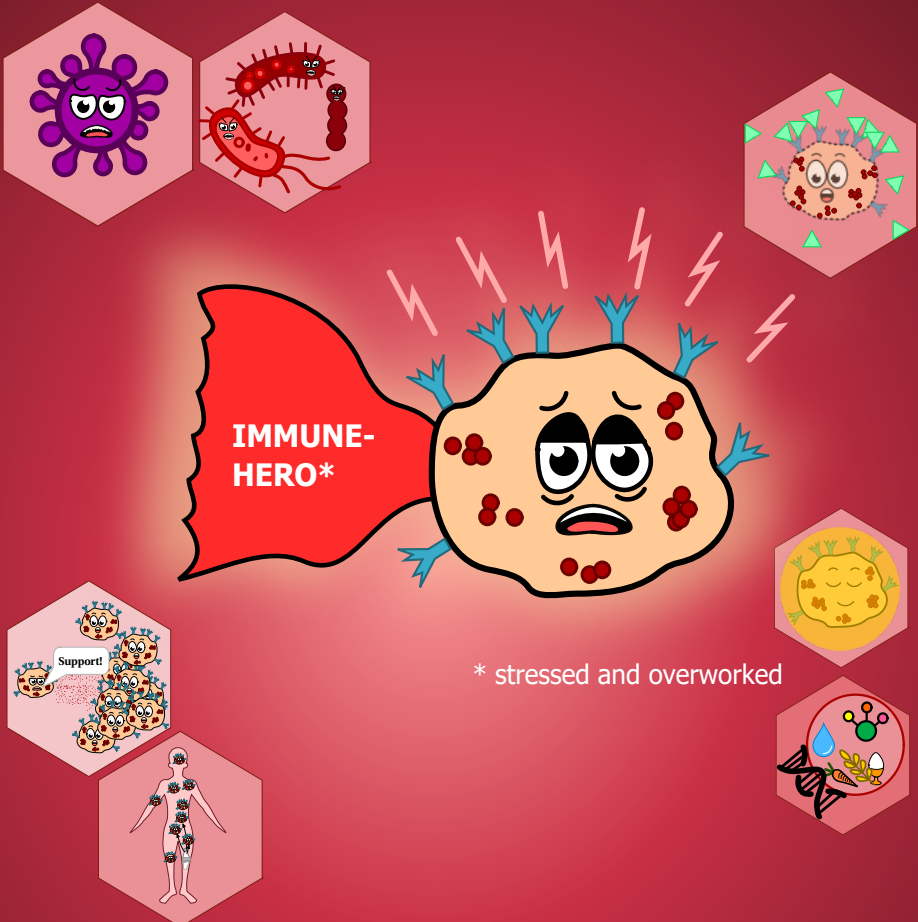




Dr. Melanie Ludwig

Mast Cell Activation Syndrome (MCAS)



* stressed and overworked



Glossary

MCAS – Mast Cell Activation Syndrome

IgE – Immunoglobulin E (Antibody)

Granules – Vesicles, small bubbles

Mediator – Messenger substance

Degranulation – Decomposition

ICD – International Statistical Classification of Diseases
and Related Health Problems

DAO – Diamine oxidase (Enzyme to deplete histamine)

2. Edition (no relevant changes)

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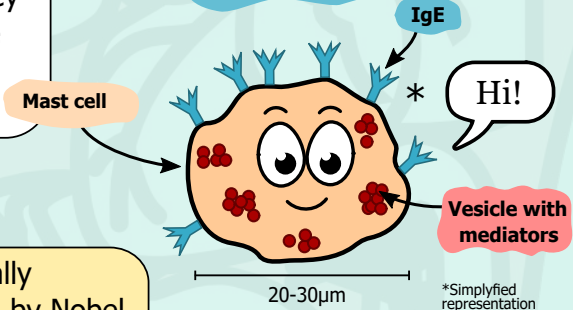
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Mast Cells and their regular function

Mast cells are an important part of our immune system. They are part of the white blood cells, the leucocytes.

