

## Antioxidant Therapy using Electrochemistry and the Naked Electron

Electrons are often seen only as the “active ingredient” in electricity. They run through the wire and cause magnetic fields, heat, and light emission. When enough electricity flows through a person, muscles spasm, such as with the effects of an electric massager, TENS unit or Taser. This is the flashy, exciting side of electricity-the part that makes it into classrooms and TV shows.

Electrochemistry is a difficult to understand “engine room”. We depend upon this part to work, but don’t have to understand anything about it. Among scientists it is becoming a dying art and is often seen as a relic of the early days of science where all the doors have been opened and all of the rooms explored, with modern efforts focused on how to get the accepted parts to work better. Longer lasting batteries etc.

This is perhaps why electrochemical understandings needed to make batteries operate have not transferred to biology until now. A half-cell equation is essential to electrochemistry. When the half-cell voltages are summed up, they help determine whether a reaction might be spontaneous. You can think of a positive voltage as a downhill coast and by contrast, if a reaction’s voltage is negative then there is an uphill climb and the reaction is not spontaneous.

Consider the half-cell reactions that occur between magnesium and a hydroxyl radical. The sum of these two components is a very large (for electrochemistry) voltage of +4.75V. Magnesium metal (the anode) is ready to give up two electrons while the two hydroxyl radicals (the cathode) are ready to take them. Because the voltage difference is so great, the electrons do not have to transfer between reactants in direct contact, and these electrons can transfer through the flesh over fairly large distances of at least two feet.

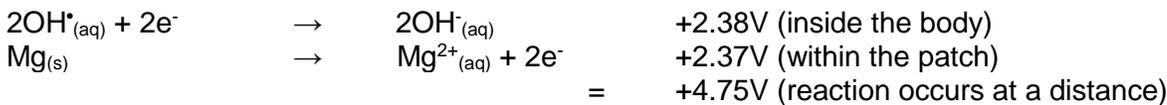


Figure 1- The reaction between electrons from magnesium and two hydroxyl radicals produces hydroxide ions (OH<sup>-</sup>) and a magnesium ion (Mg<sup>2+</sup>).

This leads us to discuss the resistive nature of the flesh. The resistance of the body varies greatly depending upon the tissues and the distance the electrons must travel to pass from the anode to the cathode. Bare skin has a very high resistance, the subcutaneous fat has a fair amount of resistance, but the extracellular matrix and tissues beneath this offer much less resistance. As the electrons travel through these tissues, the voltage available for reaction decreases in a phenomenon called voltage drop. If too much voltage drop occurs there is no remaining voltage to make the reaction spontaneous, so this summation of resistance determines the distance at which a radical can be neutralized by an electron from magnesium. Fortunately most aches and pains in the body are within the range of the Heliopatch.

Placing the patch as close to the site of pain as possible leads to fairly rapid pain relief, but we have noticed that larger layers of fat reduce the magnitude of the effect because of resistance. Likewise, if the patch is placed on an extremity, there is much less tissue through which the electrons can be distributed, so the effects are stronger here than in the core of the body. The effects of the naked electrons are still potent in these places, but the patch will have reduced impact per unit time but will have a longer time over which it can be used. If a user wants more relief than one patch can provide for these areas, we have found that more patches produce a greater impact.

We have found that electrochemistry, inflammation and pain are all intrinsically linked. All of the things that the body responds to inflammation with such as swelling, edema and redness can all be countered by taking away the root cause- free radicals. While these other secondary effects allow doctors to diagnose inflammation, they are just symptoms. Pain is the most immediate symptom and the most quickly relieved.

Beyond the symptoms of pain and obvious problems caused by injury and inflammation, there are the performance enhancing effects in normal individuals with no obvious problems. Eliminating the background noise of inflammation can let top performers find their new peak.