San Diego Rocks 2014

CORE

Dan Murphy, DC
Walter Bradford Cannon, MA, MD (1871–1945)

Walter Bradford Cannon, M.D. was an American physiologist, professor and chairman of the Department of Physiology at Harvard Medical School. He coined the term fight or flight response, and he expanded on Claude Bernard's concept of homeostasis.
THE SUPERSENSITIVITY OF DENERVATED STRUCTURES

A LAW OF DENERVATION

WALTER BRADFORD CANNON
ARTURO ROSENBLUETH

1949
The Gunn Approach to the
TREATMENT OF
CHRONIC PAIN

Intramuscular Stimulation for
Myofascial Pain of Radiculopathic Origin

C. Chan Gunn MD
Clinical Professor, Multidisciplinary Pain Center,
University of Washington Medical School, Seattle, USA

Foreword by
Patrick D. Wall FRS DM FRCP
Professor Emeritus
United Medical and Dental Schools, London, UK

1996

CHURCHILL LIVINGSTONE

NEW YORK EDINBURGH LONDON MADRID MELBOURNE SAN FRANCISCO AND TOKYO 1996
"Prespondylosis" and some pain syndromes following denervation supersensitivity.
Gunn CC.

Abstract
Pain is determined by the neurologic properties of receptor organs, neurons, and their interconnections. These may become supersensitive or hyperreactive following denervation (Cannon's Law). A common cause of denervation in the peripheral nervous system is neuropathy or radiculopathy as a sequel to spondylosis. Spondylosis in its early stage may be "asymptomatic" or painless and hence unsuspected, because small-diameter pain fibers may not initially be involved despite the attenuation of the other component fibers of the nerve. The term "prespondylosis" is introduced here to describe this presently unrecognized phase of insidious attrition to the other functions of the nerve, especially the trophic aspect. It is postulated that many diverse pain syndromes of apparently unrelated causation may be attributed to abnormal noxious input into the central nervous system from supersensitive receptor organs (nociceptors) and hyperreactive control systems at internuncial pools. Furthermore, trauma to a healthy nerve is usually painless or only briefly painful, unless there is preexisting neuropathy. Some pain syndromes in muscle (eg, trigger points and myofascial pain syndromes) and nerve (eg, causalgia and diabetic neuropathy) that may be related to denervation are discussed.

PMID: 6247768 [PubMed - indexed for MEDLINE]

MeSH Terms

LinkOut - more resources
NEUROPHYSIOLOGY

What is not well known is that “when a nerve is below par and is not functioning properly, it becomes supersensitive and will behave erratically. This principle is fundamental and universal, yet is not at all well known or credited.” This is known as Cannon’s and Rosenblueth’s:

**Law Of Denervation Supersensitivity**
On the nature of cutaneous sensory mechanisms.

MELZACK R, WALL PD.

PMID: 14472486 [PubMed - indexed for MEDLINE]

Melzack R, Wall PD.

PMID: 5320816 [PubMed - indexed for MEDLINE]
Spinal manipulation in the treatment of low-back pain.

Kirkaldy-Willis WH, Cassidy JD.

Abstract

Spinal manipulation, one of the oldest forms of therapy for back pain, has mostly been practiced outside of the medical profession. Over the past decade, there has been an escalation of clinical and basic science research on manipulative therapy, which has shown that there is a scientific basis for the treatment of back pain by manipulation. Most family practitioners have neither the time nor inclination to master the art of manipulation and will wish to refer their patients to a skilled practitioner of this therapy. Results of spinal manipulation in 283 patients with low back pain are presented. The physician who makes use of this resource will provide relief for many patients.

PMID: 21274223 [PubMed]  PMCID: PMC2327983  Free PMC Article

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Proprioceptors and somatic dysfunction*

IRVIN M. KORR, PH.D.
Kirkville, Missouri

Functional properties of osteopathic lesions, as clinically described, have been reviewed in relation to the physiology of proprioceptors. It is shown that muscle spindles in which the "gain" has been turned up by intensified activity in their gamma motor innervation may, together with other sensory inputs, account for many of the motion characteristics and palpatory features of the osteopathic lesion. "Turning down" of the gain seems to be a common denominator in a variety of osteopathic manipulative procedures. Possible origin of the high gain is discussed also.

The musculoskeletal system is the most massive system of the body, yet in the performance of its infinite repertoire of motions and postures, it is the most delicately controlled and coordinated. Accordingly, the musculoskeletal system is the recipient of most of the efferent outflow from the central nervous system (CNS), with the largest portion by far going via the ventral roots of the spinal cord to the muscles, which carry out the motor commands of the CNS.

It is less well appreciated, however, that for related reasons the musculoskeletal system is also the source of the preponderant sensory input to the CNS, an input that is also the most widespread, the most continuous, and the most variable. This sensory feedback, from countless thousands of reporting stations in myofascial and articular components, entering the cord via the dorsal roots, is essential to the moment-to-moment control and fine adjustment of posture and locomotion.

In addition to this influence on the motor pathways, the sensory reporting is selectively routed to various other centers throughout the nervous system, including, of course, the cerebral cortex, where it enters into consciousness and the ordering of volitional motor activity. Relevant portions of the reports also reach and are utilized by the autonomic nervous system in the tuning of visceral, circulatory, and metabolic activity to musculoskeletal demand. Indeed, the sensory input from the musculoskeletal system is so extensive, intensive, and unceasing as to be a dominant influence on the CNS and therefore the person as a whole.

It may be expected, therefore, that disturbances in the sensory input from the musculoskeletal system, whether generally or locally, would significantly impair not only motor function, but also other functions — and that of the person himself. For those engaged in the study of the neural and reflex mechanisms, that premise is at the heart of the clinical significance of the osteopathic lesion — now modishly and euphemistically designated as "somatic dysfunction." One of the first products of experimental research into these mechanisms, pioneered by Denslow,2-4 was the concept of chronic segmental facilitation. In 1947, the hypothesis was stated5 as follows:

(An) osteopathic lesion represents a facilitated segment of the spinal cord maintained in that state by impulses of endogenous origin entering the corresponding dorsal root. All structures receiving efferent nerve fibers from that segment are, therefore, potentially exposed to excessive excitation or inhibition.