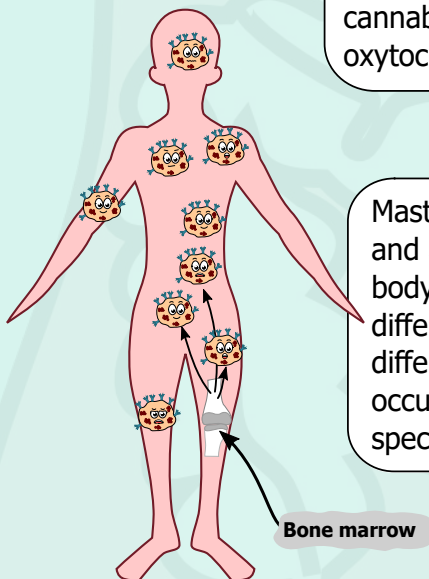
IgE are antibodies (Immunoglobulin E). They are very important for allergy reactions



! Mast cells were originally discovered and named by Nobel Prize winner Paul Ehrlich.

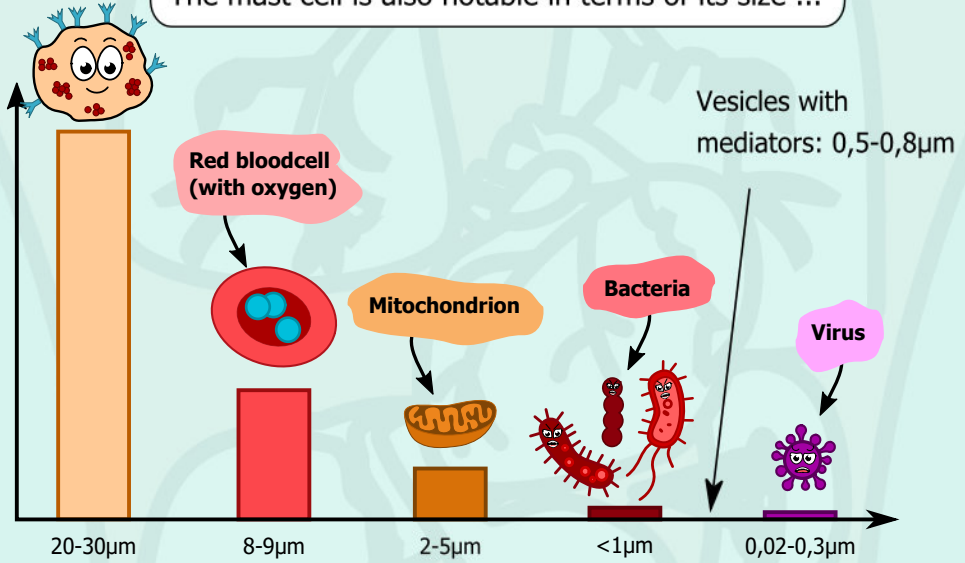
Examples of receptors: histamine, leukotrienes, prostaglandins, adenosine, complement TNF-alpha, interleukins, CRH, cannabinoids, oxytocin, ...

Mast cells have many different mediators!

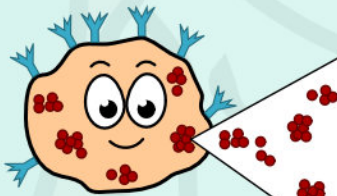
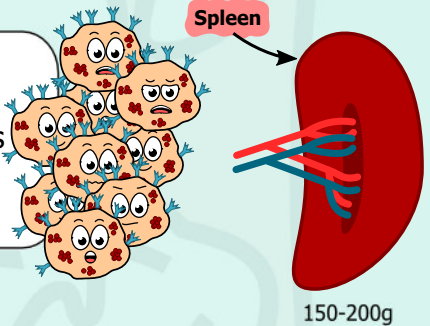


Mast cells are made in the bone marrow and are found in tissues throughout the body. The mast cells in different tissues differ from one another: they undertake different tasks depending on where they occur. For those tasks they each need very specific receptors.

