Self –Regulation and the Immune System

The concept that we can modulate immune response through neurofeedback is a logical extension of currently accepted procedures and protocols. The extensive body of literature in psychoneuroimmunology (PNI) may lead one to wonder why this is not one of the primary areas of research utilizing biofeedback and neurofeedback.

A relatively new field called "immune-endocrinology" is uncovering numerous bilateral interactions between the immune system and neuroendocrine4 circuits. Evidence indicates that an immune-endocrine feedback loop, termed "immune-hypothalamo-pituitary-adrenal system", is an integral part of the regulation of self tolerance. Pathology within this system is related to development of autoimmunity, a discovery that may lead to new prophylactic and therapeutic strategies. Many journals are dedicated to research that exposes the complex homeostatic mechanism in the immune system as it responds to stress, pathogens, trauma, pain, toxins, as well as positive life experiences. The application of neurofeedback techniques that reorganizes and reorients brain electrical activity can be used to positively modulate the immune response.

As it functions, the brain produces minute electrical signals on its surface called brain waves. Brain waves constantly change as the brain handles the business of dealing with itself and its environment. For over fifty years this electroencephalographic (EEG) activity has been used for neuroanalysis (e.g., diagnosis of brain disease or injury). With the advent of fast computers, researchers are now able to quantitatively analyze the frequency and amplitude of brain waves to form complex topographic "maps" of the EEG's power and frequency distribution for more accurate and effective diagnoses. They found that abnormal behavior often corresponded to abnormal brain wave patterns and disturbances.

Conclusive research indicates that certain types of abnormal brain functioning can be corrected by learning to operantly condition the brain's electrical activity. This conditioning is accomplished by visual and/or audio feedback of the moment-to-moment activity of the EEG. This visual/audio EEG feedback is used by the patient to learn to increase or decrease the power and/or percentage of selected brain wave frequencies. This conditioning or training is called neurotherapy.

Neurotherapy is proving to be medically effective because it facilitates positive neurochemical, personality and behavioral changes in relatively short time periods (weeks vs. months or years). Moreover, it is cost-effective because it avoids the high expenses associated with surgery, drugs or long-term inpatient or outpatient therapy.

It is also widely accepted among researchers and clinicians that patterns of surface EEG activity reflect the activity of deeper brain structures and patterns of brain neurochemistry. For example, t hose brain neurotransmitters, opiods, neurohormones and neuropeptides associated with reward and internal feelings of well-being are influenced directly (and thus fluctuate widely) according to changes in cortical EEG patterns. Equally important, alcohol cravings and uncontrollable alcohol ingestion are now strongly associated with both deficiencies and/or abnormalities in certain brain neurochemicals (e.g., serotonin; opiod peptides including beta endorphin and enkephalin; norepinephrine; dopamine; and GABA) and poorly developed low frequency EEG rhythms (e.g., alpha and theta).

Consequently, as research has shown, the normalization of alpha and theta EEG rhythms via neurotherapy produces the same normalization of brain chemistry that is produced by either alcohol ingestion or the external manipulation of the excitatory and inhibitory processes that control these essential neurochemicals. In other words, the increased feelings of reward and internal well-being that occur from alcohol ingestion or other external influences of brain neurochemistry are also produced by the normalization of alpha and theta rhythms via neurotherapy.