In speculating further about the site of the "endogenous origin," the author suggested that the proprioceptors, particularly the muscle spindles, were the most likely candidates because: 1) they would be sensitive to musculoskeletal stresses; 2) they are nonadapting receptors, sustaining streams

of impulses for as long as they are mechanically stimulated; and 3) their influence is highly specific to the muscles acting on the affected joints and the corresponding spinal segments.

In the intervening 28 years, research in many neurophysiologic laboratories has immensely increased our understanding of the proprioceptors. Concurrently, research under osteopathic auspices (reviewed by various authors) has substantially increased our understanding of the mechanisms involved in somatic dysfunction. This paper is an effort to determine what importance may still be ascribed to the proprioceptors in the origin of segmental facilitation (the clinical significance of which has also been explored). It is shown that there is now even stronger reason to view the proprioceptors, and most particularly muscle spindles, as key elements in the "neural basis of the osteopathic lesion." A new theory is offered about the neural mechanisms operating in the osteopathic lesion and about their relation to osteopathic manipulative therapy.

The palpatory criteria for identifying and evaluating the musculoskeletal disorders that are designated "osteopathic lesions" have been described and taught in many different ways. Physicians differ in the ways that they use these criteria in diagnosis and as guides to therapy. However, there seems to be a general agreement on the importance of at least one feature, decreased mobility — reduced range or ease of joint motion in one or more planes — and on the importance of restoring mobility. It also seems to be generally assumed that the resistance to motion is within the joint itself, ascribable to articular friction or to the visco-elastic properties of ligamentous structures. This assumption needs to be re-examined. It has, however, been so deeply implicit in osteopathic thinking that it is seldom verbalized, much less questioned, for several reasons. First, the view of the osteopathic lesion as a "bony," "structural," intervertebral, or articular derangement has such venerated origins as to border on dogma. This traditional view is reinforced daily by anatomically-worded descriptions that imply displacements and altered interosseous relationships, even when such descriptions are accompanied by protestations that the osteopathic lesion is, of course, a functional disturbance, and not a "bone out of place." Second, the resistance to motion and reduced range of motion, whatever their origin, are manifest in reduced joint mobility. Third, in manipulation the vertebrae or other bones are commonly the levers to which the manual forces are applied, and effectiveness of treatment is reflected in their improved mobility.

The braking power of muscle

To a physiologist, it seems much more reasonable that the limitation and resistance to motion of a joint that characterize an osteopathic lesion do not ordinarily arise within the joint, but are imposed by one or more of the muscles that traverse and move the joint. Of all the somatic tissues (for example, vertebral and paravertebral), muscle is the only active one, the one capable of self-energized, independent motion and of developing great, widely variable, and rapidly changing forces. The other tissues are passively moved, immobilized, pushed, pulled, compressed, and altered in shape by forces external to themselves — those of muscular origin and those external to the body, such as gravity.

While usually thinking of muscles as the motors of the body, producing motion by their contraction, it is important to remember that the same contractile forces are also utilized to oppose motion. By the application of controlled counteracting forces, contracting muscle absorbs momentum (for example, of a swinging limb) and regulates, resists, retards, and arrests motion. Indeed, the energy-absorbing function of skeletal muscle is no less important to the control of motion than its energy-importing function. Both are based on the same cellular mechanisms — those involved in contraction.

Valuable and quantitative insights into this aspect
The spinal cord as organizer of disease processes: III. Hyperactivity of sympathetic innervation as a common factor in disease.

Korr IM.


December 1979;79(4):232-7
OBITUARY


We have all heard the expression that as practitioners we are ‘standing on the shoulders of giants’? With neurophysiologist Irvin Korr’s passing one of the true intellectual giants of the past century has left us.

I did not know him well, but had the good fortune to meet him, and to hear him lecture, and was grateful for his work which explained a great deal about the mechanisms underpinning osteopathic treatment (Fig. 1). The importance of Korr’s work cannot be over-estimated. His pioneering and diligent research, particularly into areas such as segmental facilitation (Korr 1947, 1948, 1986), and the trophic function of nerves (Korr 1967), opened new vistas. He quite literally put flesh on the bones of earlier osteopathic theory. His ability to cross professional and political divides is exemplified by the two contributions (below) to this salute to a marvellous man. These describe the man and his work from the perspectives of two people who knew him, one by an osteopathic teacher, writer and practitioner, Professor Zachary Comeaux DO— and the other by chiropractic teacher, writer and practitioner, Craig Liebenson DC.

Leon Chaitow, Editor JBMT.

Zachary Comeaux DO wrote:

March 4, 2004 marked the end of a memorable life, when Irwin Korr Ph.D., Osteopathic Champion, succumbed at 94, in Boulder Colorado. Known to his many friends in the osteopathic profession as Kim, Korr frequently attributed his long life, and prolonged intellectual activity, to having received quality osteopathic care.

After postgraduate studies in physiology at Princeton University, Kim joined the faculty at Kirksville College of Osteopathy and Surgery in 1945 as professor and chairman of the physiology department. Joining with Stedman Denslow, a 1929 graduate of the same institution, they together spent decades adding scientific legitimacy, through experimentation and publication, to the clinically based practice of osteopathy. Much of their early work centered on demonstrating the hyper-arousal of the sympathetic nervous system associated with what was then termed the osteopathic lesion. Later this was known as the concept of spinal (or segmental) facilitation (Denslow et al., 1947).

