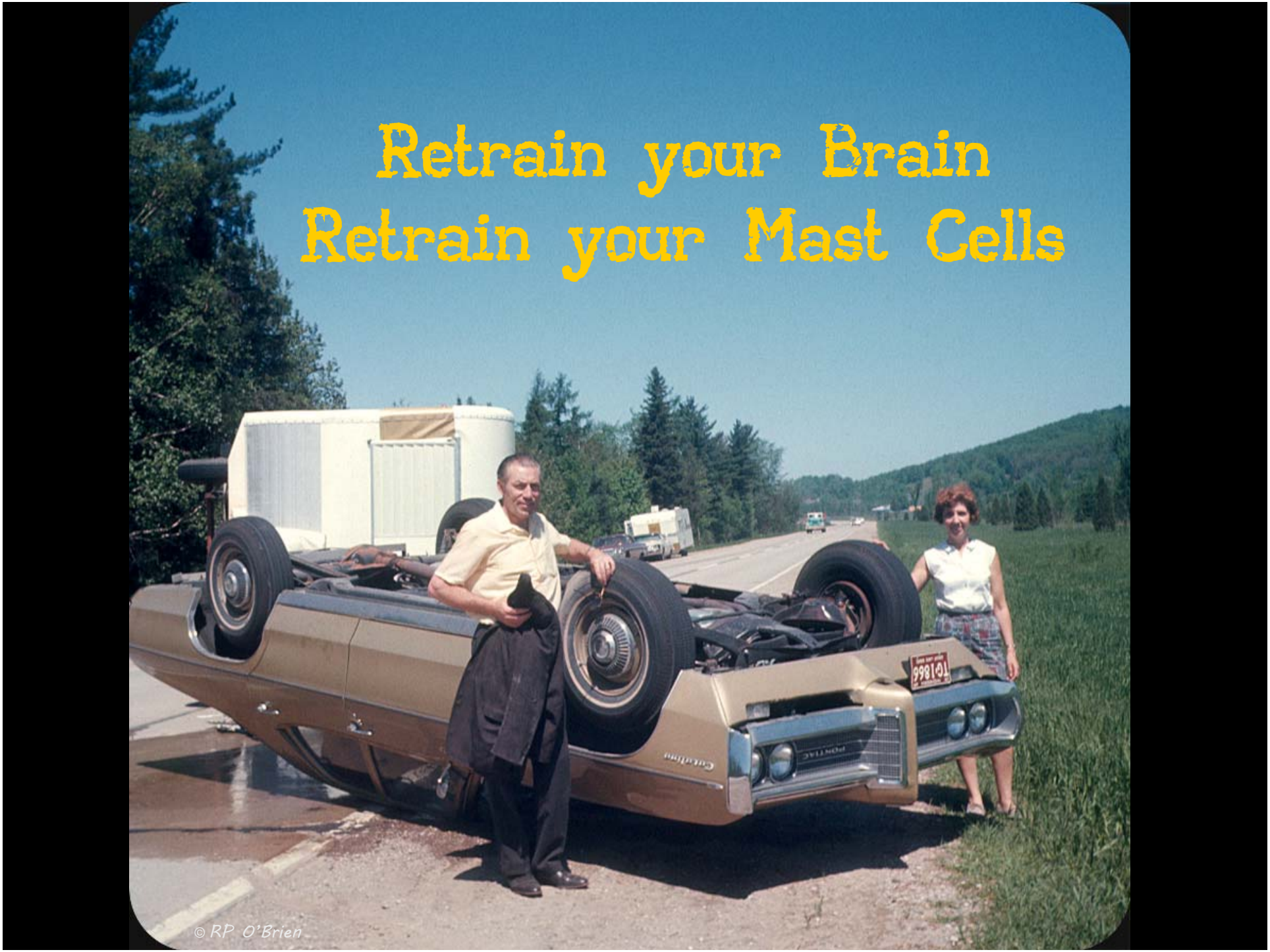
Retrain your Brain
Retrain your Mast Cells
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About Me:

Roselle P. O'Brien,

LMHC, REAT, REACE, ICAT, LPN

Education:

- MA in Clinical Mental Health Counseling
- MA in Education
- MFA in Creative Writing
- BA in Art/Fine Arts, Education
- Diploma Nursing

Licenses/Certification:

- Licensed Mental Health Counselor (LMHC)
- Licensed Clinical Mental Health Counselor (LCMHC)
- Licensed Nurse
- Licensed Educator
- Intermodal Creative Arts Therapist (ICAT)
- Intermodal Creative Arts Facilitator (ICAF)

About Me: (cont'd)

Licenses/Certification (cont'd):
- Registered Expressive Arts Therapist (REAT)
- Registered Expressive Arts Consultant/Educator (REACE)
- Certified Life Coach
- Certified Health & Nutrition Life Coach
- Certified Therapeutic Arts Life Coach

Certificates:
- Eco-Health Support: Medical Professional
- Eco-Health Support: Therapist

The Eco-Health Certificate Programs are for understanding and working with people who have Mast Cell Disorders (MCD) such as Mast Cell Activation Syndrome (MCAS), Post-/Long-COVID, being sensitive to multiple chemicals, chronic fatigue, brainfog, EDS, fibromyalgia, and more.

For more information: https://celacareonline.us

The Work I Do:

Roselle P. O'Brien,
LMHC, REAT, REACE, ICAT, LPN

Health & Wellness – Therapy – Life Coach
Creative Arts for Health & Healing – Supporting you!

