**AUTOIMMUNE DISEASES AND METAL IMPLANTS AND DEVICES**
**Originally Written April 11, 2018; Last Updated October 30, 2019**
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***Dedicated to the late Vera Stejskal, PhD, whose life's work is featured in this article***

## Introduction to autoimmune diseases and metal implants and devices

There are over 80 recognized autoimmune diseases, with some of the most common being diabetes, lupus, multiple sclerosis, rheumatoid arthritis, and celiac disease.[1] In the United States, estimates of people afflicted by these debilitating health conditions range from 14.7 million to 50 million.[2] The majority of those suffering from autoimmune diseases are women, and the consensus among health groups and researchers alike is that autoimmune diseases are on the rise, with more and more people being stricken with these illnesses each year.

In spite of this growing problem and the increasing burden it carries for patients, their families, the medical community, and society at large, there are still massive gaps in scientific knowledge about autoimmune diseases. However, it is generally agreed that these illnesses are related to genetics and environmental factors. ("Environmental factors" is a phrase that encompasses all aspects of the environment with which humans interact, including bacteria, viruses, chemicals, etc.).

In particular, along with recognizing genetic components of autoimmune diseases, researchers have clearly identified that these health conditions can be caused by metals, pharmaceutical drugs, pollen, infectious agents, molds, and food allergies (such as gluten).[3] The fact that the average person's overall exposure to chemicals, including metals, has drastically increased over the past century cannot be overlooked when discussing the synonymous rise of autoimmune illnesses. Dr. Vera Stejskal has explained: "Disregulation of the immune system by chemicals may be one of the reasons why the frequency of allergies and autoimmune diseases increases."[4]

## What is autoimmunity and how does it relate to metal implants and devices?

In simple terms, autoimmunity can be defined as a misdirected immune response that occurs when the immune system attacks the body, resulting in autoimmune disease when there is a progression to pathogenic autoimmunity.[5] Allergy and autoimmunity share characteristics in that both are triggered by an abnormal immune response and both can produce local and systemic inflammation.[6]

Metals have been widely recognized as one of the triggers capable of producing such inflammation. In a 2014 publication, Dr. Vera Stejskal wrote: "Metal-induced inflammation may be involved in the pathology of various autoimmune and allergic diseases, where abnormal fatigue, joint and muscle pain, cognitive impairment and other non-specific symptoms are often present."[7]

In this regard, it is suspected that metal ions released from dental and medical implants and devices can cause inflammation in susceptible subjects.[8] The release of metal ions from these implants and devices occurs locally (i.e. at the site of the implant/device), but the metal ions are processed both locally and in other parts of the body, and this can prompt an immune reaction.[9]

Reactions are more likely to occur for individuals who are genetically predisposed to having lower excretion rates of metals,[10] as well as other individualized factors. For example, Dr. Ivan Sterzl and his colleagues have reported: "Hypersensitivity to metals results in [a] wide range of clinical and sub-clinical symptoms such as chronic fatigue, depression, sleep disturbances and others. Patients with these symptoms often report intolerance to metal earrings and other metallic devices such as jeans buttons, watches, and intrauterine devices."[11]

## Autoimmune diseases associated with metal implants and devices

Reactions to metal implants and devices can be manifested on the skin or in the oral mucosa, but they can also include more complex immune reactions at the site of the implant (local), at other parts of the body, and/or throughout the body (systemic). Even trace amounts of metals can potentially cause a reaction.[12]

While numerous health conditions have been related to the presence of metals in the body, this report focuses on autoimmunity. Because autoimmune diseases include more than 80 health conditions, the table below represents an abridged list of autoimmune illnesses that have been associated with metals used in dentistry and medicine, including metals in implants, devices, and adjuvants (substances added to vaccines such as aluminum and mercury). Citations for the table are likewise truncated, as there are a large number of scientific research articles about this topic.

**Abridged List of Autoimmune Diseases Associated with Metals Used in Dentistry and Medicine**

| | |
|---|---|
| Amyotrophic Lateral Sclerosis (Lou Gehrig's Disease) [13 14 15] | Autoimmune Thyroiditis[16 17 18 19 20 21 22] |
| Autoimmune/Inflammatory Syndrome Induced by Adjuvants (ASIA)[23 24 25 26] | Autoimmune Disorders/ Immunodeficiency (in general)[27 28 29 30 31] |
| Chronic Fatigue Syndrome (Myalgic Encephalomyelitis/Chronic Fatigue Syndrome)[32 33 34 35 36 37 38 39 40] | Crohn's Disease[41] |
| Diabetes (Type 1 Mellitis)[42] | Fibromyalgia[43 44 45 46] |
| Gulf War Syndrome[47 48] *(listed separately here, although technically classified as ASIA)* | Lupus (Systemic Lupus Erythematosus)[49 50] |
| Macrophagic Myofasciitis[51 52] *(listed separately here, although technically classified as ASIA)* | Multiple Sclerosis[53 54 55] |
| Oral Lichen Planus[56 57 58 59] | Rheumatoid Arthritis[60] |