Dr. Korr retired from Kirksville College in 1975, assuming a position of professor in the Department of Biomechanics at Michigan State University—College of Osteopathic Medicine. In 1978 he joined the faculty at the Texas College of Osteopathic Medicine as professor of the Department of Osteopathic Theory and Practice. However with the position came responsibility as president, dean, department head and course coordinator. At this time he also met his surviving wife, Janet, who eventually convinced him to move to her home, Boulder.

Korr’s keen interest in the neurophysiologic aspects of osteopathic work led to the gamma loop hypothesis for the persistence of increased muscle tone associated with somatic dysfunction Korr (1975). This train of thought was adopted by Fred Mitchell, and also Laurence Jones, to legitimize the theories of Muscle Energy and StrainCounterstrain techniques respectively. Korr wrote prolifically, contributing to the physiological as well as osteopathic literature. A two volume collection of his papers is available from the American Academy of Osteopathy.

A regular speaker at American Academy of Osteopathy and American Osteopathic Association

Fig. 1 Irvin Korr Ph.D. and JBMTs editor Leon Chaitow, at a 1988 Los Angeles College of Chiropractic Symposium.

doi:10.1016/j.jbmt.2004.04.003
events, Korr is remembered by many of us today as being part of the effort to bring international understanding and cooperation within the osteopathic profession. At international symposia and conferences he was recognized both as an intellectual and motivational leader. He had a unique way of integrating personal clinical experience (as a patient), deep scientific theoretical understanding, and a dedication to the principles of the unity of the body and the body’s self-healing capacity. In this capacity he also participated in a series of symposia, funded by the National Institutes of Health and hosted by the American Academy of Osteopathy, into the nature and understanding of chronic pain.

Besides his research, teaching and public speaking, Kim Korr was known to us as the man he was. He possessed a gentle humor, a deep wisdom and profound humility, which sometimes masked his quiet power. He was personable, and did not live on a pedestal. He will be missed, but his legacy will endure, both in his writings and in the credibility for osteopathy derived from his work.

Craig Liebenson DC wrote:

Irvin ‘Kim’ Korr inspired musculoskeletal specialists to think of the locomotor system as the primary machinery of life. His series of paper entitled The spinal cord as organizer of disease processes (Korr, 1976) summarized not only the early osteopathic research on segmental dysfunction, but foretold our modern understanding of central pain states such as central sensitization. Korr was most of all a unique human being whose special gift was his transcendent ability to overcome human limitations such as those imposed by institutions and even aging.

Kim Korr passionately showed that the medical approach of glorifying the viscera, which are merely organs designed to maintain the musculoskeletal system, mis-understands the true nature of the human being. He enjoyed pointing out that the Ciba collection made the common error of showing multitudes of nerve endings traveling to each internal organ, and only a scant few connected to the muscle spindles, golgi tendon organs, and joint mechanoreceptors. He would laugh as he described how actually Ciba had it backwards, since the musculoskeletal system that had 90% of the connections with the nervous system.

For Korr what made us human was our ability to "will action". We express our humanness by choosing to play piano, ski, etc. This concept anchored the osteopathic field in the ennobling area of taking care of the “whole” person, while allopathic physicians were more reductionist. In spite of Korr’s great vision he was terribly disappointed when the osteopathic profession, in the late 1950s, went against his lobbying and chose to align with the medical profession in the US.

Korr was a key figure at the first conference on spinal manipulation put on by the National Institute of Neurological Diseases and Strokes circa 1975. He was so impressed that he convened a follow-up meeting at Michigan State University. Out of this came his book Neurobiological Mechanisms of Manipulative Therapy (Korr, 1978). Today there is great wealth of research in our fields. There are also dozens and dozens of premier scientists tackling questions relevant to our practices. Korr blazed this trail with his stunning research on the trophic effects of damage to nerves (Korr, 1967, 1981).

One of the most fascinating aspects to Korr’s life was his ability to transform himself. In his 40s he discovered that he had become a sedentary, desk jock and that his vitality was slipping. For one of the first times he visited an osteopath and requested a treatment. A small adjustment was administered. He then went for a walk and found the irresistible urge to break into a jog—for the first time in many years! Soon he was breathing heavily and propped up against a tree when he took a deep breath in and felt his rib cage fully expand literally tearing small adhesions. From that moment he described a transformation in his life. He threw away his sunglasses realizing that he could autonomously control his pupils without them. Yogi-like he began to walk the walk of person intent on demonstrating the potential of transformational thinking for promoting health and longevity.

He left Michigan State University in his 60s to join the Texas College of Osteopathic Medicine (TCOM) where he spearheaded efforts to build the first preventive medicine curriculum in North America. When visiting the Los Angeles College of Chiropractic in 1997 he addressed the college’s Deans and spoke of his struggles with tenured faculty who resisted the radical curricular changes at TCOM. Korr’s stature at such moments could only be described as courageous.

Anyone who spent time with this legendary figure recalls his wonderful sense of humor. Always with a gleam in his eye while he deadpanned one of his frequent puns. It seemed he enjoyed finding connections, not only between somatic structures and the spinal cord, but between words!

During Kim Korr’s later years in Texas, just prior to moving to Colorado he found a new passion he called Eugeriatrics. Distilled from his years of experience with osteopaths he found an essential truth regarding the rejuvenating benefits of
Cerebral metabolic changes in men after chiropractic spinal manipulation for neck pain.

Ogura T¹, Tashiro M, Masud M, Watanuki S, Shibuya K, Yamaguchi K, Itoh M, Fukuda H, Yanai K.

Abstract

BACKGROUND: Chiropractic spinal manipulation (CSM) is an alternative treatment for back pain. The autonomic nervous system is often involved in spinal dysfunction. Although studies on the effects of CSM have been performed, no chiropractic study has examined regional cerebral metabolism using positron emission tomography (PET).

OBJECTIVE: The aim of the present study was to investigate the effects of CSM on brain responses in terms of cerebral glucose metabolic changes measured by [18F]fluorodeoxyglucose positron emission tomography (FDG-PET).

