Chronic Pain– *from* Inflammation & Behavior

A Newsletter from Robert S. Gallup, Ed.D.

balance
the art and science of caring for chronic pain

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In this Issue:

Next Issue:

*"Medical Business" Finds Inflammation

*Guest Contributor

*Healing Happens!

*Anatomy & Physiology in PNI

Applied Psychoneuroimmunology: Inflammation is The Problem

In the first issue, I told the story of how I found (1970's) connection between inflammation and a broad range of behavior. I had observed sensory, motor, perceptual, cognitive, and behavioral performance (e.g. dyslexia, hyperactivity, coordination, lability, etc) to be a lot more impaired when clients' had an infection or allergy. These connections led me to find the then fledgling science of Psychneuroimmunology (PNI) in 1987.

In the first issue a few basic principles of PNI were presented, such as: the role of cytokines in pain, fatigue and other symptoms of inflammation; the bi-directional relationship of immune and nervous systems, and Candace Pert's concept of "chemical brain," which is critical to understanding how immune and nervous systems interact. I, also, presented my approach to the healing of chronic pain. This approach is deeply rooted in PNI. Current PNI literature makes it clear that chronic inflammation is the cause of chronic pain, and that chronic inflammation is often directly related to Health Behaviors because of the bi-directional relationship of nervous and immune systems, as well as the absolute interconnectedness of all cells and body systems through "chemical brain." Changing Health Behaviors/Lifestyle to heal chronic inflammation is a valid and successful approach to healing chronic pain without the consequences of pharmaceuticals or surgery.

Historically very relevant to my connecting chronic inflammation to behavior is my experience (1970's) with the field known as Orthomolecular Medicine (aka, Orthomolecular Psychiatry). Theory and protocols included the reduction of allergic reactions (often to food) in the treatment of Schizophrenia and what is now known as Bi-polar Disorder. Linus Pauling defined "Orthomolecular" as the biological need to "have the right molecule at the right place at the right time," for optimum health. I was an associate member, attending seminars and scientific meetings. Also, the 1970's saw great interest on the part of parents and educational institutions in the relationship of what children ate and how they lived to hyperkinesis, as well as learning and other behavioral problems. The "Feingold Diet" (Dr. Benjamin Feingold) was an example.

My journey to PNI was for a time unconsciously driven by a desire to improve my own health. The chronic inflammation, pain, and sometimes significant disability from my earliest days have become an opportunity to learn and then dramatically improve my quality of life. I am very grateful. The purpose of the Newsletter (planned to be three times a year) is to promote the sharing of the science, its applications, and victories towards improving the quality of life for the many who suffer from chronic inflammation, pain, and fatigue.

Preventing Repetitive Strain Injuries, by Beth Weiss, OTR/L, CHT

Repetitive Strain Injuries (RSI) account for about one-third of all lost time from work, and are the fastest growing job related impairment according to the U.S. Department of Labor. In 1997 the U.S. Department of Labor reported that there were over 6.6 million work related injuries, and that over 60% of these were due to repetitive strain, such as carpal tunnel syndrome. In 2005, these numbers are likely higher, especially since the Bush administration has refused to officially acknowledge the existence of "repetitive strain." These injuries are most often permanently disabling for the sufferer (the strained tissue becoming a target for chronic inflammation) and expensive for employers. The key then is prevention through education leading to change in health behaviors.

What is RSI? This term identifies the group of musculoskeletal disorders involving injuries to the tendon sheaths and the related bones, muscles and nerves of the hand, wrist, forearm, arm, shoulder, upper back and neck. Symptoms can include numbness, tingling, weakness, loss of coordination, stiffness, headaches, pain and burning sensations. These injuries are usually related to some type of work/activity; its intensity and duration. They are developed over a period of weeks, months and/or years. There is a mechanical and physiological process which leads to **inflammation** in the tissues. This inflammation causes the symptoms of RSI.