## Sources of exposure from metal implants and devices that affect autoimmunity

Metals are ubiquitous in our daily lives, and it is basically impossible to eliminate exposure to them given their presence in our air, water, food, and an increasing number of consumer products. Some metals are recognized as essential to human life and serve important roles within the human body, including chromium, cobalt, copper, iron, manganese, molybdenum, and zinc.[61] However, the beneficial effects of trace elements are based on safe and adequate intake levels, with too little resulting in deficiencies and too much resulting in toxicities.[62]

Other metals used in dentistry and medicine have no established function in the human body, and in addition to aluminum, which is both a neurotoxin and an immune stimulator,[63] these include gold, mercury, nickel, palladium, platinum, silver, and titanium.[64] Mercury is recognized as being toxic to humans even in low doses,[65] and researchers have identified chromium, cobalt, copper, gallium, gold, iron, lead, manganese, mercury, nickel, platinum, silver, tin, vanadium, and zinc (among others) as metals of concern due to residential and occupational exposure.[66]

Researchers have also established that chronic exposure to low doses of metals can elicit autoimmunity in genetically susceptible humans.[67] Dr. Ivan Sterzl and his colleagues have elaborated: "The key factors governing the harmfulness of metals are the cumulative concentration, duration of exposure, and genetic susceptibility. Many harmless metals may become allergens or exert toxicity if administered on a chronic basis."[68]

Dental and medical implants and devices placed directly into the human body merit significant consideration when evaluating the impact of metal exposure levels, especially in susceptible populations. This scrutiny is particularly crucial because the use of metals in dentistry and medicine continues to rise,[69] as the table below helps to demonstrate, even though it is only an abridged list.

**Abridged List of Metals Used in Dentistry and Medicine**

| **Product** | **Metals** |
|---|---|
| Dental Bridges, Crowns, Partial Dentures, and Implants | • These items can contain aluminum, chromium, cobalt, copper, gallium, gold, indium, iridium, iron, manganese, nickel, palladium, platinum, silver, titanium, vanadium and more.[70] [71] [72] [73]<br>• Items made of cobalt-chromium-molybdenum steel contain those elements in addition to aluminum, nickel, titanium, and others.[74]<br>• Research has found that some of these dental materials can contain lead.[75] |

| | |
|---|---|
| Dental Fillings | • Amalgam (silver) fillings contain about 50% mercury mixed with copper, silver, and tin, and they can also contain zinc[76] and other metals,[77] including lead and cadmium.[78]<br>• Some composite fillings, as well as dental cements and root-fillings, can contain titanium dioxide.[79]<br>• Dental gold alloys can also contain copper, gallium, indium, iridium, palladium, nickel, silver, tin, titanium, and zinc,[80] as well as beryllium.[81] |
| Gynecologic Devices | • Some intrauterine devices (IUDs) contain copper,[82] and possible contaminants include manganese, nickel, and zinc.[83]<br>• Permanent contraceptive devices and clips (i.e. tubal ligation) can contain nickel and titanium.[84] |
| Intravascular Devices (i.e. coronary stents, perforated foramen occluders, pacemakers, and implantable defibrillators) | • Cardiac/intravascular devices can be made of stainless steel[85] [86] (which can contain chromium, manganese, molybdenum, and nickel[87]).<br>• They can also be made of chromium, cobalt, molybdenum, and/or nitinol (which is 45% nickel and 55% titanium).[88]<br>• Stents can be coated in gold.[89]<br>• Pacemakers can contain aluminum, nickel, and titanium,[90] and can be coated in gold.[91] |
| Medication | • Pills can contain titanium dioxide and other metal oxides.[92]<br>• Antacids can contain aluminum.[93] |
| Orthodontic Appliances (i.e. bands, braces, brackets, retainers, and wires) | • These can contain nickel[94] [95] [96] [97] and titanium.[98] [99]<br>• They can also contain aluminum, chromium, cobalt, copper, iron, molybdenum, niobium, and vanadium,[100] as well as silicon and other elements.[101] |
| Orthopedic Implants (i.e. hip replacements, screws, nails, and clips) | • These often contain chromium, cobalt, nickel, and/or titanium.[102]<br>• Items made with stainless steel[103] contain a large amount of nickel[104] with chromium, manganese, and molybdenum,[105] in addition to other elements.[106]<br>• Items made with cobalt-chromium molybdenum steel contain those elements in addition to aluminum, iron, manganese, nickel, titanium, and tungsten.[107]<br>• Items made with titanium can also contain aluminum, vanadium, trace amounts of nickel,[108] and other elements.[109]<br>• Items made with nitinol contain nickel and titanium.[110]<br>• Items made with Vitallium™ contain cobalt, chromium, manganese, molybdenum, iron, and other elements.[111] |

