
Long-
COVID
&
the
Mast
Cell
Connection
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About Me:

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LMHC, REAT, REACE, ICAT, LPN

Education:

- PhD in Psychology with focus on
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  Current Candidate

- MA in Clinical Mental Health Counseling
- MA in Education
- MFA in Creative Writing
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- Diploma Nursing

Licenses/Certification:

- Licensed Mental Health Counselor (LMHC)
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- Licensed Educator
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- Intermodal Creative Arts Therapist (ICAT)
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About Me (cont'd):

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Licenses/Certification (cont'd):
- Registered Expressive Arts Therapist (REAT)
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- Certified Life Coach
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- Certified Therapeutic Arts Life Coach
- Certified Group 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

About the Work I Do:

Roselle P. O'Brien,
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Therapy · Health & Wellness · Life Coach
Creative Arts for Health & Healing · Supporting You!

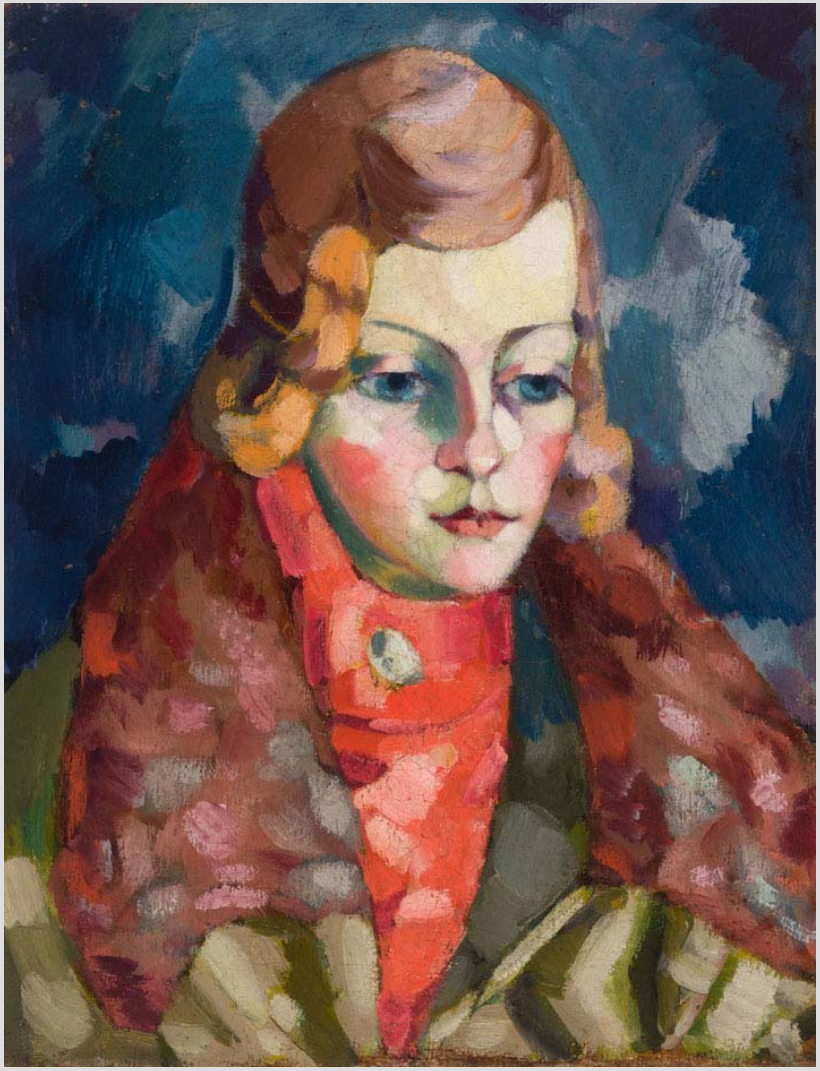
I am a mast cell specialist with over 13 years of experience working with and supporting individuals with MCAS and other mast cell activation related issues and disorders. Visit my websites and learn more about the work I do and the ways in which I provide supports and education.

The Counseling Center at CELA
https://counselingatcela.com

CELACare Eco-Health, Inc.
https://celacareonline.us

Creative Coaching | Facing Future
https://creativecoaching-facingfuture.me

RoadMap:



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"The secret of change is
to focus all your energy
not on fighting the old,
but on building the
new."

--- Socrates

A Quick COVID Recap:

There have been 3 outbreaks of coronaviruses during the past 20 years:

- Severe Acute Respiratory Syndrome (SARS-CoV-1) first detected in China in **2002**
- Middle East Respiratory Syndrome coronavirus (MERS-CoV-2) in Saudi Arabia in **2012**
- Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) COVID-19 pandemic **2019**

COVID-19 is a disease that is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and can affect virtually all systems and organs of the human body (Szukiewica et al, 2022).

COVID-19 can be transmitted between humans primarily through inhalation or contact with droplets from infected individuals. COVID-19 is very contagious and pathogenic. Some people infected by COVID-19 can be without symptoms or they can have cold or flu-like symptoms. Others can have severe respiratory syndrome, systemic inflammation, and dysfunction of internal organs (Hiu Yan Lam et al, 2021).