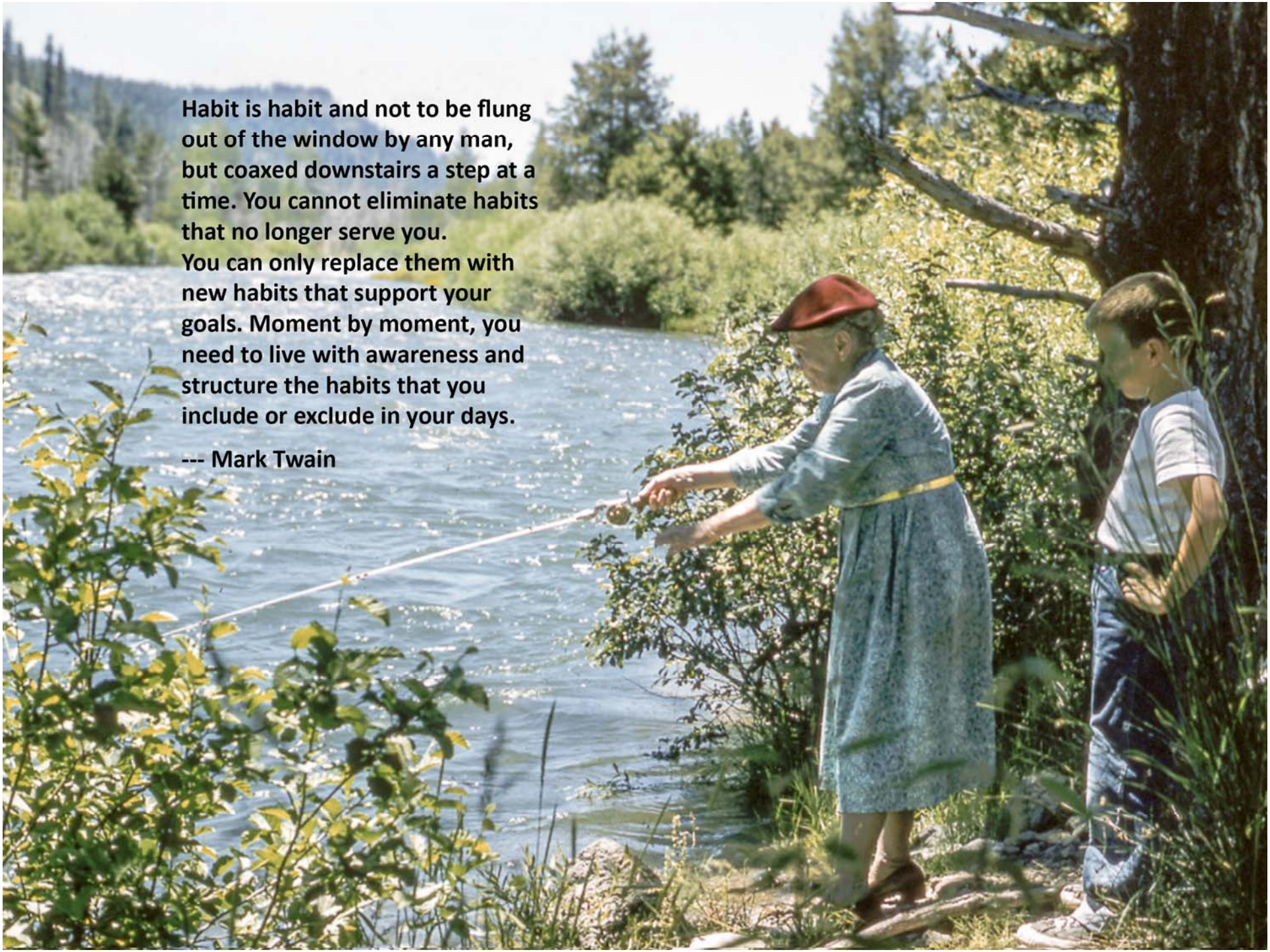
I am a mast cell specialist with over 13 years of experience working with and supporting individuals with MCAS and other mast cell activation related issues and disorders. Visit the website and learn more:

CELACare Eco-Health, Inc.

https://celacareonline.us

RoadMap:

- Mast Cells & the Body
- Cells Communicate
- Chemical & Physical Signaling
- The Conversation
- Plasticity & Retraining
- Taking the Reins

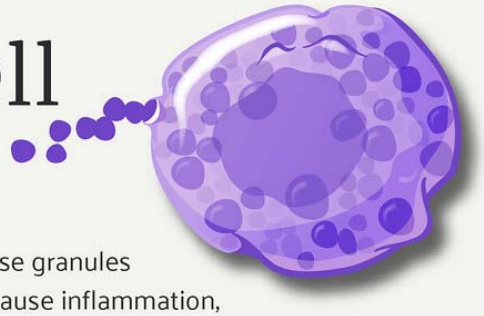

Habit is habit and not to be flung out of the window by any man, but coaxed downstairs a step at a time. You cannot eliminate habits that no longer serve you.
You can only replace them with new habits that support your goals. Moment by moment, you need to live with awareness and structure the habits that you include or exclude in your days.
--- Mark Twain

Mast Cells & the Body

Mast Cells are:

- Located in the connective tissue throughout the body
- In every organ system including the brain
- Part of the body's immune system and immune response
- Part of the body's inflammatory response
- The body's 1st responders to perceived dangers and threats

Mast Cell



White Blood Cell

Function: These cells release granules filled with chemicals that cause inflammation, such as histamine. Inflammation involves increased blood flow that allows more immune cells and other helpful particles in the blood to reach a site of infection or injury more easily.

Disease: The inflammatory chemicals released by mast cells can cause allergy symptoms when the immune system reacts inappropriately to an otherwise harmless substance–like proteins from house dust mites or a certain food. People can also experience persistent problems with inflammation if they are born with or develop too many mast cells in a rare condition called mastocytosis.

Location: Mast cells reside outside the bloodstream in the tissues, especially in skin, lung tissue, lymph nodes, the liver and the spleen. Basophils, another immune cell type that also plays a large role in allergies, are located in the blood.