| | |
|---|---|
| Surgical Clips and Staples | • Items made with stainless steel can contain chromium, manganese, molybdenum, nickel, and other elements.[112]<br>• Items made with titanium alloy contain aluminum, nickel, titanium, and vanadium.[113] |
| Vaccines/Flu Shots/Immunoglobulin Preparations | • These can contain aluminum[114] [115] and/or mercury (as thimerosal).[116] [117] [118] |

**Additional considerations for metal exposures:**

- Cigarette smoke
- Coins
- Containers including beverage cans and canned food
- Cookware and utensils
- Cosmetic products
- Detergents
- Diet (i.e. fish containing mercury; foods high in nickel such as chocolate, nuts, oatmeal, soya beans, etc.)
- Eye drops, contact lens solution, and eyeglass frames
- Jewelry, belts, watches, accessories, etc.
- Occupational exposures
- Pipes for drinking water, etc.
- Pollution
- Sunscreen
- Toothpaste
- Well water
- Other consumer products

## Metal implants and devices and adverse reactions related to autoimmune diseases

To reiterate, metals such as aluminum and mercury are known to be toxic to humans, and it might seem like a moot point to discuss adverse reactions to toxic chemicals. It should also be emphasized that exposure to any metal can elicit a harmful reaction. However, since these metals are still being used in dentistry and medicine, once these obvious dangers are acknowledged, it is helpful to chronicle the array of adverse reactions that can occur with metal exposures, which include toxicity, allergies, and more.

First, it must be understood that genetics play a role in a person's unique response to metal exposure. Jenny Stejskal, MD, and Vera Stejskal, PhD, have explained: "Depending on genetically determined detoxification systems, an individual may tolerate more or less exposure to toxic metals before showing adverse effects. The immunological effects of metals are either non-specific such as immunomodulation or antigen-specific such as allergy and autoimmunity."[119] What this means is that patients sensitive to metal can experience reactions in the oral mucosa or skin and/or fatigue and autoimmune diseases.[120] [121]

Another important factor to consider is the release of metal ions, which can increase the possibility of an immunologic or toxic reaction.[122] The release of metal ions from metal implants and devices can occur due to mechanical wear, cellular processes, and corrosion from contact with biological fluids such as blood,[123] sweat,[124] and saliva.[125] [126] Electrolytic conditions in the body can also provoke corrosion of metals by generating electrical currents in a phenomenon known as galvanism. This can occur when a combination of metals interacts with other elements in the body. For example, the combination of mercury and gold in the mouth (with saliva serving as the electrolyte) has been recognized as the most common cause of dental galvanic corrosion.[127] Yet, other metals used in dentistry can similarly produce this effect.[128] [129] As another example, fluoride-containing mouthwash has been recognized as a factor in the corrosion of orthodontic appliances (with the galvanic coupling of metallic orthodontic wires and brackets).[130] Fluoride has also been linked to the corrosion of titanium dental implants[131] and dental amalgam fillings (all of which contain approximately 50% mercury).[132]

In some genetically susceptible individuals, metals can also trigger allergies.[133] Dr. Vera Stejskal conducted a series of studies that evaluated patients with suspected reactions to their metal devices and implants. Patients were tested for metal hypersensitivities, and results were collected that demonstrated the prevalence of these metal hypersensitivities. While each study included testing for different metals, the studies collectively identified nickel as the most common sensitizer, followed by other metals, including inorganic mercury (i.e. dental amalgam mercury), thimerosal, lead, cadmium, palladium, and gold.[134] [135] [136] [137] [138] Dr. Stejskal also noted that the frequency of titanium allergy is increasing.[139]