Terminology: Infection & Disease

Airborne – carried through the air; supported by aerodynamic forces or propelled through the air by force; transported or carried by air

Blood-brain barrier (BBB) – a tightly locked layer of cells that defend your brain from harmful substances, germs, and other things that could cause damage. It's a key part in maintaining brain health. It also holds good things inside your brain, maintaining the organ's delicate chemical balance

Germ – a small mass of living substance capable of developing into an organism or one of its parts; a microorganism causing disease: a pathogenic agent (such as bacteria or a virus)

Infection – the state produced by the establishment of one or more pathogenic agents (such as bacteria or viruses) in or on the body of a suitable host; a disease resulting from infection

Pathogen – a specific causative agent (such as bacteria or a virus) of disease

Pathogenesis – the origination and development of a disease

Transmit – to cause or allow to spread: such as to convey (infection) abroad or to another

Transmission – an act, process, or instance of transmitting

(See: merriam-webster.com and my.clevelandclinic.org)

Terminology: COVID-19

Words & phrases that have become part of the collective vocabulary:

6 feet apart

Asymptomatic

Comorbidity

Herd immunity

Incubation period

Isolation

Lockdown

Quarantine

Second wave

Social distancing

(See: https://www.ktep.org/2020-06-27/essential-vocab-for-covid-19-from-asymptomatic-to-zoonotic)

If you want to know the value of vaccines, just spend some time in a clinic in Africa. The faces of the mothers and fathers say it all: vaccines prevent illness and save lives.

---Seth Berkley, Scientist

Terminology: Genetics

Deoxyribonucleic Acid (DNA) – the molecule that carries genetic information for the development and function of an organism. DNA is made up of two linked strands that wind around each other to resemble a twisted ladder—a shape known as a double helix.

Each strand has a backbone made of alternating sugar (deoxyribose) and phosphate groups. The two strands are connected by chemical bonds between the bases. The sequence of the bases along the backbone encodes biological information, such as the instructions for making a protein or RNA molecule. DNA makes us who we are.

(See: https://www.genome.gov/genetics-glossary/Deoxyribonucleic-Acid-DNA)

Ribonucleic Acid (RNA) – a nucleic acid similar to DNA but with only a single helical strand of bases. It plays a key role in turning DNA instructions into functional proteins. There are three different types of RNA: mRNA, rRNA, and tRNA. They are the principal players in protein synthesis—the process by which the instructions in your genes are turned into functioning proteins in your cells. Our DNA carries the genetic instructions our cells need to make proteins. To make proteins, cells first copy specific genetic instructions in their DNA into a messenger molecule called mRNA. This is then converted to the final protein product. This process is called gene expression. The flow of genetic information passes from the DNA code to the mRNA (the messenger RNA), to the final protein product.

(See: https://www.yourgenome.org/theme/what-is-rna/)

Terminology: Vaccines

Messenger Ribonucleic Acid (mRNA) – a type of molecule that's involved in protein synthesis. Its job is to carry protein information from the DNA in a cell's nucleus to the cell's cytoplasm (its watery interior), where protein-making machinery reads the mRNA sequence and translates each three-base section into its corresponding amino acid in a growing protein chain.

mRNA is the translator; the fundamental link between that DNA code of life and the actual cell being able to construct a living organism. Although we talk a lot more about DNA, mRNA is a crucial piece of the fundamental way in which the living organism is created.

(See: https://www.genome.gov/genetics-glossary/Messenger-RNA-mRNA)

mRNA Vaccines – mRNA was discovered in the early 1960s. Research into how mRNA could be delivered into the cells was developed in the 1970s. The biggest challenge was that mRNA would be taken up by the body and quickly degraded before it could "deliver" its message—the RNA transcript—and be read into proteins in the cells. The solution came from nanotechnology: the development of fatty droplets (lipid nanoparticles) that wrapped the mRNA like a bubble, which allowed entry into the cells. Once inside the cell, the mRNA message could be translated into proteins, like the spike protein of SARS-CoV-2, and the immune system would then be primed to recognize the foreign protein.

(See: https://publichealth.jhu.edu/2021/the-long-history-of-mrna-vaccines)

mRNA Vaccines: Then what happened?

The first mRNA vaccines that used the fatty envelopes were developed to use against the deadly Ebola virus [first identified in 1976; largest and most deadly outbreaks between 2014 and 2016] but since that virus is only found in a limited number of African countries, it had no commercial development in the U.S.

Then COVID hit. The COVID-19 pandemic spurred manufacturers to develop dozens of potential vaccines against SARS-CoV-2 and brought huge increases in funding. Some of the vaccines used traditional methods involving adenovirus as the spike protein delivery system, such as the Johnson & Johnson vector vaccine.

Thanks to decades of research and innovation, mRNA vaccine technology was ready. With COVID, this technology got its moment and has proven to be extremely safe and effective. Pfizer's COVID-19 vaccine is the first mRNA product to achieve full FDA approval in the U.S.

Looking ahead, already vaccine manufacturers are developing mRNA vaccines to protect against other respiratory viruses such as the flu. Moderna is exploring applications of the technology to protect against HIV. It's a new era for vaccine technology and production, and a testament to scientific progress and decades of research

Chris Beyrer, MD, MPH, is the Desmond M. Tutu Professor of Public Health & Human Rights and director of the Center for Public Health & Human Rights at the Johns Hopkins Bloomberg School of Public Health

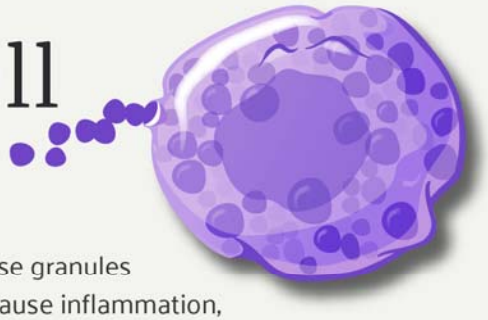
(See: https://publichealth.jhu.edu/2021/the-long-history-of-mrna-vaccines)

Mast Cells & what They Do

Mast Cells Are:

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

- A type of white blood cell
- Found in the connective tissue throughout the body
- Found in every organ system including the brain
- Part of the body's immune response
- Part of the body's inflammatory response
- The body's 1st responders to perceived dangers and threats

Connective Tissue:

There are many different types of connective tissue in the body. These tissues connect, support and help throughout the entire body in different ways.