These symptoms are usually poorly localized, nonspecific, multi-factorial, and related to overall health behaviors as well as genetics. One can develop an RSI from any activity. The general risk factors are over-all health and general inflammatory state. If there is significant circulating inflammation the factors listed next are likely to significantly contribute to a repetitive strain injury:

** repetitive, sustained, and forceful exertion ** awkward posture while performing a repetitive activity

** mechanical stress concentration (soft tissue compressed on a hard surface) ** exposure to high vibration or cold

Prevention is The Best Treatment

Healthy and correct posture while using the upper extremities is a critical factor in preventing RSI. A problem in one area will lead to reaction, and attempts to compensate in other areas. Poor posture can lead to tightening of one set of muscles and over stretching and weakening of others. Circulation and neurological output can be compromised leading to pain, tingling, numbness and weakness throughout the upper limbs. Neck pain and headaches can also be symptoms. Avoiding one posture (especially static) for an extended time by remembering to move and stretch is a key. Other animals keep changing position unless they are asleep.

When performing any activity at home, at work, or in leisure: 1. The head should be upright with ears over the shoulders. 2. Avoid repetitively reaching above 90 degrees shoulder flexion. 3. Keep the elbows slightly at our sides. 4. Our forearms should be in neutral or slightly supinated. 5. Many feel that the elbow is the key for preventing upper body strains– it should be next to the waist, in flexion, slightly in front of the trunk. Flexors are stronger than extensors. 6. Objects should be held from their bottom or side with the little finger pointed towards the floor. 7. Carrying handled-objects should have the forearm in neutral, elbow rotated in, griped tightly with the last three digits (these are the power of the grip), thumb pointed forward and elbow at least slightly flexed. 8. Objects should be approached from underneath, and with the last three digits before the thumb and first digit, otherwise there is risk of lifting with the trapezius. 9. The last joint of the thumb should be flexed in order to have maximum grip strength. 10. The placement of tools, whether computer mouses, pots and pans, or circular saws must assist the maintenance of healthy posture (such as keeping tools as close to the navel as possible).

(continued on page 3)

11. The body should be as close (our postural center is the navel) to whatever the hands are doing as possible. 12. Especially at the computer, devices should be located in the ergonomically best places. Armrests should be avoided since arm position is a key. Also, avoid dropping the wrists and overstretching the fingers especially the little one.

General stress also plays an important role in how the body reacts to a musculoskeletal strain. Learning how to effectively deal with various forms of emotional stress will help to keep cells from producing chemicals that can stimulate pro-inflammatory reactions. The body has natural anti-inflammatory chemicals and other pain relievers that can be produced when mind and body are in a state of relaxation, calm, and pleasure. Therefore, learning successful techniques to reduce stress can be powerful in preventing flare-ups from previous strain or tension. I recommend deep breathing techniques, massage, meditation, Yoga, Tai Chi, Feldenkrais and Pilates techniques. There are many more. Of course, eat a diet that promotes relaxation and anti-inflammatory chemicals.

RSI is clearly a preventable disorder, **IF** one takes the time to learn how, and develops the discipline to use their body healthfully. It is critical that if symptoms do begin, that measures be taken immediately to reverse the symptoms and correct un-healthy habits (such as poor posture) that may be causing the strain. Education and self-discipline are the keys to preventing this disorder.

Rob's Health Behavior Tips: Health in "The World of Click"

It is truly a big challenge to regularly **use a computer without developing strain and pain.** Below are some suggestions which usually **prevent problems**.

- ◊ Always have your back against the chair (anytime you are seated), with both feet flat on a solid and non-moving object.
- ◊ What you are sitting on must be both soft and firm.
- ◊ The top of your head should be above the height of the top of the monitor so that your eyes will have a downward angle.
- ◊ The elbows need to be relaxed against the waist. The mouse and keyboard should be positioned so that your elbows do not have to leave contact with your waist (usually this means the keyboard will be resting on or just over your lap). This is much easier to accomplish if chairs are without armrests.
- ◊ Wrists must be supported, and the use of the little finger for the outer keys limited.
- ◊ You **must** get up and move/walk at least every forty minutes for several minutes.
- ◊ Remember to breathe!! Try to find a reason to laugh/smile. Social interaction can be an important anti-inflammatory factor. The area should be well lighted (we usually need more watts as we age). Room temperature should be comfortable. Sip tepid water or other very gentle liquid. This will assist you to have a good reason to go for a walk.
- ◊ Frequently and gently drop your head so that your chin touches your chest for ten to twenty seconds. Re-adjust your feet and buttocks regularly.
- ◊ Anything that you are reading from or making handwritten notes on should be close enough so that you do not have to reach, twist your spine, or move your back from contact with the chair.
- ◊ When mousing rest your hand lightly on the mouse, and use your second or third digit to left or right click. Try to use a specific motion which does not involve griping the mouse tightly with the palm or thumb,
- ◊ Inflammation is much less likely, when what we are doing feels personally positive and meaningful.