METHODS: Twelve male volunteers were recruited. Brain PET scanning was performed twice on each participant, at resting and after CSM. Questionnaires were used for subjective evaluations. A visual analogue scale (VAS) was rated by participants before and after chiropractic treatment, and muscle tone and salivary amylase were measured.

RESULTS: Increased glucose metabolism was observed in the inferior prefrontal cortex, anterior cingulated cortex, and middle temporal gyrus, and decreased glucose metabolism was found in the cerebellar vermis and visual association cortex, in the treatment condition (P < .001). Comparisons of questionnaires indicated a lower stress level and better quality of life in the treatment condition. A significantly lower VAS was noted after CSM. Cervical muscle tone and salivary amylase were decreased after CSM. Conclusion The results of this study suggest that CSM affects regional cerebral glucose metabolism related to sympathetic relaxation and pain reduction.

PMID: 22314714 [PubMed - indexed for MEDLINE]
Inflammation

↓

Fibrosis

↓

Stiffness

↓

Reduced Mechanoreception

↓

Increased Sympathetic Tone

↓

Constricted Blood Vessel Diameter

↓

Reduced Delivery of $O_2 + G$

↓

Reduced ATP
Mechanoreceptors

Sympathetic Tone  

Pain Firing

Catecholamines
  Epinephrine
  Norepinephrine

Gate Theory

Alter Epigenetic Methylation

Shorten Telomeres

Cause Vasoconstriction

Reduces ATP

Reduces healing

Reduced pumps
  Na++
  glutamate

Immunosuppressive

Increase Oxidative Stress
The origin of rhythmic fast subthreshold depolarizations in thalamic relay cells of rats under urethane anaesthesia.

Pinault D¹, Deschênes M.

Abstract

Intracellular recordings were performed in relay neurons of the dorsal thalamus in rats under urethane anaesthesia. In 77 out of 127 neurons of the ventro-posterolateral and ventral lateral nuclei, but not in neurons of the ventro-posteromedial and posterior nuclei, a highly rhythmic pattern of subthreshold depolarizations was present at rest. The average frequency of these rhythmic depolarizations in ventro-posterolateral cells was 23.36 +/- 11.48 Hz (range: 6-60 Hz); in ventral lateral relay cells higher frequencies were observed (65.86 +/- 17.42 Hz; range: 17-95 Hz). The rhythmic subthreshold events were identified as excitatory postsynaptic potentials generated by the regular firing of prethalamic afferents located in dorsal column and deep cerebellar nuclei. Indeed, in cells of the ventro-posterolateral nucleus these spontaneous potentials had a waveform similar to that of synaptic potentials triggered by somatosensory stimulation. They increased in amplitude with membrane hyperpolarization and their rhythmic occurrence was not affected by the injection of large inward currents. Moreover, they persisted after capsular transection, but they could no more be recorded in ventro-posterolateral cells after lesion of dorsal column nuclei. Finally, it was found that prethalamic afferents within the deep cerebellar nuclei discharged spontaneously in a rhythmic manner within the same frequency band as that of the rhythmic synaptic potentials recorded in ventral lateral cells. On the basis of these results, it is concluded that the rhythmic subthreshold depolarizations observed in thalamic neurons of animals under urethane anaesthesia are not generated intrinsically but that they represent excitatory postsynaptic potentials of prethalamic origin. (ABSTRACT TRUNCATED AT 250 WORDS)

PMID: 1467972 [PubMed - indexed for MEDLINE]
The Neurochemically Diverse Intermedius Nucleus of the Medulla as a Source of Excitatory and Inhibitory Synaptic Input to the Nucleus Tractus Solitarii

Ian J. Edwards,¹,* Mark L. Dallas,¹,* Sarah L. Poole,¹ Carol J. Milligan,¹ Yuchio Yanagawa,² Gábor Szabó,³ Ferenc Erdélyi,¹ Susan A. Deuchars,¹ and Jim Deuchars¹

¹Institute of Membrane and Systems Biology, University of Leeds, Leeds LS2 9JT, United Kingdom, ²Department of Genetic and Behavioral Neuroscience, Gunma University Graduate School of Medicine, and Solution Oriented Research for Science and Technology, Japan Science and Technology Agency, Maebashi 371-8511, Japan, and ³Department of Gene Technology and Developmental Neurobiology, Institute of Experimental Medicine, H-1450 Budapest, Hungary

Sensory afferent signals from neck muscles have been postulated to influence central cardiorespiratory control as components of postural reflexes, but neuronal pathways for this action have not been identified. The intermedius nucleus of the medulla (InM) is a target of neck muscle spindle afferents and is ideally located to influence such reflexes but is poorly investigated. To aid identification of the nucleus, we initially produced three-dimensional reconstructions of the InM in both mouse and rat. Neurochemical analysis including transgenic reporter mice expressing green fluorescent protein in GABA-synthesizing neurons, immunohistochemistry, and in situ hybridization revealed that the InM is neurochemically diverse, containing GABAergic and glutamatergic neurons with some degree of colocalization with parvalbumin, neuronal nitric oxide synthase, and calretinin. Projections from the InM to the nucleus tractus solitarius (NTS) were studied electrophysiologically in rat brainstem slices. Electrical stimulation of the NTS resulted in antidromically activated action potentials within InM neurons. In addition, electrical stimulation of the InM resulted in EPSPs that were mediated by excitatatory amino acids and IPSPs mediated solely by GABA_α receptors or by GABA_α and glycine receptors. Chemical stimulation of the InM resulted in (1) a depolarization of NTS neurons that were blocked by NBQX (2,3-dioxo-6-nitro-1,2,3,4-tetrahydrobenzo[f]quinoxaline-7-sulphonoamide) or kynurenic acid and (2) a hyperpolarization of NTS neurons that were blocked by bicuculline. Thus, the InM contains neurochemically diverse neurons and sends both excitatory and inhibitory projections to the NTS. These data provide a novel pathway that may underlie possible reflex changes in autonomic variables after neck muscle spindle afferent activation.