Connective tissues contribute to many different body functions including:

- Supporting organs and cells
- Transporting nutrients and wastes
- Defending against pathogens
- Storing fat
- Repairing damaged tissues

There are two basic connective tissue categories:

- Specialized connective tissue
- Connective tissue proper

(See: https://www.ncbi.nlm.nih.gov/books/NBK538534/)

Connective Tissue:

Specialized connective tissues include:

- Adipose (body fat)
- Cartilage
- Bone
- Blood
- Reticular (found around the kidney, liver, spleen, and lymph nodes)

Connective tissue proper (2 types – "loose" and "dense"):

- Loose – holds organs, anatomic structures, and tissues in place
- Dense – (1) higher density **regular** with parallel fibers such as that of tendons and ligaments
- Dense – (2) higher density **irregular** with multidirectional fibers such as that of the pericardium (the sac containing the heart and roots of the great vessels that bring blood to and from the heart: superior veina cava, inferior vena cava, pulmonary arteries, pulmonary veins, and the aorta)
- Dense – (3) higher density **elastic** with significant embedded elastin such as that of the arteries

(See: https://www.ncbi.nlm.nih.gov/books/NBK538534/)

Connective Tissue:

Embryonic connective tissue – present in the umbilical cord and embryo.

Blood supply & lymphatics – different types of connective tissue have considerable variation in blood supply although most are well vascularized (plenty of blood vessels)

Nerves – all peripheral nerve fibers consist of three connective tissue layers which serve as a protective sheath

Muscles – individual muscle cells are grouped to form a fiber. These fibers are further bundled together to form a fascicle. Several of these fascicles get further grouped to create the entire muscle. Connective tissue exists between every muscle cell, fiber, and fascicle.

Tendons – collagen and elastin make up the dry mass of tendon connective tissue. Tendons are connective tissue structures. The complex multidimensional arrangement of the collagen fibers of tendons makes its function possible.

Connective tissue pathologies include: tendon tears; bony fractures; muscular compartment syndromes; cartilaginous injury; surgical disruption; direct inflammation of connective tissues.

5 Currently identified autoimmune connective tissue diseases: system lupus erythematosus; scleroderma; myositis; rheumatoid arthritis; and Sjogren syndrome

(See: https://www.ncbi.nlm.nih.gov/books/NBK538534/)

Connective Tissue & Mast Cells:

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

Mast cells play a crucial role in immune responses and inflammation

Mast cells in connective tissues 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

Recent studies have shown a population of connective tissue mast cells store and release noradrenaline (aka norepinephrine), which originates from nerves of the sympathetic nervous system

Mast cells are found close to small blood vessels in loose connective tissue. They contain large secretory granules (sacs) of heparin proteoglycan, a weak anticoagulant. They also contain histamine, which promotes an inflammatory reaction when secreted. Release of histamine causes endothelial cells lining small veins to contract, weakening the junction between these cells, and allowing proteins and cells from the plasma to leak through into the connective tissue. (Junctions are specialized cell structures that connect neighboring cells or connect cells to the extracellular matrix. Some junctions are "tight" and act as a barrier to prevent the passage of water and solutes making sure these substances move through the cells rather than between them.)

(See: https://pmc.ncbi.nlm.nih.gov/articles/PMC11050338/)
(See: https://www.ncbi.nlm.nih.gov/books/NBK499904/)
(See: https://www.histology.leeds.ac.uk/tissue_types/connective/connective_phagocytes.php)

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
- Regulate wound healing
- Regulate the body's inflammatory response
- & so much more

Mast Cells do a Lot: Mediators

- Skin
- Respiratory system
- GI system
- Pain and chronic pain
- Acts as a neurotransmitter
- Itch
- Influence neuroplasticity (brain's ability to change and grow through our experiences) associated with learning, memory, depression
- Cognitive function
- Regulates the immune system
- Direct activation of pain nerve fibers
- Muscle weakness
- Can activate the sensory neurons (called nociceptors) that send information about pain to our brain and make us aware of it, leading to pain perception as in, for example, fibromylagia, migraines, and Complex Regional Pain Syndrome
- Mediates our responses to stress

(See: Molderings, G. and Afrin, L., (27 May 2023) "A survey of the currently known mast cell mediators with potential relevance for therapy of mast cell induced symptoms")

Mast Cells do a Lot: Immune System

When the body comes into contact with an offending agent such as viruses, bacteria, toxic chemicals, or suffers an injury, it activates the immune system. The immune system then sends out what can be thought of as first responders: inflammatory cells and cytokines. Cytokines are substances that stimulate more inflammatory cells. The cells start the inflammatory response in order to trap bacteria and other offending agents or to start healing any tissue that may be damaged or injured. The result can be pain, swelling, bruising, or redness. Inflammation, however, also affects body systems that one doesn't see.

There are two types of inflammation, acute and chronic. **Acute** would be the body's response to, for example, cutting your finger. To heal the injury, the body sends out inflammatory cells to the injury where they can start the healing process.

In **chronic** inflammation, the body continues sending inflammatory cells even when there isn't any outside danger. For example, in rheumatoid arthritis inflammatory cells and substances attack the joint tissues leading to inflammation that comes and goes and can cause severe damage to the joints with pain and deformities.

(See: https://my.clevelandclinic.org/health)

Mast Cells do a Lot: Immune System

Mast cells play an important role in protecting our body and our health. They provide a line of defense against pathogens—the specific agents (for example, a virus or bacteria) that cause a disease. When the body has been exposed to what may be a pathogen, mast cells set off a fast inflammatory response to outside invaders (such as germs, viruses, parasites.) Mast cells are able to kill these organisms or they can stimulate production and release of substances that will destroy the pathogen.