The mast cell is also notable in terms of its size ...



If all the mast cells of a healthy person were to be collected in one place, their total mass would correspond to the mass of the spleen. This is roughly the weight of a medium-sized orange.



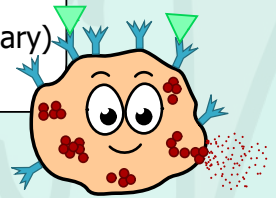
Each mast cell contains about 500 granules (vesicles, small bubbles) that are filled with mediators (messenger substances) and can be released from the mast cell.

- Histamine
- Prostagladin
- Trypsase
- Mast cell chymase
- Serotonin
- Heparin
- Leucotrienes

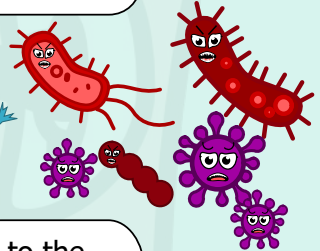
There are over 200 different mediators. Some of these messenger substances are well known, but very little or nothing is known about most of them.



When mast cells perform their normal function, they recognize foreign substances: Whether allergens, parasites of any kind or other intruders – the mast cells recognize foreign substances with the help of their receptors and alert the surrounding tissue (if necessary) via their messenger substances.

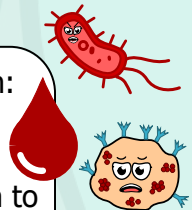


In this way, the immune system can react quickly if necessary and act against the foreign substances.



The mast cell makes an essential contribution to the rejection of all kinds of pathogens and toxins in order to protect us.
It is a true immune hero!

Mast cells are also active in other areas of the immune system: They help heal infected wounds. When bacteria enter the wound, the mast cells release the mediator interleukin-6. This mediator stimulates special cells in the outer layers of the skin to produce antibacterial proteins and fight the bacteria.



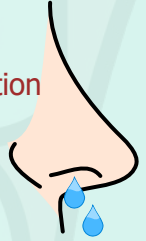
Mast cells can also influence blood clotting via the messenger substance heparin.

! Depending on the situation, the mast cells can release very different messenger substances. These messenger substances can be released slowly and continuously or suddenly in large quantities over a certain period of time.

Constriction of the bronchi



Mucus secretion



But why does the mast cell release so many different mediators in the first place?

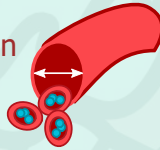
Depending on the messenger substance, amount, type and location of the release, different reactions are triggered in the body in order to remove the (presumably harmful) foreign bodies.