Key words: posture; neck; cardiovascular; respiration; medulla oblongata; autonomic

Introduction

Reflex changes in cardiorespiratory variables during body movements rely on interactions between the somatic and autonomic nervous systems. A prime example of such interaction is the somatosympathetic reflex, in which stimulation of thinly myelinated group III (Aδ) and unmyelinated group IV (C-fiber) limb muscle afferent fibers can reflexly increase cardiorespiratory output (Potts et al., 2000, 2003; Wilson, 2000). These reflexes are mediated via sensory afferent input to the spinal cord, which is then relayed to the nucleus tractus solitarius (NTS), a brainstem site for cardiorespiratory integration (Potts et al., 2003). Cardiorespiratory changes can also be evoked by stimulation of neck muscle afferents (Bolton et al., 1998; Bolton and Ray, 2000), proposed to contribute to alterations in cardiorespiratory outflow in preparation for a change in posture (Bolton and Ray, 2000). In contrast to limb afferents, the sensory signals from these muscles appear to be mediated by group IA muscle spindle afferents (Bolton et al., 1998). However, the neural pathways that link these afferent signals to cardiorespiratory control are completely unknown.

One target for sensory information from neck muscles is the cervical spinal cord where terminations can be found in the dorsal horn (although sparse) and the central cervical nucleus (CCN) (Bakker et al., 1984; Pflüger and Arvidsson, 1988; Prihoda et al., 1991). The CCN projection is generally considered to underlie spinal somatic reflex circuits, such as those for the tonic neck reflex involved in postural control (Wilson et al., 1984; Brink et al., 1985; Hongo et al., 1988; Popova et al., 1995). There is also a strong direct neck muscle afferent projection to the medulla oblongata where fibers terminate in the external cuneate nucleus and a nucleus located at the lateral edges of the dorsal aspect of the hypoglossal motor nucleus (XII), referred to either as the...
The Neurochemically Diverse Intermedius Nucleus of the Medulla as a Source of Excitatory and Inhibitory Synaptic Input to the Nucleus Tractus Solitarii

The Journal of Neuroscience
August 1, 2007

Dorsal Motor Nucleus of the Vagus

Parasympathetic Efferents
- Heart
- Lungs
- Stomach
- Intestines
- Etc.

Nucleus Tractus Solitarius

Integrated Autonomic and Cardiorespiratory Circuits

Parasympathetic Afferents from Thoracic and Abdominal Viscera

Nucleus Intermedius

External Cuneate Nucleus

Central Cervical Nucleus

Cerebellum

Upper Cervical Mechanoreceptors from Chiropractic Upper Cervical Adjustments

Tonic Postural Reflexes

Etc.
The intermedius nucleus of the medulla: A potential site for the integration of cervical information and the generation of autonomic responses

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Brainstem

A B S T R A C T
The intermedius nucleus of the medulla (InM) is a small perihypoglossal brainstem nucleus, which receives afferent information from the neck musculature and also descending inputs from the vestibular nuclei, the gustatory portion of the nucleus of the solitary tract (NTS) and cortical areas involved in movements of the tongue. The InM sends monosynaptic projections to both the NTS and the hypoglossal nucleus. It is likely that the InM acts to integrate information from the head and neck and relays this information on to the NTS where suitable autonomic responses can be generated, and also to the hypoglossal nucleus to influence movements of the tongue and upper airways.

Central to the integratory role of the InM is its neurochemical diversity. Neurones within the InM utilise the amino acid transmitters glutamate, GABA and glycine. A proportion of these excitatory and inhibitory neurones also use nitric oxide as a neurotransmitter. Peptidergic transmitters have also been found within InM neurones, although as yet the extent of the pattern of co-localisation between peptidergic and amino acid transmitters in neurones has not been established.

The calcium binding proteins calretinin and parvalbumin are found within the InM in partially overlapping populations. Parvalbumin and calretinin appear to have complementary distributions within the InM, with parvalbumin being predominantly found within GABAergic neurones and calretinin being predominantly found within glutamatergic neurones.

Neurones in the InM receive inputs from glutamatergic sensory afferents. This glutamatergic transmission is conducted through both NMDA and AMPA ionotropic glutamate receptors.

In summary the InM contains a mixed pool of neurones including glutamatergic and GABAergic in addition to peptidergic neurones. Neurones within the InM receive inputs from the upper cervical region, descending inputs from brain regions involved in tongue movements and those involved in the co-ordination of the autonomic nervous system. Outputs from the InM to the NTS and hypoglossal nucleus suggest a possible role in the co-ordination of tongue movements and autonomic responses to changes in posture.

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Neck muscle afferents influence oromotor and cardiorespiratory brainstem neural circuits

I. J. Edwards · V. K. Lall · J. F. Paton · Y. Yanagawa · G. Szabo · S. A. Deuchars · J. Deuchars

Abstract  Sensory information arising from the upper neck is important in the reflex control of posture and eye position. It has also been linked to the autonomic control of the cardiovascular and respiratory systems. Whiplash associated disorders (WAD) and cervical dystonia, which involve disturbance to the neck region, can often present with abnormalities to the oromotor, respiratory and cardiovascular systems. We investigated the potential neural pathways underlying such symptoms. Simulating neck afferent activity by electrical stimulation of the second cervical nerve in a working heart brainstem preparation (WHBP) altered the pattern of central respiratory drive and increased perfusion pressure. Tracing central targets of these sensory afferents revealed projections to the intermedius nucleus of the medulla (InM). These anterogradely labelled afferents co-localised with parvalbumin and vesicular glutamate transporter 1 indicating that they are proprioceptive. Anterograde tracing from the InM identified projections to brain regions involved in respiratory, cardiovascular, postural and oro-facial behaviours—the neighbouring hypoglossal nucleus, facial and motor trigeminal nuclei, parabrachial nuclei, rostral and caudal ventrolateral medulla and nucleus ambiguus. In brain slices, electrical stimulation of afferent fibre tracts lateral to the cuneate nucleus monosynaptically excited InM neurons. Direct stimulation of the InM in the WHBP mimicked the response of second cervical nerve stimulation. These results provide evidence of pathways linking upper cervical sensory afferents with CNS areas involved in autonomic and oromotor control, via the InM. Disruption of these neuronal pathways could, therefore, explain the dysphagic and cardiorespiratory abnormalities which may accompany cervical dystonia and WAD.