Mast Cells have an array of mediators that are capable of bringing about acute symptoms after the cell has been activated which include hives, angioedema, bronchoconstriction, diarrhea, vomiting, low blood pressure, cardiovascular collapse, and death in a few minutes (Castells, 2006). Although symptoms of acute mast cell mediator release are able to be reversed through the use of mediator blockers such as epinephrine, the continued release of histamine and other mediators leads to chronic, debilitating disease (Castells, 2006).

Mast cells can be found in every organ system of the human body, including the brain. Wherever activated mast cells are located, a person may experience and exhibit physical reactions to the flood of mediators that are specific to that organ system. When the body perceives what it thinks is a threat, mast cells trigger the release of many, many different mediators (histamine, serotonin, enzymes such as cytokines and proteases, and more.) These varied substances result in both rapid and longer-term inflammatory responses.

(See: https://www.verywellhealth.com/)

Mast Cells Communicate:

Mast cells communicate with myriad different types of cells throughout the body, in addition to other mast cells, in the nervous, vascular, and immune systems.

The ways that they communicate vary, for example:

- Chemical signaling through the release of mediators such as histamine, proteases, cytokines, leukotrienes, prostaglandins
- By being physically in close proximity to other cells (called paracrine signaling)
- Brain to cell / cell to brain direct communications
- Through neurotransmitters (e.g., serotonin, dopamine, histamine)

Mast cells play a highly important role in the nervous system. The relationship between mast cells and the nervous system is bi-directional which means that mast cells influence neural function and neurons modulate mast cell activity.

Mast cells are present and communicate in the Central Nervous System (CNS) which is the brain and spinal cord, and in the Peripheral Nervous System (PNS) which is the network of nerves that extends throughout the body, connecting the CNS to the rest of the body including muscles and organs.

Mast Cells Communicate:

In cell communication, “sensors” and “effectors” play crucial roles. **Sensors** (e.g., receptors – protein molecules embedded in the plasma membrane of cells; the doorways into the body) are responsible for detecting changes in the environment or within the cell, while **effectors** (e.g., mast cell mediators) carry out the cellular response to these signals. Mast cells are both sensors and effectors in communication among nervous, vascular, and immune systems.

Mast cells reside in the Central Nervous System (CNS) and are capable of migrating across the blood-brain barrier (BBB) in situations where the barrier is compromised as a result of CNS pathology.

In the brain, mast cells reside on the brain side of the BBB, and interact with all sorts of cells. They are first responders, acting as catalysts and recruiters to initiate, amplify, and prolong other immune and nervous responses upon activation.

Mast cells both promote harmful, deleterious outcomes in brain function *and* contribute to normative behavioral functioning, particularly cognition and emotion.

(See: https://pmc.ncbi.nlm.nih.gov/articles/PMC4282993/)

Mast Cells Remember:

The immune & nervous systems are built to manage vast quantities of information. The immune system is required to consistently recognize foreign antigens (molecules that trigger an immune response; any substance the immune system recognizes as foreign,) from countless sources, and each individual neuron is required to receive information from numerous synaptic connections. To file this data, each system employs mechanisms for molecular memory.

One tool used by the immune system is somatic V(D)J recombination, which rearranges genes in response to specific antigens permitting lymphocytes (a type of white blood cell that plays a crucial role in our immune response) to produce the proteins needed to mount our immune responses. This mechanism results in both an immediate immune response and a population of long-lived memory cells that can mount stronger responses if the initial pathogen is ever again detected.

To handle the brain's computing load and to store information despite molecular turnover, the cells establish memory networks.

(See: https://www.cell.com/fulltext/S0092-8674(09)01620-1)

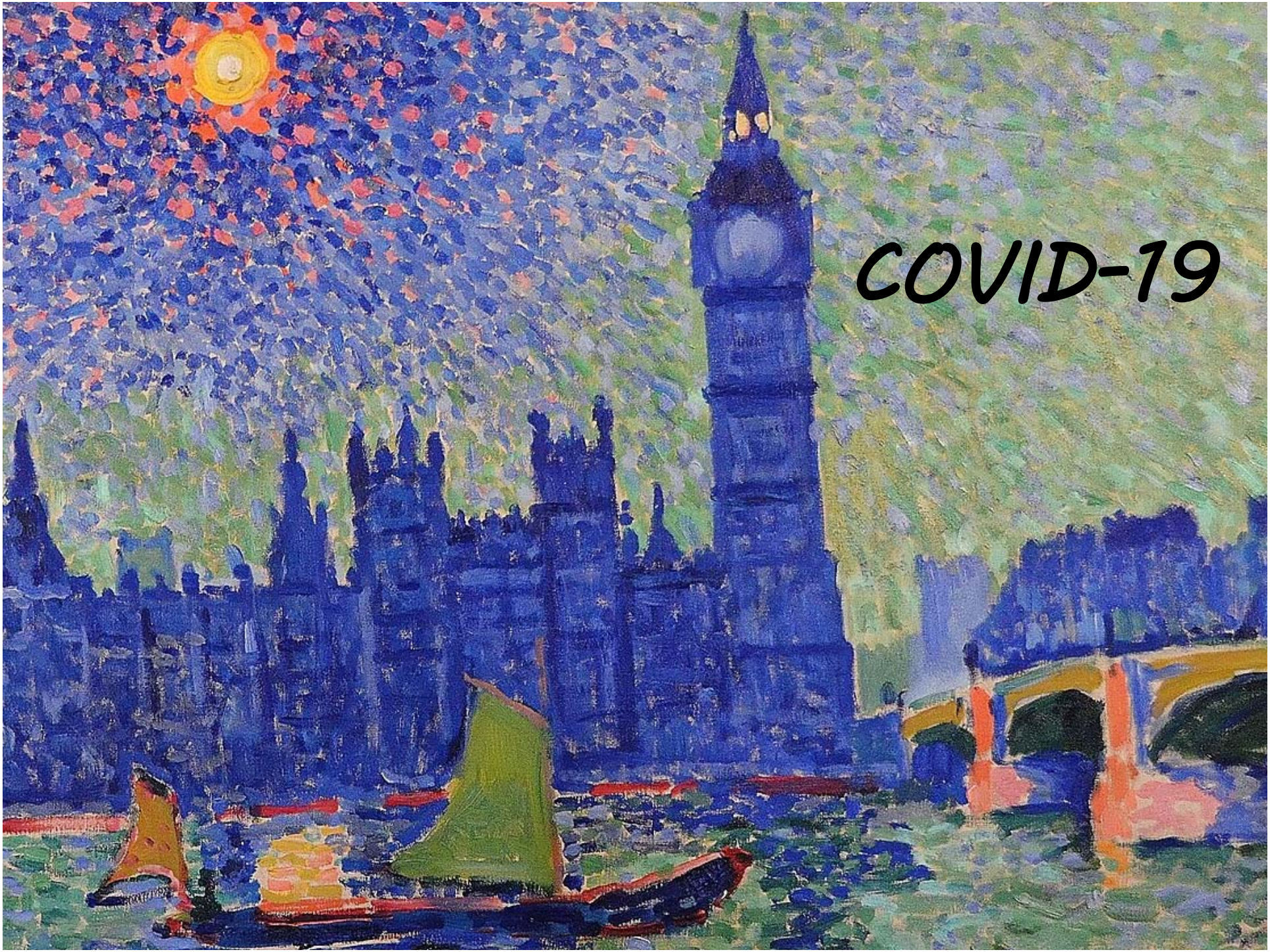
Mast Cells Anticipate:

Mast cells are our body's first responders and early warning system. They anticipate and respond to what they perceive as potential dangers and threats.

One of the key mechanisms by which mast cells respond to threats is through the recognition of Interleukin-33 (IL-33). When structural cells, neuronal cells, and smooth muscle cells undergo necrosis, (a form of cell injury that leads to the premature death of cells in living tissue caused by things such as infection, trauma, chemical stress,) they release IL-33. Mast cells recognize this signal through the IL-33 receptor, ST2, which triggers their activation.

Mast cells play a critical role in anticipating and responding to dangers and threats by initiating an inflammatory response and signaling other immune cells to take action.

(See: https://pmc.ncbi.nlm.nih.gov/articles/PMC3342375/)


COVID-19

COVID-19: Research Background

Growing evidence demonstrates involvement of mast cells in the pathogenesis of coronavirus, including COVID-19 (Hiu Yan Lam et al, 2021). Research has revealed an elevated density of specific types of mast cells in the lungs of COVID-19 patients who were studied and a higher number of activated mast cells in the fluid from COVID-19 patients after they underwent specific diagnostic testing of their lower respiratory system called a bronchoalveolar levage. The fluid collected from the patients with COVID-19 was then compared to samples from healthy individuals. Additionally, there were more mast cell-specific enzymes—CPA3—found in the serum of COVID-19 patients compared to a control group with significant positive correlation between CPA3 and other substances (meutrophics and C-reactive protein) which are associated with exacerbated inflammatory response and thereby disease severity in COVID-19 patients (Hiu Yan Lam et al, 2021).

Gebremeskel et al, in their study (cited in Hiu Yan Lam et al, 2021) reported that the serum from COVID-19 patients had significantly higher levels of chymase (a mast cell enzyme), of tryptase (a mast cell protease/enzyme), and of CPA3 (a mast cell enzyme) compared to controls who were not infected with COVID-19, indicating systemic mast cell activation in these patients (Hiu Yan Lam et al, 2021).

COVID-19: Research Background

There was also elevated gene expression of TPSB2 and TPSAB1 which convert and specify the genetic code for mast cell tryptase in the lungs of COVID-19 patients compared to those of healthy persons which suggests activation of lung mast cells in these patients (Hiu Yan lam et al, 2021).

In a different study, Tan et al (cited in Hiu Yan Lam et al, 2021) have reported that blood from severe COVID-19 patients during the acute phase had increased production of genes associated with mast cell functions and have shown that severe COVID-19 patients have elevated plasma chymase, again indicating mast cell activation in COVID-19 patients (Hiu Yan Lam et al, 2021).

A 2023 research study by Tan, J. Y. J. et al (see: https://www.jci.org/articles/view/149834) focusing specifically on mast cell activation in the lungs and lung pathology during SARS-CoV-2 and severe COVID-19, indicates that mast cells are strongly activated by SARS-CoV-2 infection and that in vivo animal models had levels of mast cell activation significantly associated with severe COVID-19 disease in humans.

Kempurage, D., et al in their 2020 study (see: https://journals.sagepub.com/doi/10.1177/1073858420941476) found that COVID-19 can induce mast cell activation, psychological stress, cytokine storm, and neuroinflammation.

COVID-19: Pathogenesis

The pathogenesis of COVID-19 involves a complex interplay between host factors and the SARS-CoV-2 virus that leads to a multitude of clinical manifestations beyond the respiratory system.

Risk factors include: genetic predisposition; advanced age; obesity; male gender; comorbid conditions such as hypertension, diabetes, renal disorders, chronic pulmonary disease, arrhythmias, heart failure.

Point of entry into the body:

- SARS-CoV-2 is typically transmitted through droplets and aerosols, entering the human body through the respiratory tract
- Initial target cells for the virus are ACE2+ TMPRSS2+ mutli-ciliated cells (special cells found in various tissues including the brain, airways, and reproductive tracts) found in the airway. Ciliated cells in the nasal cavity also express high levels of ACE2 and TMPRSS2 on some of their membranes.