NIH National Institute of Allergy and Infectious Diseases

Mast Cells & the Body

Mast Cells do a Lot:

Body's 1st line of defense against viruses, bacteria, foreign substances, pathogens (our immune response)

Help protect the body against things like bacteria, viruses—it "adapts" to the specific danger it encounters (adaptive immune response)

Regulate blood pressure and heart function

Regulate wound healing

Regulate the body's inflammatory response

Regulate most hormones in the GI tract influencing weight gain and loss

Directly activate pain nerve fibers; induce pain; headache; chronic pain

& More

Mast Cells & the Body

Mast Cells are in the Body's Connective Tissue:

Connective tissue connects, supports, and helps throughout the entire body. Connective tissue:

- Supports the body's organs and structures
- Provides the framework that holds the body's parts together
- Protects the body's parts
- Plays roles in immune function
- Transports nutrients and wastes
- Stores fat
- Repairs tissue damage
- & more

Mast cells are found in connective tissue throughout the body and virtually in every organ and every organ system.

Mast cells play a crucial role in immune responses and inflammation.

Mast cells in connective tissue contain numerous granules that store a variety of bioactive molecules—mediators—including histamine, heparin, proteases, cytokines that are essential for the cell's function in immune responses and inflammation.

Mast Cell Activation in 4 Steps

Step 1: Activation
The mast cells have encountered a perceived threat or possible danger. They're sensitized then—bang!—they're activated;

Step 2: Degranulate
The activated mast cells degranulate, they crumble;

Step 3: Mediators
The degranulating mast cells pump out hundred of mediators (chemicals) into the body. These mediators flood the body;

Step 4: Receptors
When mast cell-specific mediators hit their mast cell receptors ("doors") those substances get in and interact with the body.

Emotions & Stress

Emotions are closely linked to bodily sensations and physiological responses which occur on a cellular level.

Changing somatic markers (the physiological responses associated with emotions) involves altering those physiological responses associated with certain situations or decisions.

The amygdala, a part of the brain that is also part of the limbic system, is responsible for processing emotions, especially fear and anxiety, and it connects these emotions to memory and our senses. It is also involved in learning.

Mast cells can influence the amygdala's function leading to localized inflammation and altered neuronal connectivity, potentially contributing to conditions such as Autism Spectrum Disorder (ASD).

Mast cell activation by environmental triggers can disrupt neuronal connectivity in the amygdala, altering the normal fear threshold and leading to an exaggerated fight-or-flight response.

Emotional and physical stress can trigger mast cell activation.

The limbic system, which is responsible for controlling behaviors related to survival and stress responses, can also influence mast cell activity. Chronic activation of the limbic system due to prolonged stress or trauma can lead to limbic dysfunctions which can overstimulate the immune system and cause mast cells to become hyper-reactive.

There is a strong connection between emotions and mast cell activity, with emotional stress playing a significant role in triggering mast cell activation.

The Language of Cells

Cells Communicate

All Cells in the Body Communicate.

When cells talk to each other, it's called "signaling." Cells use a lot of different signaling pathways to communicate with each other.

Cells communicate:

- Through chemical signaling
- Through physical signaling

Helpful Terminology

Adjacent – having a common boundary or edge; abutting or touching

Cytokines – proteins that help control inflammation In the body

Effector cells – any of various kinds of cells that actively respond to stimuli and brings about a change

Gap junction – membrane channels between adjacent cells that allow for direct exchange of molecules, an essential part of cell-to-cell communication

Ion – any atom or group of atoms bearing one or more positive or negative electrical charges. Ions play a crucial role in cell communication

Ligand – in cell communication, ligands are molecules that bind to specific receptors on or inside target cells, delivering a signal in the process

Transmitter – a molecule that carries signals from one cell to another

Neurotransmitter – the body's chemical messengers. They carry messages from one nerve cell (neuron) across a space to another nerve cell or to a muscle or gland cell

Synapse – a structure in the nervous system that allows neurons to pass chemical signals to other neurons or target effector cells. Chemical synapses are the most common type.

Cells Communicate: Chemical Signaling

Chemical Signaling

- Involves the use of molecules to send information between cells or within a cell
- These molecules, known as **ligands**, can be diverse, including ions, lipids (fats), peptides (building blocks of proteins), carbohydrates, and nucelic acids (large molecules crucial in all cells that create, encode, and store info in every living cell of every life form on earth)

Chemical Signaling Process in 3 Steps:

1. **Ligand release** – the signaling cell releases a chemical molecule into the extracellular space;
2. **Ligand binding** – the ligand binds to a specific receptor on the target cell;
3. **Signal transduction** – the binding of the ligand to the receptor triggers a series of intracellular events. These events often involve second messengers, which amplify the signal and initiate a cellular response.

Chemical Signaling (cont'd)

Cells being able to communicate with each other---to signal---allows them to coordinate activities like growth, development, and responses to external stimuli.

Signaling is a three-step process:

STEP 1 – Reception >> STEP 2 – Transduction >> STEP 3 – Response

RECEPTION

A cell received a signal, typically a chemical message from another cell or the environment. This Signal is often in the form of a molecule called a ligand, which binds to a specific receptor on The cell's surface or inside the cell.

