

HOMEOSTASIS AND ITS RELATION TO ASTHMA

What Is Homeostasis?

Like most medical terms, there's a dictionary definition, but that's not always helpful in understanding what a concept actually looks like or how it operates in the body. Biology dictionaries define homeostasis as "the tendency of an organism or a cell to regulate its internal conditions, usually by a system of feedback controls, so as to stabilize health and functioning, regardless of the outside changing conditions." In terms of asthma, homeostasis refers to your body's respiratory system functioning correctly without increases in inflammation or other parts of the pathophysiology of asthma negatively impacting you.

Your Body Wants to Maintain a Certain "Normal"

When you are outside and it's raining, your body does a few things. First, a "sensor" detects what's going on in the world around you. When it's raining, your "sensor" is your skin, and your skin tells your brain that it's wet and cold out. Then, an "internal mechanism" reacts to that stimulus; in this case, your brain helps raise your skin temperature by burning fat stores and calories you've consumed that day to help keep your body as warm as possible. When you are shivering, it's actually a way for your body to warm itself up and increase circulation in order to keep your temperature high. In asthma, the homeostasis of the smooth muscle in your lungs is interrupted when you are exposed to irritants (such as dust or tobacco smoke) or allergens (such as pollen). Symptoms like these can occur as a result:

- Chest tightness
- Long-term coughing
- Shortness of breath
- Wheezing

Returning back to our earlier example, once it has stopped raining, your brain stops raising your body temperature as a response to the fact that your body isn't experiencing the same stimuli. This is a "negative feedback mechanism." Similarly, you stop shivering as soon as you aren't as cold. And while some of these words and terms might seem confusing, the way that all of it works is pretty straightforward. And it's a perfect example of homeostasis. In asthma, it may take a rescue inhaler to revert the changes back, or you may need to take a regular medication to try to keep homeostasis in balance.

Homeostasis is a broad term, but it relies on a few key things no matter whether you are talking about asthma or something else. In every scenario, your body needs a "sensor" (your skin in the rain scenario or smooth muscle with asthma), an "internal mechanism" (the processes inside your body that raises your body temperature or symptoms related asthma), and a "negative feedback mechanism" (another process that causes your body to stop raising your

temperature—or in some cases a medication to reverse the process and return you to a state of homeostasis).

You don't have to know too much about any of the internal mechanisms to understand what's going on. When there is an outside stimulus, your body senses it and tries its best to adapt to keep things constant. Your body will always try to keep you at the same temperature, for example, even when it's raining. Asthma is a good example of homeostasis gone wrong because the body reacts to a stimulus in an extreme way, which starts a process that leads to symptoms like coughing and shortness of breath.

Homeostasis as a “Mechanism” and a “State”

In the rain example above, we described homeostasis as a “mechanism,” or a tool or method by which your body reacts to a stimulus in order to achieve balance. There are many different examples of homeostasis as a mechanism. Another good one is a fluid balance. Your body always wants to keep enough fluids on hand to keep all of your organs and processes running smoothly, but it will expel more fluids through waste when you drink more water in order to maintain healthy fluid levels. This is also important to asthma, as dehydration can negatively impact your respiratory status. The mechanism by which your body “senses” how much fluid you have consumed reacts to your respiratory status, and then stops reacting once you have expelled enough. This is an example of homeostasis as a mechanism.

The term homeostasis can also be used as a state to refer to the equilibrium that your body is trying to achieve through the mechanisms discussed above. Homeostasis is the place your body wants to be; it's 98.6°F, fully hydrated, well nourished, and fully stocked with vitamins and nutrients.

Homeostasis is the perfect middle area, where you don't have too much or too little of anything, and your body is able to perform all its functions perfectly. In terms of asthma, think of this in relation to your oxygen levels. If your oxygen levels drop too low, your body will seek to increase oxygen levels by either having you take bigger breaths or increasing your rate of breathing.

Homeostatic Imbalance

When everything goes perfectly, your body is able to control things to maintain a perfect state of homeostasis through homeostatic mechanisms. Of course, things don't always go perfectly, and there are a few different ways that your body can reach a homeostatic imbalance such as asthma.

For one, as you age, your body's negative feedback mechanisms get worse. Your body gets worse at telling itself when it doesn't need to strive for normalcy anymore; that's why elderly people often shiver more than young people. As your body becomes worse at maintaining an

internal balance, you will be more likely to become ill as well. Another way this is linked to age is that many elders need to take more vitamins and supplements because their body becomes worse at processing nutrients even when they are fully nourished and maintaining a homeostatic balance. If you fail to take asthma medication that is needed to help you achieve homeostatic balance, you can develop increased symptoms like coughing and shortness of breath.

Overall, homeostasis is a very complex process. But when asking yourself, “What is homeostasis?” just remember that it can be many things. It refers to the natural balance of your body when everything is running smoothly and your body is in harmony, and it can refer to the mechanisms that keep you balanced as your body reacts to external stimuli.

Adapted from:

*Bass, P., & Asher, B. (Ed.). (10 July 2020). Homeostasis and Its Relation to Asthma. Verywell Health.
<https://www.verywellhealth.com/homeostasis-and-asthma-200952>*