Upon Entry, the SARS-CoV-2 genome generates viral proteins and replicates.

Immune cells detect SARS-CoV-2, triggering the production of mediators and immune responses to combat the virus.

(See: https://www.sciencedirect.com/science/article/pii/S1877117323001308)

COVID-19: Pathogenesis

As the disease progresses, the lower respiratory tract becomes involved, leading to the dysfunction of cells and impairment of mucus clearance.

While some people remain asymptomatic or experience mild symptoms, others develop severe symptoms such as fever, headache, myalgia (muscle pain), GI symptoms, and shortness of breath. In certain cases, SARS-CoV-2 causes severe infections resulting in fatal outcomes due to multi-organ failure.

In the respiratory system: the direct effects of the SARS-CoV-2 virus on these cells leads to inflammation, reduced cell function, and loss of specific cell identity.

Breathlessness, a common symptom, arises from hypoxemia-induced respiratory failure known as Acute Respiratory Distress Syndrome (ARDS). This condition involves an inflammatory response in lung tissue and pulmonary vascular leakage. Patients with COVID-19 display systemic inflammation, including the release of proinflammatory cytokines along with elevated levels of inflammatory markers.

Severe infection ultimately leads to multiorgan involvement, affecting the GI, cardiovascular, musculoskeletal, nervous, renal, and hepatic systems.

(See: https://www.sciencedirect.com/science/article/pii/S1877117323001308)

COVID-19: Pathogenesis

Although the disease process of COVID-19 is initiated by SARS-CoV-2, it is the dysregulation of the immune response that leads to disease amplification.

It has been observed that patients who develop ARDS and extrapulmonary complications exhibit elevated levels of proinflammatory cytokines and chemokines [both produced by mast cells] along with systemic markers of inflammation.

As the disease progresses and the virus replicates, it affects more and more systems:

- Cardiovascular system
- Renal system (urinary and kidneys)
- GI system
- Hepatobiliary (liver, gall bladder, bial ducts) system
- Nervous system
- Endocrine and metabolic system
- Ophthalmic system

(See: https://www.sciencedirect.com/science/article/pii/S1877117323001308)

COVID-19: Pathogenesis

COVID-19 can activate mast cells that are found in the respiratory tract in the initial stage of infection. Although mast cell activation can be helpful in fighting infections, extensive mast cell activation leads to the release of inflammatory cytokines and chemokines, which further worsen inflammation and increase severity and likelihood of mortality from COVID-19.

The virus activates mast cells to release several pro-inflammatory molecules including histamine, tryptase, IL-1B, CCL2, IL-6, GM-CSF, and TNF which are implicated in COVID-19 disease. Accordingly, mast cell activation in the respiratory tract can worsen lung inflammation and lung failure from COVID-19.

(See: https://www.sciencedirect.com/science/article/pii/S1877117323001308)

Mast cells play an active role in various infectious diseases, including bacterial and viral infections. During infections, mast cells become activated and release various mediators. Inflammatory mediators from mast cell activation are associated with COVID-19.

Evidence of mast cell activation in the lungs post infection, after the patients had negative PCR tests could suggest a role for mast cells in the sustained inflammatory response that limits disease resolution.

(See: https://pmc.ncbi.nlm.nih.gov/articles/PMC9228930/)


Long-COVID

Long-COVID & Mast Cells

People who have experienced COVID-19 infection, but who recover, seem to have long-term problems. Long-COVID symptoms (aka post-COVID or post-COVID syndrome) refer to persistent or systemic symptoms such as chest pain, generalized fatigue, joint pain, and more after recovery from a COVID-19 infection.

Pulmonary fibrosis is one of the main problems that develop in long-COVID, and results in irreversible and decreased pulmonary function. Mast cells play a pivotal role in pulmonary fibrosis. Tumor necrotizing factor plays a key role in the development of fibrosis, and it is stored in mast cells where it is readily released during mast cell degranulation.

In a survey of self-reported symptoms, researchers compared 136 long-COVID patients with 136 controls who had never had overt COVID symptoms and 81 patients with mast cell activation syndrome (MCAS). They found that mast cell activation symptoms were increased in long-COVID, and that the symptom profiles of long-COVID mimicked those of MCAS.

Many mast cell researchers have noted that MCAS is likely grossly under-diagnosed, as well.

(See: https://pmc.ncbi.nlm.nih.gov/articles/PMC9228930/)

From the Medical World: Interventions & Strategies

Recent in vitro studies have found that certain anti-allergic drugs such as ketotifen, particular antibiotics (clarithromycin), and corticosteroids such as hydrocortisone were all highly effective in stabilizing the deleterious effects of mast cells.

Another report suggests that mast cell stabilizers (such as quercetin and vitamins C, D, B6, and B12) were effective in the treatment of mast cell mediated epiploic appendagitis (which causes severe stomach and abdominal pain). Because of the role of mast cells in long-COVID, these therapeutics may be useful in the treatment of post-COVID pulmonary fibrosis and in relieving the symptoms of post-COVID syndrome.

Vaccination-specific strategies: prior to receiving the vaccination, pre-treatment with antihistamines and mast cell stabilizers. Continued mast cell stabilizing treatment throughout the two-week period post vaccination and, in some cases, beyond the two weeks.

(See: https://pmc.ncbi.nlm.nih.gov/articles/PMC9228930/)

Long-COVID: Be Informed

Anyone can get Long-COVID.

Long-COVID occurs more often in people who had severe COVID-19 illness, but anyone who gets COVID-19 can experience it, including children.

Long-COVID is defined as:

A chronic condition that occurs after SARS-CoV-2 infection and is present for at least 3 months. Long-COVID includes a wide range of symptoms or conditions that may improve, worsen, or be ongoing.

