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Perspective



# Environmental Exposures and their Relationship to Rheumatic Disorders

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## Introduction

What can healthy individuals and arthritis sufferers do to protect themselves from adverse environmental exposures and simultaneously maintain or improve their general well-being? Some of the answers are being provided by a relatively new organization called REACT Rheum, which disseminates information to physicians and patients about the potential impact of toxic environmental exposures on rheumatic diseases. Rheumatology directed action for environmental health occurs in concert with other organizations, including (but not limited to) The Autoimmune Association, The Lupus Foundation of America, and The Arthritis Foundation. Together, they rely on data driven information to effectively transmit reliable advice.

Peer reviewed publications in reputable medical journals have previously outlined a myriad of harmful exposures and lifestyle factors capable of activating the immune system [1-3]. Some of these include air pollution, extreme weather events, radiation, wildfires, UV light, microplastics, infectious diseases, ultra-processed foods, diets rich in sugars and fats, non-restorative sleep, persistent stress, medications, hormones, heavy metals, high tension power lines, smoking, alcohol, obesity, and chemical contamination of multiple environmental compartments. Some of these entities have also been implicated as etiologic factors for neurologic fatiguing syndromes, where overlapping biochemical and immunological disturbances coexist (e.g., fibromyalgia, myalgic encephalomyelitis/chronic fatigue syndrome or ME/CFS, small fibre neuropathy, postural orthostatic tachycardia syndrome or POTS, and dysautonomia) [4-7]. Causative mechanisms producing immune dysfunction include epigenetic modifications, neuroendocrine dysregulation, DNA damage, molecular mimicry, isoform synthesis, citrullination, hapten formation, and modulation of immune cell signalling [2]. Causative mechanisms producing biochemical disturbances have primarily focused on mitochondrial dysfunction, alteration of G protein coupled receptors, enzymes regulating the interactions of multiple neurotransmitters, channel proteins regulating cell membrane ion flow in nerve conduction pathways, the GAD65 enzyme responsible for the production of GABA (gamma amino butyric acid), metabolomic alterations, GI dysbiosis, reactivation of previously acquired viruses, and heparin sulfate and chondroitin sulfate matrix macromolecules that (a) bind the preformed mediators of inflammation inside mast cells, (b) are components of sensory nerve receptors, (c) regulate platelet

activation (e.g., platelet factor 4), and (d) comprise the serine protease enzyme affinity site that cleaves BDNF (brain derived neurotropic factor) into an active molecule [4-7].

Two types of chemical exposures capable of causing all of the biochemical disruptions noted above, as well as epigenetic modifications and DNA damage, have been at the centre of intense controversy for nearly four decades. They are silicones and vaccines, both of which have been repetitively misjudged regarding (a) mechanisms of disease causation, and (b) environmentally induced diseases (including neurologic fatiguing syndromes) [5-12]. Silicones belong to a family of chemicals known as organosiloxanes, molecules that contain artificial silicon-carbon bonds. No animals on land nor in the sea nor in the air, nor any other living organisms on planet earth (e.g., bacteria, viruses) are capable of synthesizing organosiloxanes. Yet more than 60,000 of these chemicals have been manufactured by chemists over the past ninety years, and they are present in thousands of commercial products (breast implants are just one of these products) [6]. Organosiloxanes and their degradation products (e.g., silanols) now contaminate every worldwide environmental compartment, and both have now been identified in humans and a variety of wild animals. At least 21 different vaccines contain hidden organosiloxanes, but the Food and Drug Administration (FDA) in the USA does not require silicones to be listed as ingredients [12]. At least four vaccines contain hidden volatile organic compounds in the benzene and toluene families (Gardasil, Hepatitis B, and the mRNA Covid-19 vaccines manufactured by Pfizer and Moderna). The biochemical disruptions following exposures to organosiloxanes and/or volatile organic compounds can translate into a multitude of seemingly bizarre clinical phenomena. These include (but are not limited to): fatigue, exercise intolerance, arthralgias, dry eyes and dry mouth, cognitive dysfunction, myalgias, weakness, hair loss, itching, skin rashes, paraesthesia's, dysesthesias, headaches, dizziness, nausea, loose stools, palpitations, chills, abdominal pain, chest pain, shortness of breath, anxiety, blurry vision, disturbed sleep, recurrent sinusitis, muscle twitching, skin pigment changes, easy brushability, nail cracking and splitting, periodontal decay, Odor and smell hypersensitivity, medication intolerance, and even death [9-11,13,14]. A recent publication has proposed a new theory for identifying the population at risk for vaccine-induced toxicity prior to immunization [15].

The presence of a positive ANA (antinuclear antibody) test in up to one-third of individuals suffering from organosiloxane toxicity can be quite perplexing to patients and their health care providers. It often leads to other exhaustive lab tests without any additional clarification. The mechanism for this anomaly is dysfunction of mitochondrial quantum tunnelling (the process of oxidative phosphorylation via the electron transport system to facilitate the production of energy in the form of ATP). The enzymes directing the flow of electrons to their final receptor, oxygen, incorporate the cofactors iron and copper in their structure. This is why phosphorus is metal ion bound in energy systems. Although the element silicon forms four bonds like carbon, silicon behaves like a metal at times and is capable of interfering with enzyme functions involved in electron transport. The net result can be energy disruption and the formation of oxygen derived free radicals. Energy disruption may impair the phosphorylation of the JAK-STAT3 signalling pathway proteins which are (a) intimately involved in gene transcription, and (b) have been shown to be functionally abnormal in certain T cell subsets comprising anaplastic large cell lymphomas [16,17]. Thus, oxygen derived free radicals may not only damage cells, but they can also facilitate changes in epigenetic factors which, in turn, can adversely alter gene expression in both mitochondrial DNA and cellular DNA. Indeed, organosiloxanes are capable of producing dramatic changes in the electromagnetic fields of virtually all life sustaining molecules, highlighting the vast biochemical differences in living organisms between silicon linked to oxygen (the normal) versus silicon linked to carbon (the abnormal). Volatile organic compounds are also capable of producing autoimmune and inflammatory markers, immune dysfunction, faulty transcription activity, neuroinflammation, and cellular damage [18,19].

The vaccine controversy between pro-vexers and anti-vaxxers has, up to now, transpired in a vacuum, primarily because the hidden chemicals in vaccines (both organosiloxanes and volatile organic compounds) have mostly gone unnoticed. In light of this, rheumatologists and neurologists might consider reanalysing their reliance on molecular mimicry mechanisms thought to be responsible for vaccine induced classical autoimmune disorders (e.g., systemic lupus erythematosus, Guillain-Barre, rheumatoid arthritis). Proponents of vaccine induced autism might also find it beneficial to shift their research focus. Even researchers reporting on the increasing prevalence of positive ANA tests in the general population, which is now nearly 20% in the 12-19 age group, do not mention vaccines as a potential contributing factor [20].

It is becoming increasingly obvious that a broad variety of environmental exposures can simultaneously orchestrate multiple biochemical disruptions and immunologic disturbances in any single individual, all of which are capable of circuitously augmenting each other. Once underway, these events are subsequently capable of initiating distinct rheumatologic disorders, neurologic fatiguing syndromes, and multiple other adverse clinical phenomena. We are reminded once again that genetic susceptibility and the environment go hand in hand.

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## Conflict of Interest

No conflict of interest.

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