Gastric emptying



Bowel emptying

Vasodilatation



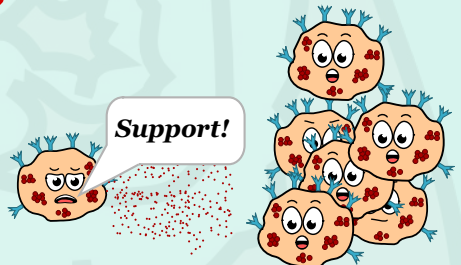
Vascular permeability



Inflammatory response

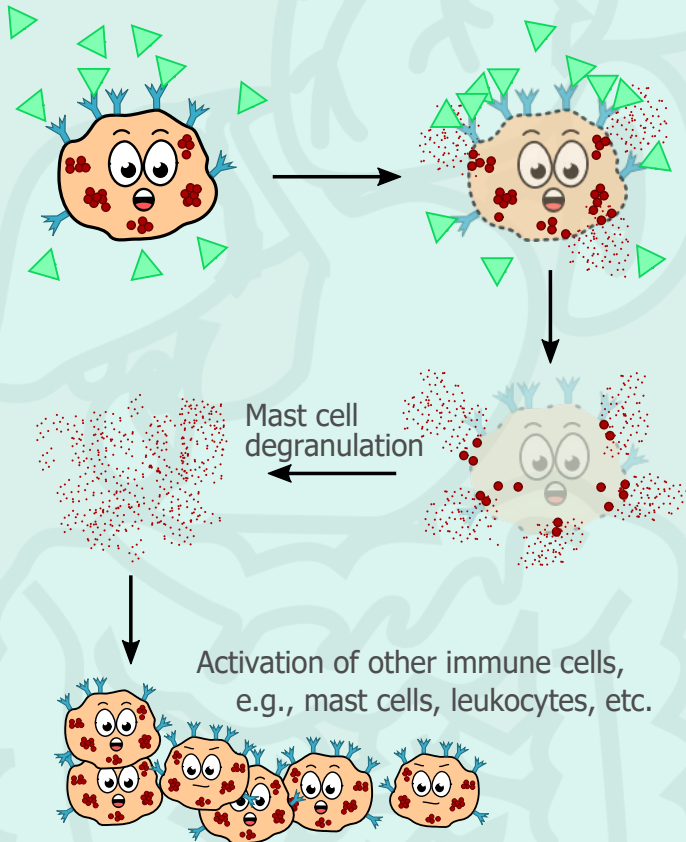


Signal amplification (activation of further mast cells)





While the mast cell remains intact when messenger substances are slowly released, its cell membrane **dissolves** in the event of strong stimuli and the mast cell disintegrates **completely**. The vesicles are released and dissolution leads to the release of a large number of messenger substances in a short period of time. This happens, for example, with immediate allergic reactions.

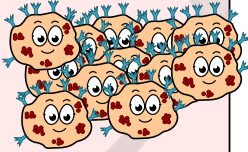


Both chemical and physical stimuli can cause the mast cells to release their mediators.

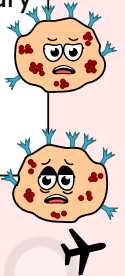
Mast cell diseases


There are several types of mast cell activation disorders.

In general, these diseases are divided into primary, secondary, and idiopathic mast cell activation. Mastocytosis, for example, is a rare disease of primary mast cell activation. There are too many mast cells in the tissue that can also (very rarely!) grow like cancer and develop into mast cell leukemia (blood cancer).



In mast cell activation syndrome (MCAS) (this can be secondary or idiopathic) the number of mast cells is normal, but the mast cells react faster and more violently to various stimuli – especially to things that do not provoke a response from the mast cells in healthy people.



Humidity % 



Food



Weather changes



Longer car trips
Travel

mental
exertion



Stress

Medicine,
Drugs



The mast cells can respond to a number of so-called »triggers«.

Lack of sleep



Smells,
Scents



Physical inactivity
Physical activity
Exertion



Water temperature
Temperature



Noises

and much more

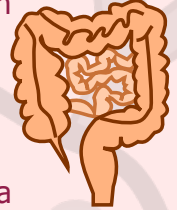
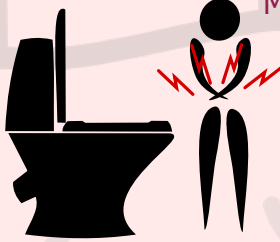


Brain Fog
 Fatigue
 Anxiety
 Migraine
 Forgetfulness
 Difficulty concentrating



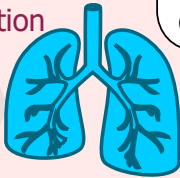
Cramps in the stomach and intestines
 Menstrual pain

Nausea
 Vomiting
 Heartburn



Diarrhea
 Constipation

Breathing difficulties
 Shortness of breath
 Throat irritation

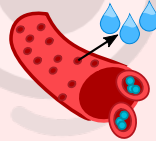


A variety of symptoms can arise due to the body's reaction to different mediators.