Documented rates of metal allergy in other research support Dr. Stejskal's findings and establish that millions of Americans are in danger of having a reaction to dental amalgam fillings and/or medical implants placed into their bodies. According to data presented in a study published in 2018 that used North American Contact Dermatitis Group (NACDG) patch testing results from 5597 patients, nickel was the most commonly detected allergen at 17.5%, and cobalt was the second most common metal allergen at 6.2%.[140] Another study published in the same edition of the journal *Dermatitis* was conducted on 686 adults who were patch tested with the NACDG series and demonstrated that "38.9% of patients had 1 or more positive patch-test reactions to a metal allergen, most commonly nickel (17.4%), mercury (12.3%), and palladium (9.2%)…Among patients with positive reactions to nickel, 34.5%, 15.1%, and 5.0% had positive reactions to 1, 2, or 3 additional metals, respectively."[141]

Both of the studies mentioned above involved individuals with suspected allergies; yet, the statistics are relevant, as studies involving the general population and the prevalence of metal allergies are rare.[142] Nonetheless, recent studies and reports tend to agree that metal allergies are on the rise.[143] [144] Part of this could be caused by increased exposure to metals, including ear/body piercings, because exposure to metals has been cited as a potential trigger for the development of allergies to them.[145] It has also been hypothesized that contact with metals during an infection could increase chances of developing a metal allergy later in life.[146] At any extent, in a 2016 review, researchers from Harvard School of Medicine qualified: "Dermal hypersensitivity to metal is common and can affect up to 15% of the population."[147]

However, one issue with calculating the number of patients with adverse reactions to a metallic material is that the onset of symptoms can be delayed and therefore might not be associated with the implant or device. For example, researchers writing about dental amalgam fillings warned: "Sensitization appears most frequently after the amalgam has been present in the mouth for more than 5 years."[148] Another issue is that there may not be any local reaction to help the patient and doctor identify the metal as the culprit in ill health,[149] and even if hypersensitivity reactions are noticed, they can be misdiagnosed as infection.[150]

Clinical screening for metal allergy has been recommended,[151] and the importance of patients reporting reactions to metals to their doctors has also been emphasized in the scientific literature.[152] [153] [154] [155] [156] [157] In addition to reporting any rashes from jewelry, watches, or other metal exposures, it is essential for each patient to recognize the gamut of symptoms that can be related to the presence of a metal implant or device in their body. **It is also vital for patients to remember that sensitization to metal can develop years after an implant or device has been placed and that adverse effects can occur *with or without* the sign of a rash or eruption on the skin or in the mouth.**

Allergy testing can be used to assist in identifying some of the individuals susceptible to adverse reactions to metals. Patch testing is generally regarded as the "gold standard" in allergy testing; however, patch testing has also been criticized because it involves directly applying the allergen to the skin, it can exacerbate symptoms in patients, it can result in sensitization, and the results can be affected by other conditions.[158]

One relatively new alternative to skin patch testing is known as the Lymphocyte Transformation Test (LTT), which was first used in the 1960s to evaluate certain types of antigens. Two relatively new alternatives to skin patch testing are a modified version of the Lymphocyte Transformation Test (LTT) known as MELISA[159] and the Lymphocyte Response Assay (LRA) by ELISA/ACT.[160] The MELISA test was introduced by Dr. Vera Stejskal in 1994 to test for type IV delayed hypersensitivity to metals, including sensitivity to mercury.[161] Much of Dr. Stejskal's work has involved using the testing to help diagnose patients with reactions to metals, thus facilitating the decision to have the metal implants and devices safely removed and replaced with safer alternatives, and then, recording the health outcomes, the majority of which have involved significant improvement.

Another option for testing has been created specifically for dental materials. If this biological testing is used, a patient's blood sample is sent to a laboratory where the serum is evaluated for the presence of IgG and IgM antibodies to the chemical ingredients used in dental products.[162] The patient is then provided with a detailed list of which name-brand dental materials are safe for their use and which ones could result in a reaction. Two labs that currently offer this service are Biocomp Laboratories[163] and Clifford Consulting and Research.[164]

Unfortunately, in some reported cases, the only way to fully establish that a metal implant or device was causing health problems was to have it removed and then document the results. Researchers from Harvard School of Medicine wrote in 2016: "Paradoxically, a patient can sometimes only be diagnosed with metal allergy when the symptoms resolve upon replacement with an immunologically inert implant."[165]

**Removal of metal implants and devices and potential recovery from autoimmunity**

Removal of metal implants and devices is an obvious course of action when adverse effects occur. Indeed, the scientific literature is abundant with studies and cases of individuals improving or recovering from autoimmune diseases ***usually within a year or two after removal*** of the offending metal, as the following table of selected examples from research shows:

**Sampling of Research Documenting Improvement in Autoimmunity upon Metal Implant/Device Removal**

| **Health Condition/s Improved or Recovered** | **Implant/Device Removed** |
|---|---|
| Amyotrophic Lateral Sclerosis (Lou Gehrig's Disease) Variant: Progressive Muscular Atrophy | Metal denture and titanium screws in knee, among other therapies[166] |
| Autoimmune Thyroiditis/ Fatigue | Dental amalgam mercury fillings[167] [168] [169] [170] |
| Autoimmune/Inflammatory Syndrome Induced by Adjuvants (ASIA) | Nickel-titanium chin implant[171] |
| Chronic Fatigue Syndrome (Myalgic Encephalomyelitis/Chronic Fatigue Syndrome) | Dental amalgam mercury fillings and other metallic dental restorations[172] [173] [174] [175] [176] |
| Chronic Fatigue Syndrome (Myalgic Encephalomyelitis/Chronic Fatigue Syndrome) | Nickel clips from tubal ligation, dental amalgam mercury fillings and other metallic dental restorations[177] |
| Chronic Fatigue Syndrome (Myalgic Encephalomyelitis/Chronic Fatigue Syndrome) | Skull plate made of aluminum, titanium, and vanadium with nickel impurities[178] |
| Chronic Fatigue Syndrome (Myalgic Encephalomyelitis/Chronic Fatigue Syndrome) | Titanium screws in cervical vertebra and titanium dental implants[179] |

| | |
|---|---|
| Crohn's Disease | Dental amalgam mercury fillings and other metallic dental restorations[180] |
| Dermatitis | Cobalt-chromium prosthesis and dental amalgam mercury fillings[181] |
| Dermatitis | Copper IUD[182] |
| Fibromyalgia | Dental amalgam mercury fillings and other metallic dental restorations[183] [184] [185] |
| Multiple Sclerosis | Dental amalgam mercury fillings and other metallic dental restorations[186] [187] |
| Multiple symptoms including fatigue, pain, depression, and headache | Dental amalgam mercury fillings and other metallic dental restorations[188] |
| Oral lichen planus | Dental amalgam mercury fillings and other metallic dental restorations[189] [190] |
| Sjögren's Syndrome | Dental amalgam mercury fillings and other metallic dental restorations[191] [192] |
| Systemic Lupus Erythematosus | Dental amalgam mercury fillings[193] |

The removal of metal implants and devices should only be conducted by a qualified healthcare professional. This is because an unsafe removal process can cause serious injury (and even death) to the patient, in addition to the possibility of increased metal exposure. For example, if dental amalgam fillings are removed unsafely, patients can be exposed to increased levels of mercury. In her research, Dr. Vera Stejskal specifically warned about applying safety measures during amalgam filling removal.[194] [195] Furthermore, in a clinical study published in 2013, Dr. Paolo Pigatto and his colleagues reported "one major adverse outcome related to dental amalgam removal without safe procedures,"[196] but no side effects were reported with a safe and effective dental amalgam removal.[197]

Based on scientific research, the International Academy of Oral Medicine and Toxicology (IAOMT) has developed recommendations known as the Safe Mercury Amalgam Removal Technique (SMART) to assist in mitigating the potential negative outcomes of mercury exposure during amalgam removal.[198] The IAOMT also offers education about alternatives to dental amalgam fillings so that patients can opt for a more "biocompatible" replacement (i.e. one that is best suited for the patient based on safety and personal healthcare needs).

It is important to note that other factors can influence whether or not a patient improves after the removal of a metal implant or device. While many patients improve or even recover, there are some who do not. One obvious reason for this is if the patient is still being exposed to the metal or a different sensitizer through another implant, device, or other source. In a most unfortunate circumstance, patients can even have a reaction to the new implant or device. Thus, it is critical to select a biocompatible replacement. Fortunately, in most cases, metal-free devices such as ceramic options are now available.

Dr. Vera Stejskal has also noted that in order to get well, some patients further require the eradication of *Heliobacter pylori*,[199] the cessation of smoking,[200] [201] and/or the adoption of a low nickel diet.[202] [203] Some medical professionals and researchers have also suggested the need for detoxification and supplements to assist the body in recovering from metal exposure.

Additional impediments in achieving improved health can include the presence of another illness and/or allergy, exposure to certain pesticides, solvents, molds, and foods, hormonal imbalances, stress, a sedentary lifestyle, and countless other factors. For all these reasons and more, it is imperative for patients battling autoimmune diseases to work with their doctors and other healthcare professionals so that toxins and allergens are kept out of their bodies and healthier, safer options are put in to replace them.

*For more information about the research of Dr. Vera Stejskal, visit [http://www.melisa.org/articles/](http://www.melisa.org/articles/).*

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