(See: https://www.cdc.gov/covid/long-term-effects/index.html)

Long-COVID: Recognize It

Long-COVID symptoms differ between people, and between adults and children. Overall, the most common symptoms of post COVID-19 condition include:

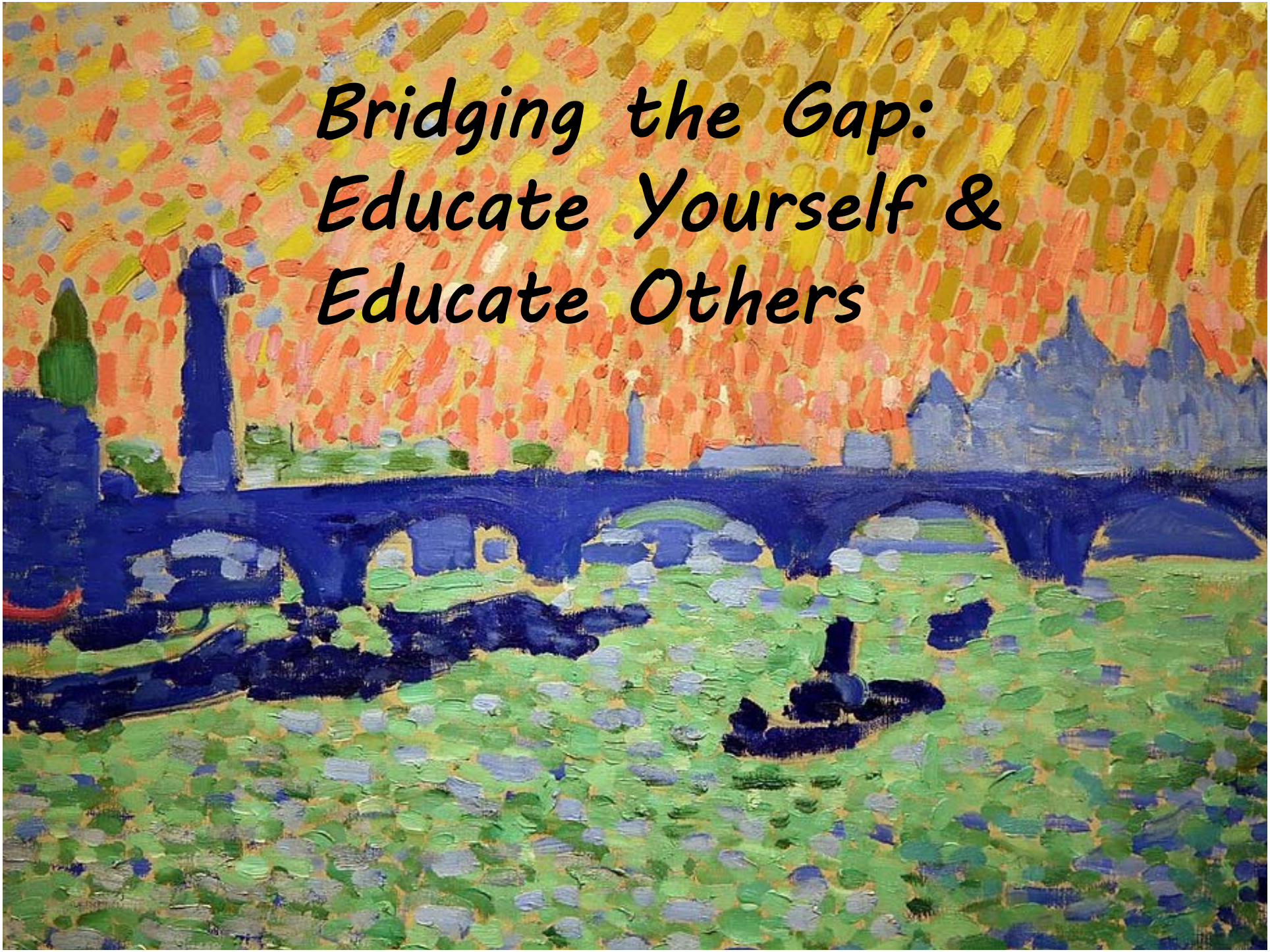
- fatigue
- shortness of breath or difficulty breathing
- memory, concentration or sleep problems
- persistent cough
- chest pain
- trouble speaking
- muscle aches
- loss of smell or taste
- depression or anxiety
- fever