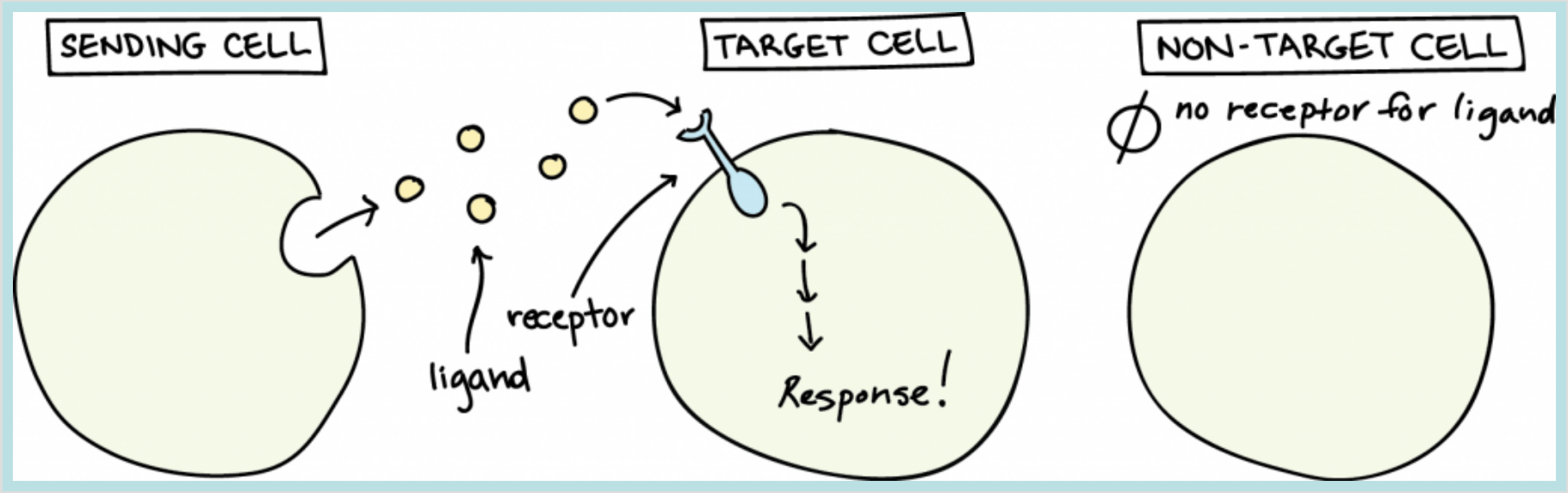
TRANSDUCTION

Once the ligand binds to the receptor, it triggers a change inside the cell, often a cascade of events that relay the signal to the cell's interior. This involves a series of molecules interacting and often amplifying the initial signal.

RESPONSE

The final stage of cell signaling is the cell's response to the amplified signal. This can be a wide range of changes such as activating enzymes or changing cell shape.

Chemical Signaling (cont'd)



Not all cells can "hear" a particular chemical message. In order to detect a signal (that is, to be a target cell), a neighbor cell must have the right receptor for that signal. When a signaling molecule binds to its receptor, it alters the shape or activity of the receptor, triggering a change inside of the cell. Signaling molecules are often called ligands, a general term for molecules that bind specifically to other molecules (such as receptors).

Image credit: Khan Academy

Chemical Signaling (cont'd)

Summing up the Chemical Signaling Process:

- Signaling is the process by which cells communicate with other cells within the body or with the external environment
- The communication involves the transfer of information from one cell to another so that cells can then coordinate their activities and respond to changes in their surroundings
- Signals are carried by molecules called ligands
- Ligand signals (the information) go to receptors on the cell membrane and enters the cell
- The cell responds by relaying the info message to appropriate cells (effector cells) so they can act

Types of Chemical Signaling

Signaling can be categorized *into several different types based on how the signal travels to the target cell. Each type of signaling can involve different cells and different functions, depending on the specific signal and its target.*

Cell surface receptors *play a crucial role in these signaling processes by transmitting information from outside the cell to the inside.*

Types of Signaling:

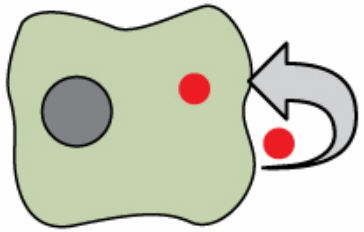
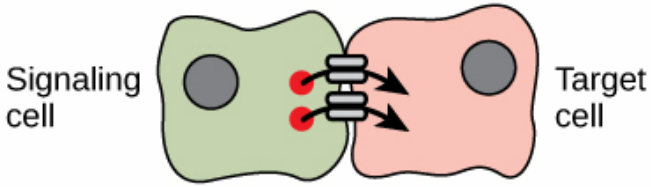
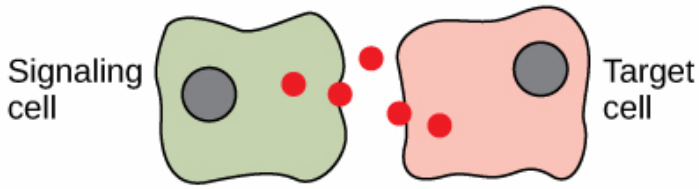
- **Autocrine signaling** – when a cell releases signaling molecules that act on itself.
- **Intracrine signaling** – when a chemical signal produced by a cell acts on receptors located within the same cell.
- **Juxtacrine signaling** – (aka direct signaling) requires direct contact between cells, where a ligand on one cell's surface interacts with a receptor on an adjacent cell. This type of signaling is important to the immune system and during development.
- **Endocrine signaling** – involves hormones that are released into the bloodstream and can affect cells throughout the body. For example, the pituitary gland releases hormones that can influence the thyroid gland, ovaries, and other organs. This type of signaling enables messages to be sent via the bloodstream to cells that are at a distance.

Types of Chemical Signaling (cont'd)

- **Gap Junction signaling** – gap junctions allow the direct exchange of small molecules and ions between adjacent cells. Chemical signals can act over varying distances and gap junctions play a crucial role in this. For example, in the heart, gap junctions allow the rapid spread of electrical currents ensuring synchronous contraction of all cells in the tissue. Gap junctions are essential in the nervous system where they can transmit signals composed of small molecules and ions through pores, providing a more direct form of communication compared to chemical synapses. Furthermore, gap junctions are involved in various physiological processes, including electrical activation of the heart, neuronal signaling, hormone secretion, auditory function, wound healing, immune functions, inflammatory disorders, and bone remodeling.

- **Neuronal signaling** – the signaling occurs between neurons and can involve neurotransmitters that travel across synapses to activate neighboring neurons. This type of signaling is crucial for the nervous system's function, including sensory perception, motor control, and cognitive processes.

