lower-than-normal eosinophil count may be due to:

- Alcohol intoxication
- Over production of certain steroids in the body (such as cortisol)