Healing Happens!

Al is a 48-year-old divorcee with two teenage children he shares with their mother. He came to me with complaints of pain and intermittent disability related to Osteoarthritis (OA) of his cervical and lumbar spine. Al is a career pre-school teacher who, in recent years, was able to work only intermittently for half-days for a few months at a time. He sometimes needed assistance to perform even basic self-care. Al has experienced various intensities of pain and/or sensory changes in all four limbs for decades. He is now on Social Security Disability (SSD). He was referred to me by his friend.

Some History- Al first experienced severe "neck spasms" when 14 years old. He had sought help from Physiatrists, Neurologists, Neurosurgeons, Occupational Therapists, Physical Therapists, Chiropractors, Massage Therapists, Homeopathic Physicians, Acupuncturists, and Psychotherapists. He is six feet tall and 158 pounds. He experienced a difficult birth, was a victim of repeated child abuse, and developed Irritable Bowel Syndrome before five years old. Al's coordination was considered "poor" and was observed by a pediatrician who specialized in "problem children." He was "a lonely child." He had speech therapy for stuttering in the 5th and 6th grades. He rarely spoke in whole sentences into his mid-twenties, yet received two graduate degrees by that time. His father died traumatically in Al's presence when he was 12 years old, and had not emotionally been in his life. His mother had also died traumatically a few years before he sought my help. He has been attending various Twelve Step Programs for three years. He had an uncomplicated and "very successful," anterior cervical decompression at C 5-6, four years before we met. He had been diagnosed with "spastic parapareisis" and an abnormally narrow spinal canal, after several severe falls while running. A recent MRI Report showed that he has varying degrees of spinal cord compression at C 3-4, C 4-5, and C 7-8, and moderate to severe lumbar-sacral OA.

The Initial Evaluation revealed– mildly impaired strength throughout; coordination was mildly impaired for gross and fine as well as rapid vs paced; poor single footed and dynamic standing balance; normal upper body sensation with complaints of varying numbness, coldness, tingling, and pain in all limbs; decreased proprioception in his lower limbs; decreased biceps reflex R>L; had one friend, did not see his sons regularly; felt generally "lonely," yet tended to have regular serial romantic relationships; was now very limited in his participation in "political activities," expressing a great deal of anger at "corporate U.S." Al generally tried to walk when he felt able, looked for opportunities to dance; described details of why he was "into a healthy diet," including a daily, and well thought out supplement regime, and had been avoiding "sweet foods for awhile." Al was articulate, self-insightful, and fearful about his future.

Dick Locher-Chicago Tribune

Applying Psychoneuroimmunology

We **made a plan** in which Al agreed to keep a "Discovery Journal" to include the following: Pain numbers and feelings of sensation at awakening, noon, and at bedtime and other times; his schedule of all social, spiritual, and physical activities such as cleaning, shopping, exercise, teaching, etc; mood; sleep; and everything he ate or drank in approximate amounts and time of day. For general inflammatory reduction he agreed to walk on only level surfaces, for no more than twenty-minutes, skipping at least one day in between. He would follow each walk with a ten-minute "lay-down," then a long, hot shower followed by a five-minute "lay-down." He was to sip room temperature or warm water all day. We agreed to collaborate with his primary care physician.

(continued on page 5)

Journaling revealed- after a three week period: pain levels of "2-9/10" and variable sensation, all and every day, as in his initial report; that a "good day" was usually followed by "a bad day;" constipation alternated with diarrhea; "sad-fearful-anxious-tired" mood generally on "bad pain days," and "happy-positive-energetic" mood on the "low pain days." Al slept seven to eight hours a night, "without any problems."

Pain levels were generally higher> for a few days after he ate dairy, sugar, red meat, any tomato product, spices, wheat, vinegar, or performed what he called "binge eating;" massage of his neck/shoulders was followed by high numbered pain the next few days; he had more pain when "constipated," his "blood sugar felt low," he "felt impotent about politics," and when he "felt alone."

Pain levels were generally lower and he felt "more normal sensation"> almost immediately after a bowel movement and almost immediately after he ate "plain chicken breast or baked fish; mildly decreased pain and more normal sensation after the walk-lay down-shower-activity, when he sat in firm straight back chairs with arms, slept on his sides with a pillow between his knees & ankles, when awakening, during and immediately after romantic/sexual activity, in the midst of pleasant social contact of any kind, after he cried, and when he attended "San Jose Sharks or San Francisco Giants games" and his favorite team was winning.