Keywords  Proprioception · Autonomic · Immunohistochemistry · Electrophysiology

Introduction

The intermedius nucleus of the medulla (InM) is a neurochemically diverse perihypoglossal nucleus (Edwards et al. 2007, 2009) with no known function. Furthermore, very little is known regarding the anatomical connectivity of the nucleus. We have previously identified a monosynaptic projection from the InM into the neighbouring nucleus of the solitary tract (NTS) using electrophysiology (Edwards et al. 2007), indicating a possible role in autonomic and/or respiratory control. Direct primary afferent input to the InM arises from upper cervical levels in a number of
<table>
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<th>Hypoglossal Nucleus</th>
<th>Oromotor Control</th>
<th>Oropharyngeal Control</th>
<th>To Phrenic Nerve for Inspiratory Activity</th>
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<td>Pontine Parabrachial Nucleus</td>
<td>CN V</td>
<td>CN VII</td>
<td>C4–C5–C6 Motor Neurons</td>
<td>Eye Position</td>
</tr>
<tr>
<td>Nucleus Ambiguus</td>
<td>Caudal Ventrolateral Medulla</td>
<td>Nucleus Tractus Solitarius</td>
<td>Autonomic Innervation to and From the Viscera</td>
<td>Posture</td>
</tr>
<tr>
<td>Muscles of the Soft Palate, Pharynx, Larynx</td>
<td>Inhibits Sympathetic Tone and Blood Pressure</td>
<td>The Integratory Center</td>
<td>Most of the Sympathetic Nerves in the Body are Splanchnic</td>
<td>Regulate Reflex Cardiovascular Activity and Modulate Respiratory Functions</td>
</tr>
</tbody>
</table>
DO IT ALL AGAIN

More than 80 percent of U.S. small business owners say they would still become a small business owner today if they had the chance to do it all over again, according to the most recent Wells Fargo/Gallup Small Business Index. Among the key reasons identified for their decision: the independence gained from their career choice, being their own boss, a sense of job satisfaction, having family time and schedule flexibility, and interacting with customers.

CHARACTER FIRST

Selecting science and engineering graduate students based on an assessment of character rather than standardized test scores could improve student quality and increase participation of women and minorities in STEM fields, according to a recent article published in Nature. The primary reason half of all American PhD candidates don’t graduate, the authors state, is U.S. academia’s overreliance on the GRE’s quantitative score, which measures math ability as a predictor of ultimate success. The test also discourages women and minorities from STEM fields. The authors propose in-person interviews to better assess an individual’s likelihood of success and the elimination of typical selection procedures that reject candidates based on high minimum GRE scores.

TURN IT OFF!

Background TV has a negative influence on the language development of toddlers, according to a recent study published in the Journal of Children and Media. Parents of toddlers ages 12 to 36 months were observed interacting with their children for an hour with and without an adult television program in the background. When the TV was on, the quantity of words and phrases spoken and the number of new words introduced by parents were significantly lower. The average American child under 24 months is exposed to an average 5.5 hours of background TV per day.

SAVING BACKS... AND COSTS!

by ANNIE LOCKE

On-site chiropractic care can improve employee health while cutting overall costs.

After repeatedly lifting and loading heavy cases at Brewers Distributing Company, Josh Jackson began experiencing back pain. Though he tried working through it, the pain would often get worse; that is, until he was paid a visit by a local chiropractor.

A graduate of Palmer College of Chiropractic, Dr. Jay Benningfield of Benningfield and Associates comes from a family of chiropractors spanning two generations. Dr. Benningfield—or “Dr. Jay,” as he is known to patients—visits Brewers Distributing once a week to help relieve the pain felt by Jackson and other employees. “I experience pain a bit each day,” Jackson says. “It helps tremendously.”

As a wholesaler for Anheuser-Busch, the world’s leading brewing company, Brewers Distributing employees spend much of their time moving around hefty cases and kegs of beer. Having noticed a large number of workers compensation cases due to lifting-related injuries, the company decided to introduce several workplace wellness programs to prevent these injuries from occurring in the first place. One of these programs involved weekly, on-site chiropractic visits, free of charge to any employee. “Dr. Jay was one of many initiatives we had,” explains Robert F. Personett, chief financial officer at Brewers, “but this is one that we feel has given us the most benefit.”

Every Thursday, Dr. Jay comes to Brewers during the employee shift change. “The convenience is the best part,” Jackson notes. “It only takes about five minutes and a little tweak—and I’m good to go.” In addition, if employees need help outside of that weekly window of time, they can always visit him in his office.

By treating pain before it develops into a serious injury, the preventative approach is a good fit with Dr. Benning-
field's philosophy on wellness, which includes health and nutrition education on top of on-site chiropractic adjustments. "We see them when [the pain] is minor," he explains. "If we weren't there—if they didn't have the option—these guys would still come in and work until it became something severe and needed to be covered by workers' compensation."

While some business owners and administrators might dismiss such a program as too expensive, it has actually saved Brewers a significant amount of money. In the two years since it was implemented, the number of employee sick days has declined by 22 percent, while the accident rate has been cut in half. Consequently, the company's workers' compensation costs have experienced a dramatic reduction, with premiums declining by more than 25 percent.