Osteoporosis



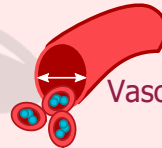
Swelling in the tissues
 Leaky Gut



Weight loss
 Weight gain



Runny nose
 Stuffy nose



Vasodilation

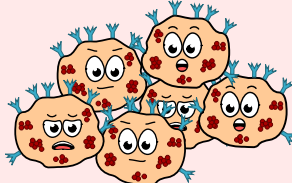
Exhaustion and tiredness
 Low blood pressure
 High blood pressure
 Fainting
 Palpitations
 Heart rhythm disorder



Inflammation
 Joint pain
 Muscle pain
 Skin irritation
 Itching



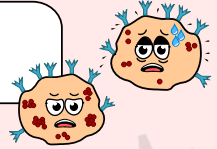
Anaphylactic shock



and much more



But why do the mast cells overly react?



That is a good question, and so far not at all clear. There are few theories and ideas for possible triggers.



MCAS is not an autoimmune disease, but it is a malfunction of the body.



Nutritional deficiencies



Mold



Genetic predisposition

However, it is known that this disease can start and develop in very different ways. Many cases have few mild symptoms. Some people experience steady deterioration.

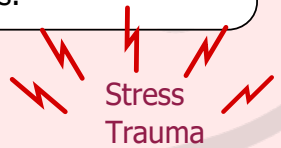
The disease can be caused in part or massively worsened by »major life events« such as accidents, severe infections, severe psychological stress, or the like. Changes in the microbiome – for example after taking antibiotics – are also suspected to be triggers.



Strong infections



altered microbiome



Stress
Trauma



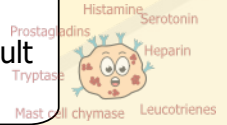
A **cure** is not yet known.

In many cases, however, symptoms can be alleviated and more or less controlled.

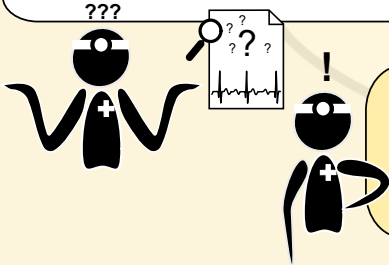


Diagnosis and Therapy of MCAS

The large number of mediators and the fact that not all messenger substances are known make it extremely difficult to diagnose MCAS with certainty.

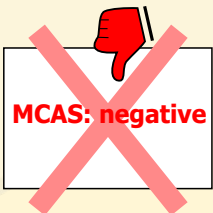
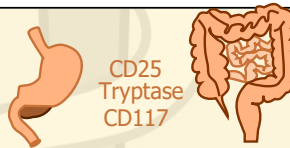


To make matters worse, only a few doctors are familiar with this disease and the associated diagnostics.



For the diagnosis and, above all, the therapy of MCAS, it is very important to have an MCAS-competent doctor by your side. **!**

Basically, some of the mediators can be tested in the blood. Some, like tryptase, often require »relative« testing; one looks at the increase in tryptase in a strong MCAS reaction in comparison to the normal, individual tryptase concentration. MCAS can (sometimes) also be diagnosed with special stains from biopsy samples (e.g. from a gastroscopy / colonoscopy).



However: At the moment there is no test to reliably rule out MCAS disease. Even if all of the mediators tested are normal and the biopsies show no evidence of MCAS, it is not evidence that you do not have MCAS. There could simply be other mediators active that have not yet been tested or cannot be tested (yet).

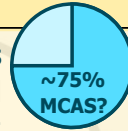


Due to the large number of uncommon symptoms, it is often and incorrectly assumed that those symptoms are purely psychosomatic. However, even after diagnosis and with a doctor who is familiar with MCAS, treatment is not straightforward.