- **Paracrine signaling** – involves molecules that diffuse to nearby cells to trigger a response. For instance, immune cells can release cytokines that activate neighboring immune cells, enhancing the immune response.

Forms of Chemical Signaling	
Autocrine	A cell targets itself.
	
Signaling across gap junctions	A cell targets a cell connected by gap junctions.
	
Paracrine	A cell targets a nearby cell.
	
Endocrine	A cell targets a distant cell through the bloodstream.
	

Cells Communicate: Physical Signaling

Physical Signaling

- Involves the use of non-chemical cues such as mechanical force, temperature, light, and sound to transmit information
- These signals are often detected by specialized receptors that convert the physical stimulus into a biochemical signal

Physical Signaling Process in 3 Steps:

1. **Stimulus detection** – the cell detects a physical stimulus, such as pressure or light;
2. **Receptor activation** – the stimulus activates a receptor, which can be a protein or a channel;
3. **Signal transduction** – the activated receptor triggers a series of intracellular events, similar to chemical signaling, leading to a cellular response.

Physical Signaling (cont'd)

Examples of Physical Signaling:

Mechanical Force
Cells in the skin and ears respond to mechanical stimuli. For instance, pressure and vibration are interpreted through mechanoreceptors which are sensory receptors that respond to mechanical changes in the environment. These mechanoreceptors can be found in various parts of the body including the skin, muscles, tendons, joints, and ligaments. They play a crucial role in somatosensation which includes the perception of touch, pressure, vibration, and proprioception (the sense of body position and movement). An example, when external pressure is applied to the skin mechanoreceptors in the skin detect this change and convert it into electromechanical signals that are transmitted to the nervous system which leads to the perception of touch or pressure.

Temperature
External temperatures provide physical signaling that influences thermoregulation. Temperature receptors in the skin detect changes in the external temperature and transmit this information as nerve impulses (electrical signals that convert to chemical signals) to the brain.

Light
Photoreceptors in the eyes detect light and convert it into electrical signals that the brain can interpret. Plants Also use light sensing to regulate growth and flowering.

Sound Waves
Ears respond to sound waves, which are converted into electrical signals by hair cells in the cochlea.

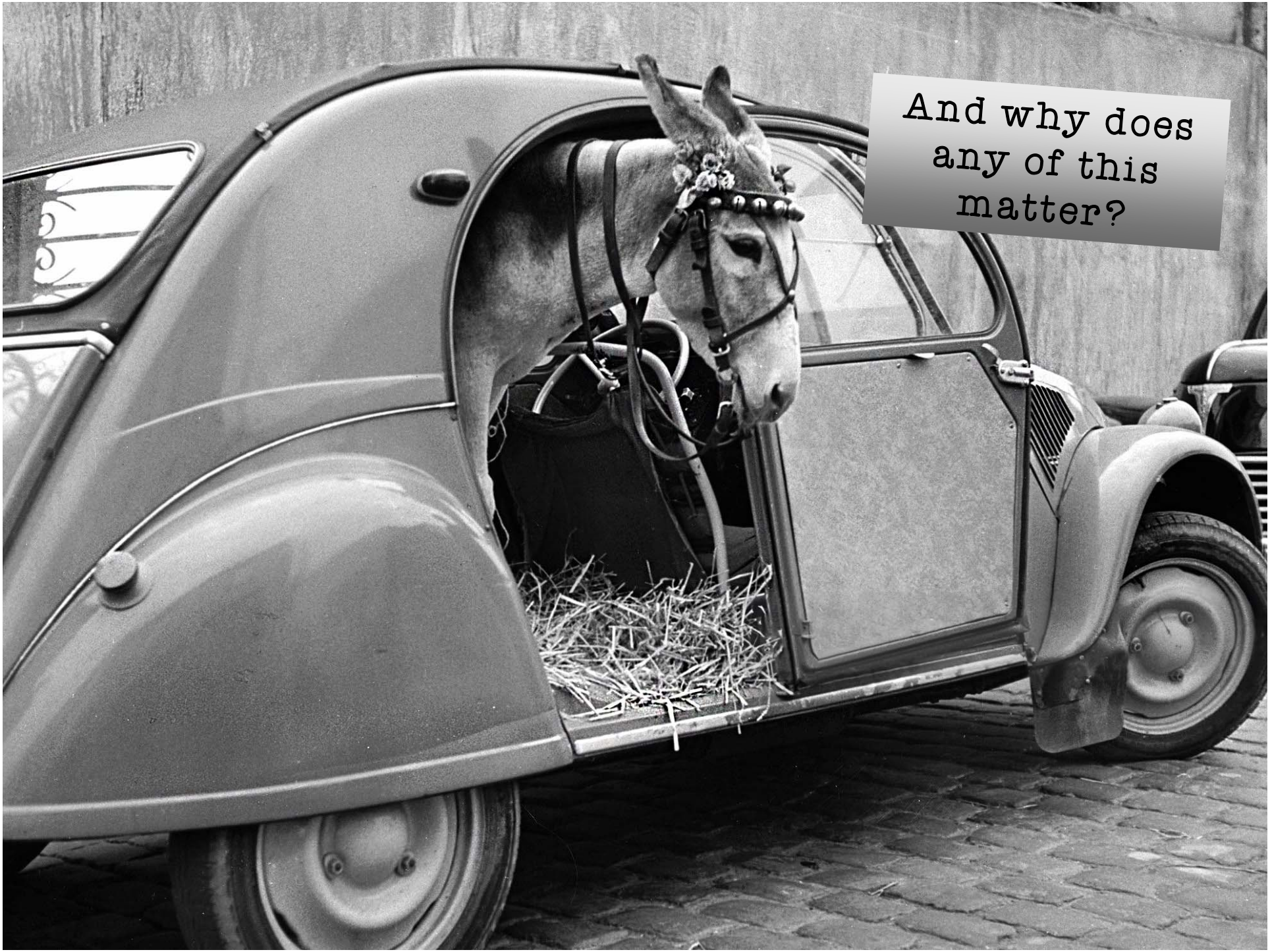
Chemical Signaling vs. Physical Signaling

Key Differences:

Nature of the Signal
Chemical signals are molecules. Physical signals are non-chemical cues such as mechanical force, temperature, light, and sound.