Changes- Based on the above I made recommendations> Continue the daily journaling. The muscular reaction to the massage indicated that an evaluation and treatment by an Osteopath would likely help. He would also continue the progressive walking/lay-down program based on short frequent walks on level ground and counting activities such as washing dishes, laundry, or sex as the same as a walk, and avoiding all of the foods that Al found suspicious for stimulating inflammation. After consulting with his MD, he added digestive enzymes and a good balance of soluble (such as vegetables or beans) and insoluble fiber (such as whole grain brown rice) to each of three white meat chicken or fish meals a day with no additional snacks. I suggested he read the two pieces linked on my web site about blood sugar, inflammation, and low fat protein ("Harnessing Hormones: Key to Long Life," by Steiner, and "The Zone Diet," by Sears'). He started counseling with a psychotherapist who specializes in child abuse/incest survivors; and made an extra effort to have regular social contact with men from his Twelve Step Groups. He would use the Internet to contact political groups working on issues he cares about, and volunteer with a group one to two hours a week. He talked with his children, working towards a goal of predictable and regular contact. He began to seek out a male Sponsor from his Twelve Step Meetings and work "The Steps."

Five months after I met Al he was happier and able to work two and one-half days per week in his occupation. He described his pain range as "2- 5/10 with more normal sensation." Al was in "de-briefing" with a Psychotherapist. He was taking three 20 minute walks on the days that he did not work. He was lifting light (5-8 lbs) weights in supine to strengthen his proximal spinal and chest/shoulder muscles. The Osteopath had found issues of pelvic alignment, which when treated (every 2-4 weeks) resulted in improved spinal alignment. He averaged 2-3 comfortable bowel movements a day. He had a male friend who "loved to talk sports and about relationships." Al was committed to monthly activity with "a human rights group." He had started with a Twelve Step Sponsor and had attended a few "Twelve Step Dances." He had a schedule of phone calls and visits with his children. At **eleven months**, Al was working full time with pain in the "1-3/10" range. He had given up his Social Security Disability status.

The Why in PNI

The chronic pain in Al's limbs was a symptom of chronic inflammation which has been targeting his spinal system due to its vulnerability from previous inflammation. Because of the intimate and bi-directional relationship of the immune and nervous systems, chronic pain is a symptom of chronic inflammation. Chronic inflammation can be healed by promoting behaviors which stimulate anti-inflammatory cytokines while changing/reducing behaviors which stimulate the production of pro-inflammatory cytokines. It appears that in mammals, the anti-inflammatory

(continued on page 6)

(continued from page 5)

system will dominate if given a good chance.

It is common to find adults who were abused as children to be more vulnerable to chronic inflammation. Al's nervous system was conditioned to be very reactive at an early age. Successfully releasing memories, which are "stored" as cellular reaction, through psychotherapy was very significant in the reduction of Al's inflammation. The increase in activities, which are especially meaningful to Al, and meet his deeper needs promote his anti-inflammatory system. Keeping his blood sugar in a healthy zone through diet and exercise, while reducing intake of what stimulates the production of inflammation (for example, allergy) in Al's digestive tract helps reduce circulating pro-inflammatory cytokines which can result in spinal system pain. Decreased symptoms with bowel movements is common for those who have lower lumbar stenosis. The Osteopathic treatment provides better structural alignment, reducing the probability of strain (leading to inflammation). The improved strength in Al's muscles-ligaments-tendons, along with their improved ergonomic use means less probability of strain and inflammation. It is critical that a well-graded program with "an anti-inflammatory priority," rather than an "exercise" or "a tissue-building priority" is used. Al's comprehensive and excellently balanced regime of supplements also plays an important anti-inflammatory role. His willingness to look at and feel his true feelings, real behaviors, and its consequences through his Twelve Step Work as well as his Psychotherapy, surely is a key for Al to be able and willing to make the qualitative changes he needs ("one day at a time"). Twelve Step Groups and other support groups give an important opportunity for very positive social and spiritual support. Social and spiritual support are well accepted as biologically powerful factors.