According to leading MCAS scientists, MCAS affects around **17% of the population** – i.e. one in six people. Projections suggest that, e.g., in ~ 75% of IBS patients there is an increased activity of the mast cells and thus possibly based on MCAS.



Diagnosis
»irritable bowel syndrome«



In Germany there is currently no separate ICD number for MCAS, and the disease is often not recognized as such by health insurance companies. Therefore, drug costs are usually not covered or only covered in individual cases.

R63.8 R10.4 G

On sick leaves, doctors often have to use ICD numbers that describe the main symptom but not the illness.

R63.4

R19.4

R11

T78.1

R06.8

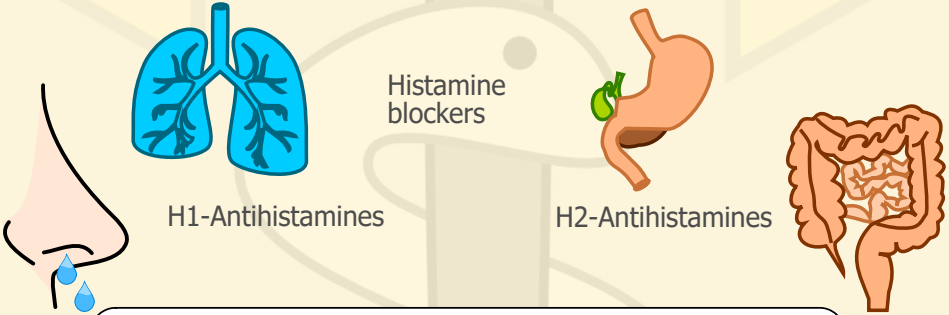
and much more

After all, there is an ICD number for general mast cell diseases: ICD **D47.0**. In other countries, **ICD D89.4-** specifies different mast cell diseases.





To find a treatment, it is often a lengthy trial and error process to determine a suitable combination of drugs and their dosage for each individual case.



The basic therapy usually consists of a combination of antihistamines and possibly various mast cell stabilizers. Sometimes symptomatic medication can or must be supplemented.

Histamine breakdown support (DAO)



Mast cell stabilizers

Vitamin C,
Cromoglicic Acid,
Ketotifen

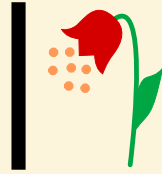


In addition, other drugs sometimes have to be used, such as antagonists of specific receptors, steroids such as cortisone, or even various immunosuppressants. Emergency medication (such as an epipen) can also be necessary depending on the symptoms.