With that in mind, Brewers has encouraged others to adopt similar programs. At a recent industry conference, the company's on-site chiropractic program was recognized as a "best practice" among hundreds of attendees. Katie Waddington, human resources manager, presented information about the program at the conference. "A lot of people at first think, 'Oh my goodness, that costs to have a chiropractor in your facility?' But when you really look at the numbers... it makes sense. We have the return on investment and the statistics to prove it." [1]

Benningfield & Associates Chiropractic Rehabilitation Center is located at 1524 W. Glen Ave. in Peoria. For more information, call Dr. Jay Benningfield at (309) 692-6800.

PSYCHOLOGY OF COLOR

Color therapy—the idea that light in the form of color can help balance human energy—dates back to ancient Egypt, where the practice was first used to treat disease. According to researchers for the Ibn Sinha Institute of Tiff, the theory is that all matter is composed of energy, each vibrating at a specific frequency, and color therapy may help balance the frequency of malfunctioning cells, restoring them to their natural state. For instance, warmer colors may stimulate the sympathetic nervous system, increasing energy and blood flow, while cooler colors may stimulate the parasympathetic nervous system, decreasing energy and blood flow.

Color therapy has been utilized in the treatment of skin conditions and cancers through techniques like infrared radiation and UV light therapy, but healthcare entities aren't the only ones who have realized its potential. Marketers also know that color affects our visual experiences—from brand identity to the conveyance of emotions. Samsung ran with this idea last August when it launched a huge digital ad campaign for its new Galaxy Tab S. The interactive "Color Therapy" ads were customized by region across six cities worldwide, each ebbing and flowing into some 100 different combinations of colors and shapes based on the weather—responding to cool tones when it was hot and dry, and warm tones when cold and wet. The goals were twofold: to showcase the tablet's visual capabilities, and to use color to play on potential consumers' moods.

You can use color to your business' advantage, too. Set the right mood with careful color selection in your business logo; reach the right audience through a targeted background hue in your next advertisement; or boost office creativity with the perfect shade for conference room walls.

In its "Psychology of Color" chart, the Carey Jolliffe Graphic Arts agency breaks down the connotations associated with different colors, helping to harness the right color to tell a client's story, set a business mood, or inspire people to take action. [2]

View the full chart at cjolliffe.com/Resources/CJGA-Color-Theory.pdf.

BRIGHT RED
Positive: exciting, energizing, sexy, passionate, hot, dynamic, stimulating, provocative, dramatic, powerful, courageous, magnetic, assertive, impulsive, adventurous, demanding, stirring, spontaneous.
Negative: aggressive, violent, temperamental, antagonistic, dangerous.

LIGHT PINK
Positive: romantic, affectionate, compassionate, sweet, soft, tender, delicate, innocent, fragile, youthful.
Negative: too sweet, too sentimental.

GOLD
Positive: rich, glowing, divine, intuitive, luxurious, opulent, expensive, radiant, valuable, prestigious.
Negative: gaudy.

DARK GREEN
Positive: natural, trustworthy, refreshing, cool, restful, stately, hushed, woody, traditional, reliable, money, prosperity.

SKY BLUE
Positive: calming, cool, heavenly, constant, faithful, true, dependable, restful, contented, tranquil, trusting, serene, expansive, open, transcendent.

BLACK
Positive: powerful, empowering, elegant, sophisticated, mysterious, heavy, bold, basic, classic, strong, expensive, invulnerable, magical, nighttime, sober, prestigious, stylish, modern.
Negative: depression, death, mourning, underworld, evil, oppression suppression, menacing.

WHITE
Positive: pure, clean, pristine, spotless, innocent, silent, lightweight, air bright, bridal, ethereal, clarity, simplicity, arctic, efficient.
Negative: sterile, cold.
Impact of Chiropractic Services at an On-Site Health Center

Journal of Occupational and Environmental Medicine
September 2014; Volume 56; No. 9; pp. 990–992

Sylvia L. Kindermann, MPH; Qingjiang Hou, MS; Ross M. Miller, MD, MPH

The objective of this study was to compare the influence of employer-sponsored, on-site chiropractic care against community-obtained care on health care utilization. It was a retrospective claims analysis study, using 876 on-site and 759 off-site participants.

KEY POINTS FROM THIS ARTICLE:

1) Musculoskeletal conditions are the primary cause of physical disability in the United States.

2) About 50% of US adults have back pain, arthritis, osteoporosis, or bodily injury in excess of 3 months' duration annually.

3) 17% of US workers have absenteeism as a result of musculoskeletal conditions yearly.

4) Neck pain inhibits about 14% of workers from successfully completing their jobs.

5) In 2006, the average direct cost of treatment for musculoskeletal conditions was $576 billion, and indirect costs added an additional $373 billion, primarily in wage losses. [total = $949 billion]

6) “Doctors of chiropractic promote wellness and injury prevention.”

7) “Chiropractic care has been demonstrated to deliver effective treatment for the symptoms of musculoskeletal conditions.”

8) “On-site chiropractic care has been shown to deliver substantial value through convenience of access, high quality of care and delivery, and lowered overall costs.”

9) On-site chiropractic care has “demonstrated significant improvements in headache, neck pain, and low back pain functional status in patients utilizing on-site services over a short time frame while still showing lower utilization and cost outcomes than community-based care.”

10) Employer-sponsored worksite clinics could control costs and increase workplace productivity while providing high quality and convenient care to their employees.
11) “This study demonstrates that users of on-site chiropractic services have lower health care utilization than those who obtain their care at off-site community care centers.”

12) “Patients receiving chiropractic care on-site were significantly less likely to have radiology [diagnostic imaging, including MRI, ultrasound, and x-rays] testing.”

13) The off-site group received more radiology services overall (55.5% vs 38.2%) including magnetic resonance imaging, ultrasound, and radiograph; had higher outpatient and emergency department utilization; and demonstrated greater use of chiropractic care and physical therapy.

14) “The mean number of chiropractic services and physical therapy visits per member were both significantly higher in the off-site group.”