Detection Mechanism
Chemical signals are detected by specific receptors that bind to the ligand. Physical signals are detected by specialized receptors that convert the physical stimulus into a biochemical signal.

Range of Action
Chemical signals can act over short distances (for example, neurotransmitters) or long distances (for example, hormones). Physical signals are often detected locally but can have widespread effects (for example, light affecting circadian rhythms).


And why does any of this matter?

The “Conversation”

Begins with Resilience.

Resilience is the body’s ability to adapt and recover from stress and adversity. It is important, in understanding resilience, that we understand how our body responds to danger and that we use that knowledge to support it.

We need to put the concept of resilience into the context of the reciprocal communication between the brain and the body via neuroendocrine, autonomic, immune, and metabolic mechanisms viewed over the life course and to discuss strategies in interventions to promote brain and body health (McEwen, B., 2019).

The "Conversation"

Includes Homeostasis.

Homeostasis is how the body regulates its internal systems so that they function correctly. Our bodies like everything to be in balance. Mast cells play a key role in homeostasis.

- Homeostasis processes are automatic. A specific part of the brain and hypothalamus run things
- Homeostasis happens mainly through negative feedback and positive feedback

Negative Feedback – your body senses a change and tries to counteract or reverse the unwanted change. Most homeostatic processes in the body rely on negative feedback.

Examples of Negative Feedback: blood pressure; body temperature; oxygen levels.

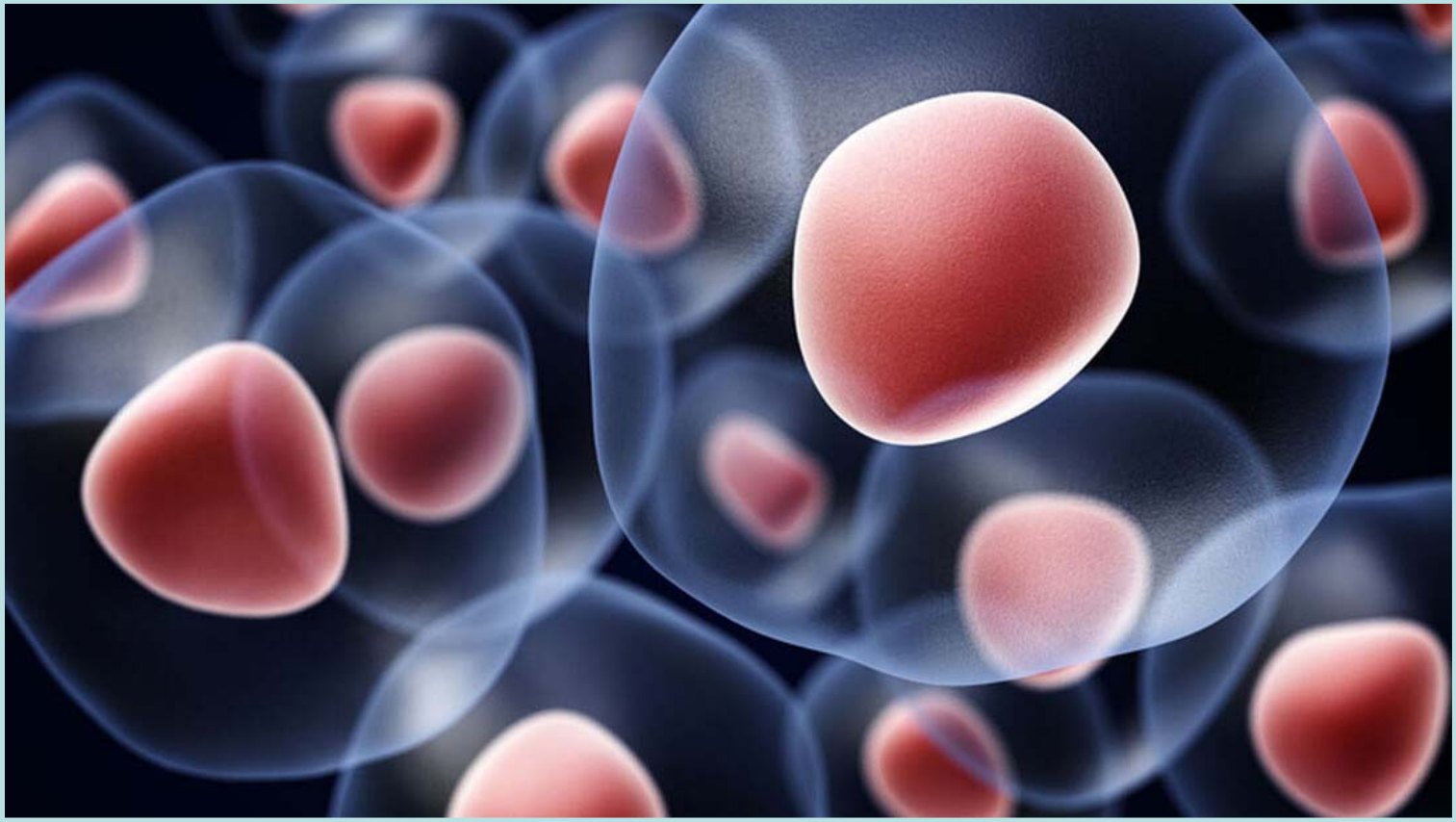
Positive Feedback – the processes add to themselves and get stronger. It will keep happening until the initial cause is gone.

Examples of Positive Feedback: blood clotting; immune responses and inflammation.

The “Conversation”

Is at the Cellular Level.

We need to actively participate in it.