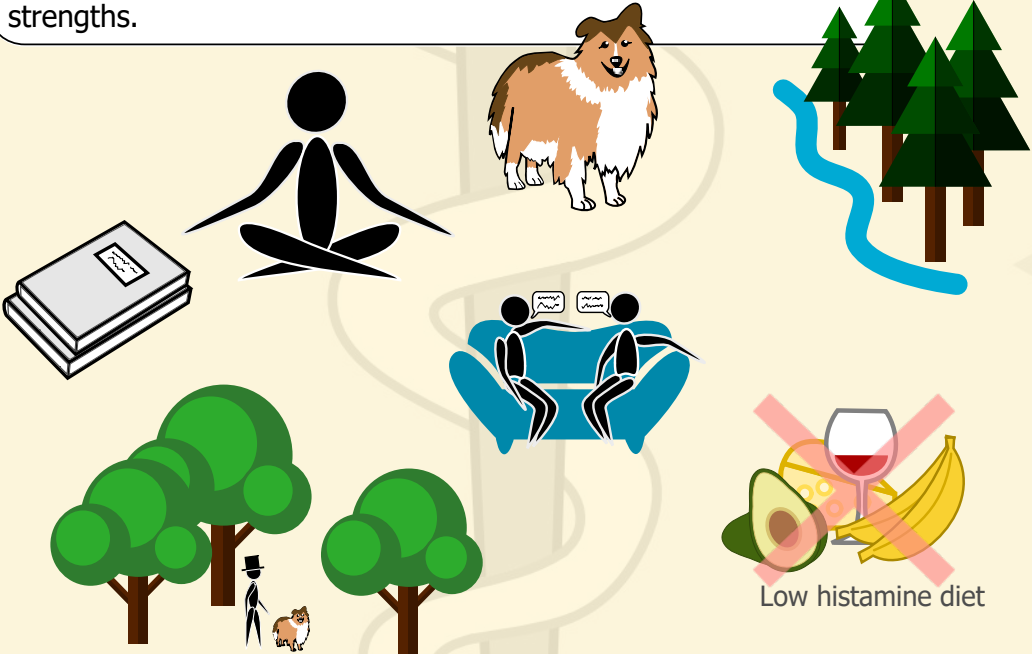




mouth and nose protection



In addition to drug treatment, it is important and helpful to find **individual factors** (e.g. pollen, foods rich in histamine, other foods, stress, temperature, etc.) that trigger the mast cells – and those that help calm and support the body to **recover**. It often helps to relieve external stress, pursue hobbies and include **resources of joy**. Of course, everything depends on personal day to day abilities and strengths.



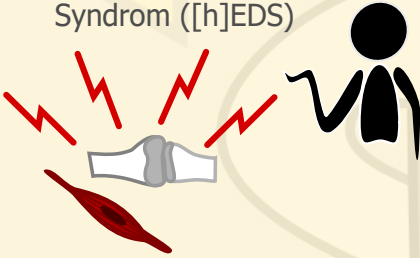
Low histamine diet





Common diseases in parallel to MCAS

[hypermobile] Ehlers-Danlos Syndrome ([h]EDS)



Postural Orthostatic Tachycardia Syndrome (POTS)



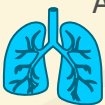
There are a number of medical conditions that are commonly associated with MCAS. It is largely unclear whether and to what extent they cause each other.

Gastrointestinal disorders, e.g., Gastroparesis, small intestinal bacterial overgrowth (SIBO)



Histamine intolerance (HIT)

Autoimmune diseases



and much more

The lines between the symptoms of different diseases can become quite blurred.



As Family, Friends, Colleagues,...

??? What to do if someone in the family, a friend, an acquaintance or a colleague has MCAS?



Ask and talk about it! MCAS is extremely individual. And not only that; The disease and with it the symptoms can change constantly in people with MCAS.



Important: respectful thoughtfulness – without direct or indirect paternalism.



For example, it may be that at a certain time of the year (due to pollen, weather, ozone levels, ...) that some symptoms appear, or are stronger/weaker.



Hormonal fluctuations can also have a massive impact on MCAS. Therefore, symptoms can vary greatly and even change within a month.



What often helps those affected: Listening, understanding, being there – if individually possible!



Someone reacts to certain foods, smells or other things and has problems with them, even though you can't see any of them? Please try to accept this – and above all to respect it.



You actually want to meet or invite a person who has MCAS, but are worried about overtaxing and »triggering« her/him? Talk about it! Invite her/him – and be understanding if she/he cancels. Don't exclude her/him from your life just because you don't want to overwhelm or trigger her/him. She/He will tell you what is possible for her/him right now – and what is not.



???



And sometimes something changes without the person concerned having any idea what or why.



MCAS is often **invisible**. Those affected often look completely »normal« and healthy, regardless of how they are doing.



Helpfull pages & Book recommondations

<https://mcas-hope.de> (including the »Patientenbroschüre«)

<https://www.mastcellhope.org/>

<https://mastcell360.com/>

<https://www.mastattack.org/>

<https://www.mastzellaktivierung.info/en/>

L.B. Afrin: Never bet against Occam (Sisters Media, LLC; 2016)

A. Walker: Mast Cells United (Kindle Direct Publishing, 2019)

Digital Version

A digital version of the comic and further information can be found at:
melanieludwig.de

Disclaimer

As descriptive as a comic is, various simplifications are often necessary at the same time in order not to make the visualization too complex. Even this comic can only convey a first, rough idea, but in case of doubt it does not replace reading the underlying scientific literature – and above all, it never replaces the exchange with your own doctor(s).

