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BLOOD HISTAMINE LEVEL AS A FACTOR IN SKIN CONDUCTANCE AND RESPONSE

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Venables and Christie in their chapter "Mechanisms, Instrumentation, Recording Techniques and Quantification of Responses" state that the range of expected values for human subjects for skin conductance level (SCL) runs between 2 and 100 umho/cm^2. With such a wide range of expected values the use of SCL as a measure of sympathetic activation or autonomic arousal is significantly compromised. Clinically speaking, it is uncomfortable for the new biofeedback client to notice that he or she is 0 umho or almost 0 umho on SCL and shows little or no skin conductance response (SCR). Nor is it reassuring to tell him that no "normal" ranges have been established for electrodermal activity. If skin conductance data is to be useful clinically, some explication of the extremes of SCL found among human subjects should be researched. The experimental design which follows deals with the role of histamine in skin conductance.

Carl C. Pfeiffer suggests a way of taxonomizing schizophrenia on the basis of blood histamine levels. A significant number of formerly psychotic patients have been referred to us for the treatment of "general anxiety." The psychotic behavior of such clients was frequently characterized by delusions, hallucinations and severe disperception of time, self, and others with disconnected thoughts and considerable confusion. Such clients in Pfeiffer's experience tend to have low histamine and high serum copper levels. He labels them histapenic. In spite of such a patient's self-perceived high anxiety, he or she tends to have a low SCL, EMG, and sometimes even warm hands, and tends to train poorly on SCL, SCR, and temperature.

The histadelic or high histamine schizophrenic clients tend to be referred to our biofeedback lab for treatment of severe headaches. Their symptomatology is frequently characterized by suicidal depression, obsessive-compulsive behavior or thought patterns, and occasional periods of blank-mindedness. Since Guyton and others implicate a histamine flooding of the nerve endings in the production of pain other than headache pain, it seems logical that patients with other types of chronic pain might be in this high histamine group. It has been our observation that these people tend to have high SCL and SCR scores.

The mechanism by which histamine might be postulated to affect SCL can be stated as follows:

Stimulation of the sympathetic nerves to the adrenal medullae causes both norepinephrine and epinephrine to be released into the circulating

blood and these two hormones in turn are carried in the blood to all tissues of the body. Epinephrine triggers a cyclic AMP (cAMP) "first message" which is read at the cell surface which stimulates an increase in membrane-bound adenyl cyclase. This enzyme generates cyclic 3, 5 AMP (adenosine monophosphate) from ATP (adenosine triphosphate) inside the cell. Whenever the intracellular concentration of cAMP reaches a certain level, the cell is stimulated to secrete its intracellular store of hormone, lipid, water or whatever. It is at this point that histamine is released in the local tissue involved such as the palms or digital surfaces. Since "histamine is a potent pharmacologic amine that causes dilation of the capillaries, increased permeability and contracture of the smooth muscles," epidermal moisture levels increase, thereby increasing the SCL.

The experiment which follows was set up to test the hypothesis that blood histamine levels are positively correlated with SCL. Blood histamine levels are primarily based on assaying histamine in the basophils, while SCL is primarily dependent on histamine in the mast cells. It is therefore necessary to assume that in general basophil histamine levels and mast cell histamine levels are somehow systematically related to each other, in the absence of trauma of any kind at the location of any hypothesized mast cell comparative sampling.

SUBJECTS

Sixty-three consecutive two-day lab patients were selected from the new patient population of The Center for the Improvement of Human Functioning, a Wichita biochemical lab/wholistic medicine treatment center directed by the second author. The two-day lab patient is typically from out of the state of Kansas and receives an extensive psychophysiological evaluation which takes approximately two days, hence the name. Blood histamine levels are routinely run on all such two-day lab patients. The age distribution of clients in the sample was as follows: age 0-19: 5; 20-39: 30; 40-59: 23; over 60: 5. The sex distribution was 33 females and 30 males.

METHOD

On the second day of the two-day lab workup following the completion of the standard biochemical test regime each patient was seen by the first author for a 15-minute SCL/SCR data taking session. Each subject was hooked up to a standard ASI 3400 dermograph/5100 integrator using contact finger electrodes without paste or adhesive. They were then instructed to just relax on the recliner couch as if they were taking a nap. No scores were taken for a period of 3 - 5 minutes, or until the SCL indicator stopped consistent movement. Three consecutive one minute scores were then read from the ASI 5100 which was attached to the ASI 3400. Following the taking of the above scores, hereafter referred to as SCL, a second and third set of scores were taken. A response score, hereafter referred to as SCRC (skin conductance response-clap) was calculated as a measure of the base to peak response to a vigorous hand clap by the first author within six inches of the subject's face. A score representing the base to peak response following the subject's inhalation of a deep breath was also taken and is hereafter called SCRB (skin conductance - breath).

RESULTS

SCL correlates (Pearson's r) with blood histamine +.30 p .03, SCRC correlates with blood histamine +.29 p .04 and SCRB correlates with blood histamine +.44 p .004. This supports the notion that histamine levels are somehow related to SCL, SCRC, and SCRB levels. Other dimensions of the Pfeiffer taxonomy appear to fare somewhat less well. Serum copper, a brain stimulant known for the fact that it destroys histamine, did not significantly negatively correlate with histamine in spite of the fact that one might expect it to do so. Serum zinc levels did not correlate significantly, even though frequently postulated to be inversely correlated with stress or anxiety. Hair zinc levels were negatively correlated with histamine, though not significantly, which fits the Pfeiffer taxonomy. The amino acid methionine, which is thought to methylate and detoxify histamine and might be expected to be negatively correlated with histamine, does not significantly correlate in our data.

DISCUSSION

As indicated above, our clinical experience suggests that people who are extremely low on SCL, SCRC, and SCRB are frequently difficult to train using biofeedback procedures. The connection to histamine may suggest a reason for the difficulty. In view of histamine's role in the body as a facilitator of capillary dilation and increased cellular permeability, one might expect its facilitative effect to be decreased if the patient has a histamine deficiency. A training subject without the biochemical requirements necessary to produce the prerequisite variability in the behavior to be trained is difficult to reinforce either positively or negatively.

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