Anatomy and Physiology in Psychoneuroimmunology

Connected

In 1926 (*Ann. Pasteur Inst.* **40**, 893-900) Metal'nikov and Chorine published a dramatic study (classical conditioning) showing that immunologic reactivity is modulated by learned behavior. Through 1960, there were several European studies replicating and adding to this work. Research in the U.S. on behaviorally conditioned alterations on immune function began with the study by Ader and Cohen in1975 (*Psychsom. Med*. **37** (No.4),333-40). The mechanisms linking immune and nervous system function can involve almost any immune organ or cell, as well as almost any nervous (central or peripheral) system organ or cell. This bi-directional relationship is accomplished with immuno and/or neuro produced chemicals, and/or neuro fibers. Immune cells relate to this bi-directional relationship from central (as in microglia) or peripheral locations. Please remember that immunopeptides and neuropeptides play a very large role in this bi-directional communication, and that immune cells produce chemicals of communication which were once thought to be only produced by nervous tissue. As in the first issue of this Newsletter (July, 2004), I strongly suggest readers to be familiar with the critically important work of Candace B. Pert, Ph.D.. Her very accessible and straight forward book*, Molecules of Emotion* would be a good place to begin (1999, Touchstone Edition, New York).

Central Nervous System Structures Are Connected

Electrolytic lesioning using stereotaxic procedures have shown:

Lesions in the **Preoptic Anterior Hypothalamus** lead to- a decrease in nucleated spleen cells and thymocytes, decreased antibody production, altered tumor cell growth, and inhibition of anaphylaxis. This region is involved in both humoral and cell-mediated immunity, and is considered a major player.

Lesions in **Limbic Forebrain Structures** generally lead to- enhanced immunity, as in the case where lesioning the dorsal hippocampus or amygdaloid tissue results in a transient increase in (continued on page 7)

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Volume 1, Issue 2 March 25, 2005 Newsletter2@rsgallup.com page 7

balance
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(continued from page 6)

splenocytes, thymocytes, and the t-cell proliferative response. Chronic alteration in t-cell response is seen after lesioning in the lateral septal area and its connections to the hypothalamus. These limbic structures have extensive connections to the hypothalamus and can regulate both neuroendocrine and autonomic outflow.

In Brain Stem Central Autonomic Nuclei- lesions of caudal reticular formation or caudal pons result in inhibition of the delayed-type hypersensitivity response. Lesions in rostral reticular formation (RF) or raphe nuclei result in enhanced response. Lesions of RF are followed by thymic involution.

Cerebral Cortex (CC) lesions can- modulate immune responses. The CC is likely lateralized in this regard. A lesion in the left hemisphere results in decreased t-cell numbers and decreased NK cell activity, without effects on B-cells or macrophages. A lesion in the right hemisphere has the opposite effect. Since the CC is involved in responses to psychosocial factors, and conscious interpretation of the external and internal world/individual perception>> and since there is direct outflow from the CC to the immune system>> this outflow reflects individual perception. Also, the CC has direct communication with the limbic forebrain, hypothalamus, brain stem, reticular formation, visceral nuclei and some pre-ganglionic neurons which themselves have direct communication with the immune system.

CNS Responses to Immunization

Electrical recordings in specific **hypothalamic regions** give evidence for immune influences on neuronal firing rates, most likely by secreted cytokines. Experiments have demonstrated increased neuronal firing rates in the **ventromedial nucleus** at the time of peak antibody response to primary immunization. Increased neuronal firing rates were found in the **pre-optic/anterior hypothalamus** at the time of peak immunological response during primary antibody response. A decrease in neuronal firing rate was observed in the **paraventricular nucleus** in the first few days after immunization, followed by an increase several days later.

In the 1980's early Soviet studies documenting electrophysiological alterations in evoked or spontaneous brain activity during the reaction to an antigen were translated into English. Alterations in activity were found in the **hypothalamus, limbic forebrain structures** such as the **hippocampus,** and **midbrain reticular formation**.

A Few Good Sources for Psychoneuroimmunology Literature

- The Journal of *Brain, Behavior, and Immunity.* (The Official Journal of the Psychoneuroimmunology Research Society) Academic Press
- *Foundations of Psychoneuroimmunology*. Locke, et al (1985). Aldine Publishing Company, New York
- *Psychoneuroimmunology, Second Edition.* (1991). Eds., Ader, R.A., Felten, D.L., & Cohen, N. Academic Press, Inc.
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