It is also not possible or advisable to make a diagnosis based on this comic.



Scientific Paper

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Kohn, A., & Chang, C. (2020).

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Cheung, I., & Vadas, P. (2015).

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Mast cells: phenotypic features, biological functions, and role in immunity, 155-231.

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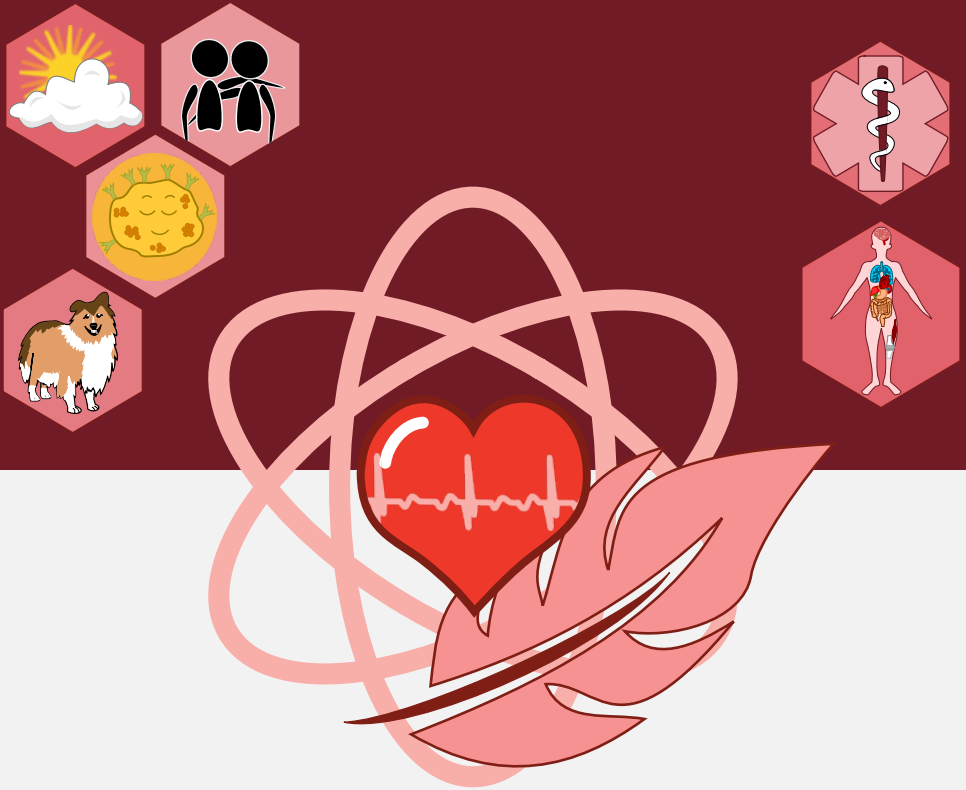
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Journal of allergy and clinical immunology, 128(1), 147-152.

Molderings, G. J., Brettner, S., Homann, J., & Afrin, L. B. (2011).

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Journal of hematology & oncology, 4(1), 10.

Akin, C., Valent, P., & Metcalfe, D. D. (2010).

Mast cell activation syndrome: proposed diagnostic criteria.
Journal of allergy and clinical immunology, 126(6), 1099-1104.



This comic briefly and concisely illustrates the characteristics and functioning of (healthy) mast cells and sheds light on the mast cell activation syndrome (MCAS). Possible triggers, symptoms and theoretical causes are discussed, as well as medical aspects for diagnosis. Therapeutic options and diseases that often occur simultaneously with MCAS and may be related to it are also briefly summarized.