The Brain, Mast Cells, & Plasticity

Plasticity

Plasticity is the ability of the cells or organisms of the body to adapt and change their properties or behavior in response to environmental conditions.

Neuroplasticity

- Refers to the brain's ability throughout life to change and adapt
- Plays a crucial role in how the brain responds to new information, sensory stimulation, damage, and more
- The brain can reorganize and rewire its neural connections to compensate for injuries or adapt to new skills

Mast Cell Plasticity

Mast cells exhibit phenotypic and functional plasticity. This means they can change their phenotype and function in response to various stimuli. Phenotype is an organism's observable characteristics and traits. Mast cell "phenotype" refers to the distinct characteristics and functions of mast cells based on their environment and the signals they receive.

Cell Memory

Cell Memory in the human body refers to the ability of cells to store and recall information, which can influence their function and behavior. It is not limited to brain cells. It extends to other cells and parts of the body, as well.

Studies have shown that kidney and nerve tissue cells can form memories similar to brain cells. This indicates that memory formation might be a fundamental property of all cells.

Mast Cells can exhibit a form of immunological memory by altering the production of preformed mediators and thereby refining their responses to pathogens they may have previously encountered.

IgE-mediated Memory refers to the ability of mast cells (and basophils) to maintain a long term memory of allergens even after the production of allergen-specific IgE has ceased.

IgE-mediated Memory is crucial for immediate hypersensitivity reactions such as anaphylaxis, which can be maintained for decades after initial allergen exposure.

Retraining

Neural Pathways

Neural pathways are connections between neurons where information is passed on through electrochemical signals. When you encounter a new thought or behavior, a new neural pathway starts.

The more you repeat the behavior or thought, the stronger and more dominant the neural pathway becomes.

Creating new neural pathways involves consistent practice and repetition of a new behavior or thought. This process is known as neuroplasticity.

Neuroplasticity is the brain's ability to change itself constantly by creating new neural pathways and losing those which are no longer used.

To create new neural pathways, it is important to practice the new behavior or thought under the right conditions.

Retraining

Mast Cell Neural Pathways

Creating mast cell neural pathways is a complex process. It involves understanding the way that mast cells and the nervous system interact.

Mast cells are known to interact with neurons and they can be influenced by behavioral, hormonal, and environmental factors. Research has shown that mast cells can be triggered to enter specific regions of the brain, indicating that behavior can influence their presence and activity in the brain.

One should consider the following when it comes to potentially creating new mast cell neural pathways:

- **Behavioral triggers** – behaviors or activities which might stimulate the movement of mast cells.
- **Hormones** – can influence the number and activation state of mast cells in the brain.
- **Environmental factors** – exposure to certain environmental stimuli might influence the migration and activation of mast cells. This can include changes in diet, exposure to allergens, or other environmental stressors that affect mast cell behavior.

Take the Reins

Tools for the Tool Box

Mast cell stabilization and managing mast cell activation reactions involves having multiple tools in our tool box from which we draw regularly. It's highly individualized and no two persons' tool boxes are exactly the same.

My Tool Box:

- Retraining strategies
- Food intervention strategies (mast cell stabilizers, anti-inflammatory, low histamine, things that counter reactions for me include green cabbage)
- Having a mast cell aware diet
- Medications (prescription and over-the-counters)
- Exercise (as tolerated)
- The Arts (I'm a musician, I write, I watch a lot of visuals--and brain can't tell what's happening in real time from visuals, a huge help in managing stress and reactions)
- The learning of the NEW = retraining (e.g., new hobbies, expanding knowledge)
- How I approach having reactions in the moment (charting/documenting self provides neutral focus to help manage anxiety & track reactions, vagus nerve informed breathing to manage anxiety)
- Education (of self and others)
- The people in my life (being positive and supportive rather than exhausting and triggering)

Strategies

Exercise to Retrain

Exercise has the ability to retrain cells.

- Exercise can be a tool in managing mast cell activation and MCAS symptoms by reducing inflammation and improving overall metabolic health *(Tanya Dempsey, MD, Mast Cell Specialist)*
- Exercise can stabilize mast cells *(Tanya Dempsey, MD, Mast Cell Specialist)*
- Regular moderate intensity exercise can reduce improve plasticity
- Regular exercise can help stabilize mast cells over time by reducing overall inflammation and improving immune function

Important: Exercise can be both a trigger and potential stabilizer of mast cells. This depends on each individual, their health, and reactivity.

Strategies

Talk to your Body

Our body reads our emotions and is constantly relaying information to the brain.

Our cells remember – past experiences and our body's past responses to those experiences.

Repetition of new thinking and new behaviors creates new neural pathways and puts those new neural pathways into a dominant place.

One of the strongest ways we can talk to our bodies—and this is at a cellular level—is through the creative arts:

- Visual arts
- Music, Sound, & Soundscapes
- Writing
- Dance and movement

Strategies

Visual Arts & Visualizations

What we see, visually, can alter and influence what our brain is perceiving and processing.

When we're anxious, our brain's attention processes are more strongly influenced by emotional cues which can enhance our perceived contrast and clarity of visual information. The heightened attention to visual details can be harnessed to focus on calming images and scenes, reducing anxiety. Stress in all its shapes and forms can bring on and intensify mast cell activation and reactions.

Whether we're completely absorbed by an artwork, a film, or a vividly recalled visualization, our brain thinks that's what is happening to us in the moment, in real time, and responds accordingly.

Even when our visualization is a memory, if it's an intense memory with vivid detail, our brain thinks that's what is happening right then. It can't tell the difference between yesterday and now and responds as if it's happening in the current moment.

Strategies

Creating New Neural Pathways

- Be mindful and take in all the good things. Don't rush. It takes time to build, so enjoy the process.
- Think of positive emotions that are connected with the new habit.
- Thinking of the future outcome helps the mind build willpower, reinforcing the habit.
- Repeat it until it becomes a habit. The key here is to create new neural pathways that will be strong enough to turn into superhighways.
- Visualize what your optimal outcome looks like, feels like, and what you would be doing if you achieved it.
- Focus on the good for 10-20 seconds, really absorbing and storing the experience in your long-term memory. This can help change your brain and what it focuses on.