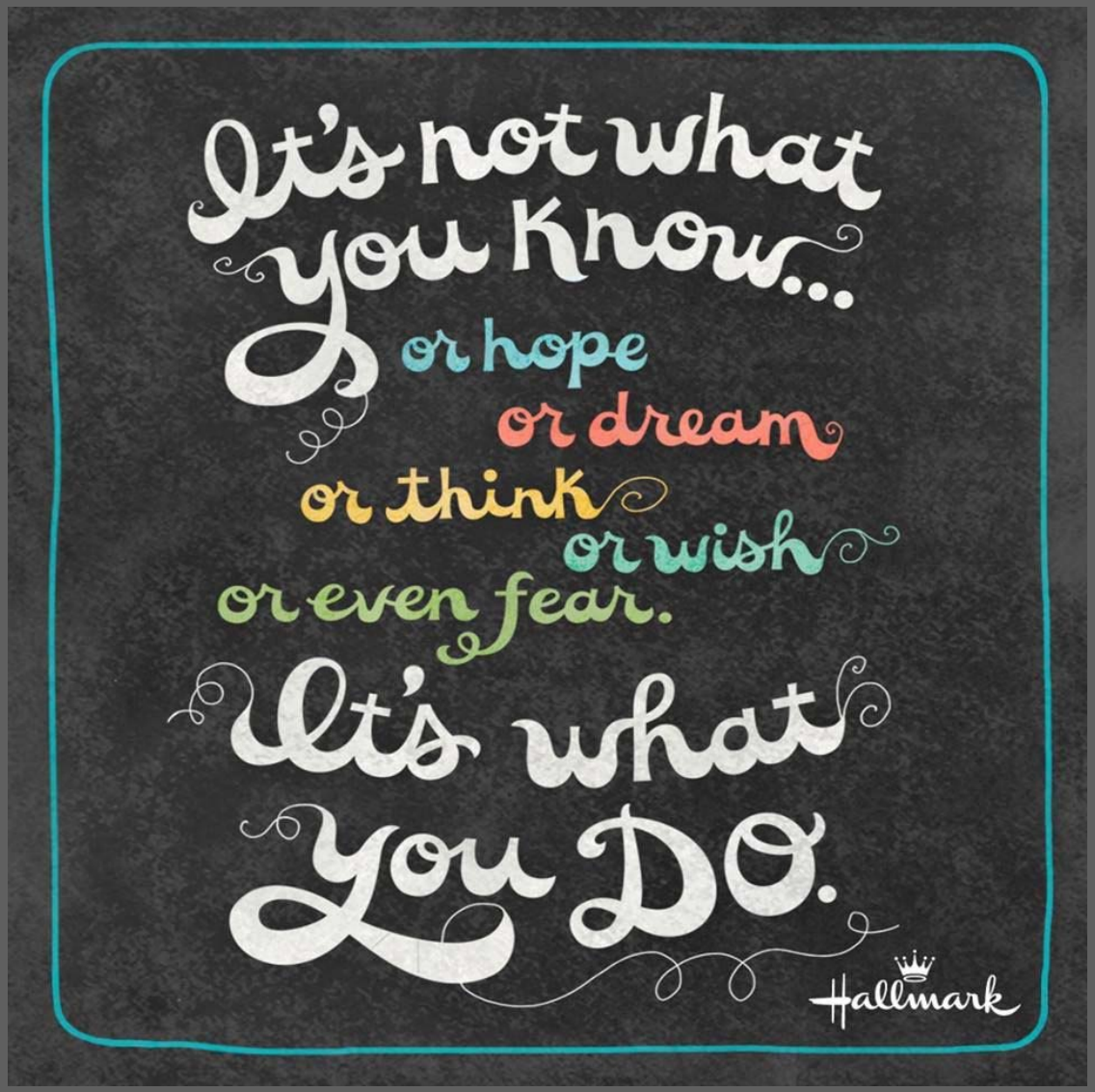
People with post COVID-19 condition, also known as long COVID, may have difficulty functioning in everyday life. Their condition may affect their ability to perform daily activities such as work or household chores.

(See: https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-(covid-19)-post-covid-19-condition)

Tools for you Toolbox

- Food as medicine
- Circadian rhythms (mast cells have own circadian clock)
- Exercise regularly to retrain mast cells
- Medications (cromolyn sodium, H1 & H2 receptor blockers, famotidine (pepcid), aspirin, prednisone, ibuprofen, vitamin C, vitamin D3)
- Stress management interventions (mindfulness, yoga, tai chi, music, creative arts, exercise, walking)
- Sandra Den Braber, RN, masks


Bridging the Gap:
Educate Yourself &
Educate Others


It's not what you know...
or hope
or dream
or think
or wish
or even fear.
It's what you DO.
Hallmark

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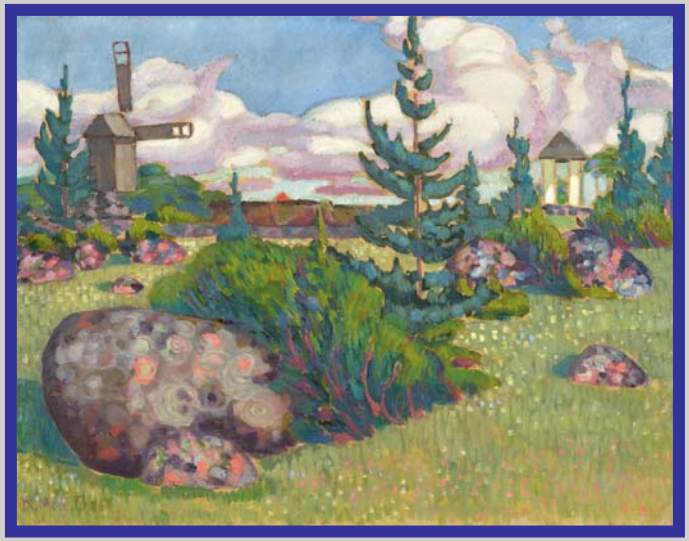

Artwork & Artist:

Konrad Magi – pgs 1, 5, 35, 43, 44
(1 Nov 1878 - 15 Aug 1925)

One of the first modernist painters in Estonia and the Nordic countries, at the core of whose creative legacy are visionary landscapes. He only worked for sixteen years, yet the total volume of his work is estimated at around 400 paintings. In recent years his art has been discovered in Europe with multiple gallery showings. In addition to landscapes, Magi painted portraits, including several portraits of members of the women’s movement, and still lifes. He was the first director of Pallas, the first Estonian higher art school. He suffered with ill health throughout his creative career. He was 46 when he died. The whereabouts of more than half of his works are still unknown.

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Artwork & Artist:

Andre Derain – pgs 10, 14, 28, 41
(10 Jun 1880 - 8 Sept 1954)

Derain was born just outside Paris. In 1898, while he was studying to be an engineer, he took painting classes and met Matisse. It was Matisse who convinced Derain's parents to let him abandon an engineering career and devote himself solely to painting. Together they started the Fauvist movement. Derain died in France in 1954, at age 76, when he was struck by a moving vehicle.