Strategies

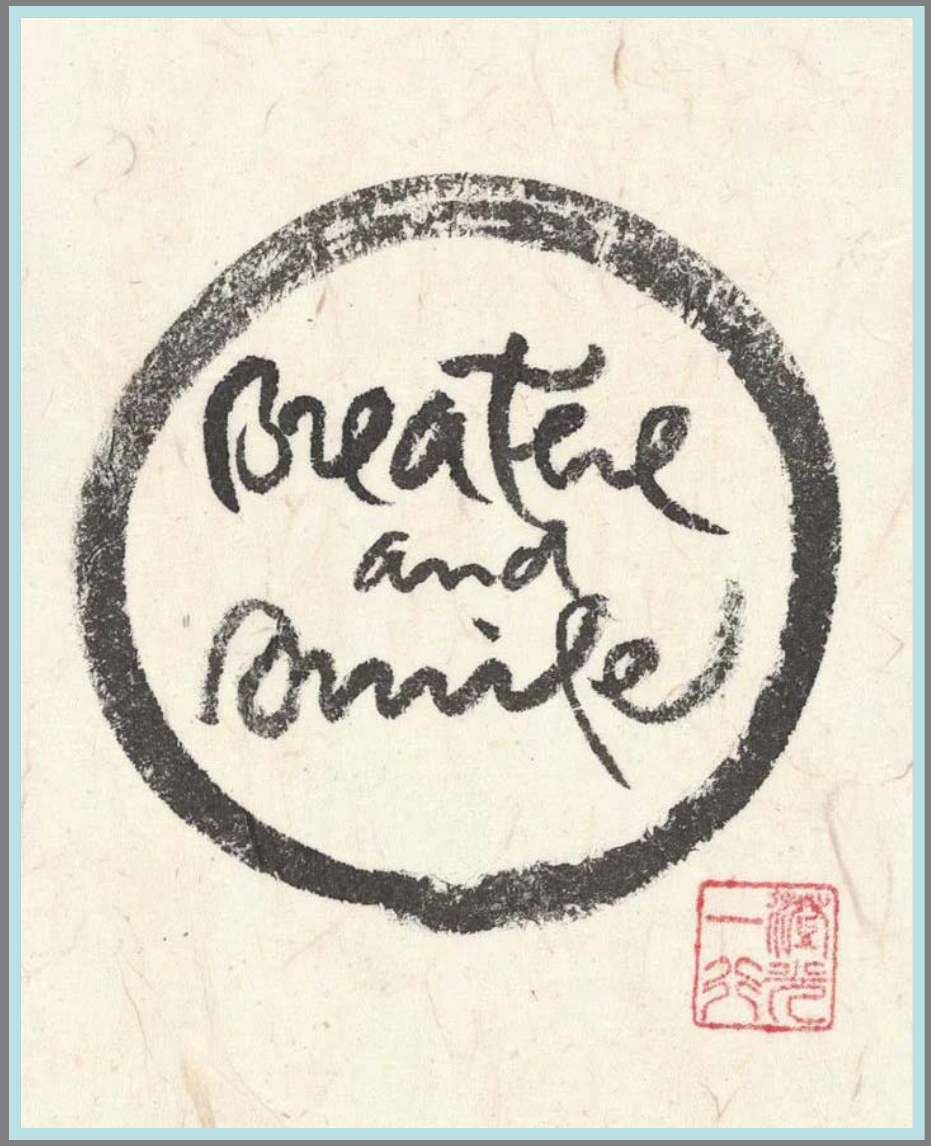
Vagus Nerve Informed Breathing

Vagus nerves are cranial nerves which means they are in direct communication with the brain. They are in charge of turning on and shutting down the body's fight-flight response.

Research has found that breathing in a particular way over-rides the fight-flight message and sends the exact opposite message directly to the brain.

The Breathing:

1. Inhale;
2. Exhale and emphasize the exhalation;
3. Simultaneously, when exhaling with emphasis, add a vocalization;
4. Repeat.


Breathe
and
Smile

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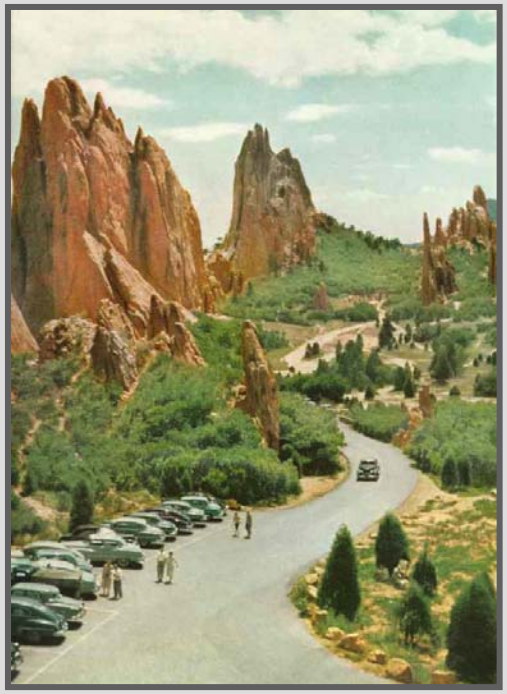
Retrain & Strategies:
- https://search.brave.com/search?q=exercise+as+a+mast+cell+stabilizer&source=web&summary=1&conversation=1eade491bed650718672ef



References (cont'd):

Retrain & Strategies (cont'd):

- https://search.brave.com/search?q=using+how+the+brain+responds+to+visuals+to+heal+inflammation+and+brain+plasticity&source=web&summary=1&conversation=8af3019491d3ca0e724b21
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