15) “The results of this study support the value of chiropractic services offered at on-site health centers in comparison with chiropractic services provided off-site. Future research into potential indirect and direct cost savings would supplement this study and further demonstrate the advantages of on-site chiropractic care.”

16) “Compared with off-site care, on-site chiropractic services are associated with lower health care utilization. These results support the value of chiropractic services offered at on-site health centers.”

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<tr>
<th>[numbers rounded]</th>
<th>On-Site Chiropractic Care</th>
<th>Off-site Chiropractic Care</th>
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<tbody>
<tr>
<td><strong>Diagnostic Imaging</strong></td>
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</tr>
<tr>
<td>(X-ray, MRI, Ultrasound)</td>
<td>38%</td>
<td>56%</td>
</tr>
<tr>
<td>(X-ray)</td>
<td>27%</td>
<td>46%</td>
</tr>
<tr>
<td>(MRI)</td>
<td>12%</td>
<td>15%</td>
</tr>
<tr>
<td>(Ultrasound)</td>
<td>11%</td>
<td>16%</td>
</tr>
<tr>
<td><strong>Repeated Diagnostic Imaging</strong></td>
<td>19%</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Outpatient Utilization</strong></td>
<td>30%</td>
<td>47%</td>
</tr>
<tr>
<td><strong>Emergency Department Visits</strong></td>
<td>13%</td>
<td>19%</td>
</tr>
</tbody>
</table>

COMMENTS FROM DAN MURPHY

This article could be a great marketing strategy for new graduates. It suggests that all major companies should have an on-site chiropractor.
Impact of environmental factors on the prevalence of autistic disorder after 1979

Journal of Public Health and Epidemiology
September 2014; Vol. 6; No. 9; pp. 271-284

Theresa A. Deisher, Ngoc V. Doan, Angelica Omaiye, Kumiko Koyama and Sarah Bwabye

BACKGROUND FROM DAN MURPHY

It is not my intention to be morally judgmental. It is to inform:

If one types in the words “Where do human fetal cells in vaccines come from?” into an internet search engine, one will immediately find an overwhelming number of articles on the topic. After reading a dozen or so of them, one will discover that they mostly give the same answer and history. Portions of a few samples follow:

The Children’s Hospital of Philadelphia
Hot Topics: Fetal Tissues
Do vaccines contain fetal tissues?
“Varicella (chickenpox), rubella, hepatitis A, shingles and one preparation of rabies vaccine are all made in fetal embryo fibroblast cells. These cells were first obtained from elective termination of two pregnancies in the early 1960s. These same embryonic cells obtained from the early 1960s have continued to grow in the laboratory and are used to make vaccines today. No further sources of fetal cells are needed to make these vaccines.”

Viruses need cells to grow and tend to grow better in cells from humans than animals cells. When scientists studied viruses in the lab, they found that the best cells to use were the fetal cells.

National Network for Immunization Information
Human Fetal Links with Some Vaccines
June 3, 2008
“Some vaccines are grown in cell cultures that were originally obtained from two human fetuses. In addition, the rubella virus used to make rubella vaccine was isolated from a third human fetus.”

“Viruses cannot reproduce on their own.” “The growth of viruses requires living cells.” “They require a living host in which to grow, such as chicken embryos, and cells from animals that are grown in culture.”

“Varicella (chickenpox) virus does not grow well in most cells derived from species other than humans. Also, human cells are preferred because cells derived from animal organs sometimes may carry animal viruses that could harm people.”
“Human diploid cells are batches of human cells that are grown in a laboratory.”

“Certain diploid cell strains are valuable in vaccine manufacture because these cells can be used for a very long period of time in the laboratory and are a reliable means by which many viruses that infect humans can be successfully and easily grown.”

“Two different strains of human diploid cell cultures made from fetuses have been used extensively for vaccine production for decades. One was developed in the United States in 1961 (called WI-38) and the other in the United Kingdom in 1966 (called MRC-5). “WI-38 came from lung cells from a female fetus of 3-months gestation and MRC-5 was developed from lung cells from a 14-week-old male fetus.”

“The WI-38 and MRC-5 cell cultures have been used to prepare hundreds of millions of doses of vaccines, preventing millions of cases of rubella, hepatitis A, varicella and rabies.”

Development Of Vaccines From Aborted Babies
Jessica Farnsworth, M.D., May 2011

“In the 1960s, Dr. Leonard Hayflick at the Wistar Institute located in Philadelphia, Pennsylvania began working with aborted babies in an attempt to obtain human cell strains that would provide a culture medium for the growth of viruses. These viruses, grown in the human cell culture (also called human diploid cell cultures), could then be used to make vaccines to protect against various illnesses such as polio and rubella.”

“Cell strains from fetal organs can multiply many times and provide a cell source for many decades, serving as an ideal culture medium due to their longevity. One aborted baby can be the source of a cell strain with a potential yield of about 20 million metric tons of cells, which can be stored frozen for many years. The availability of aborted babies also presents an economic advantage over animal sources of cell cultures such as monkey, chicken, duck, dog, or rabbit, since animals must be housed, fed, maintained, and bred.”

“The intent of the researcher was to use the aborted babies for development of vaccines. The aborting parents were screened for health and their baby chosen for research material. The need for fresh fetal tissue dictated that the abortion be pre-arranged between abortionist and researcher.”

“In 1962, Dr. Hayflick successfully developed a cell line from the lungs of an aborted female 3-month old fetus. “This cell line was named WI-38, for Wistar Institute and the 38th fetal sample used in this research. “WI-38 cells are used extensively to this day by several pharmaceutical companies in vaccine production.”
“In 1966, the Medical Research Council in Britain developed another cell line from another baby, this time from the lungs of a male 14-week old fetus removed for ‘psychiatric’ reasons from a 27 year old woman.” “This cell line was named MRC-5. It is used extensively in current vaccine production.”

Several other tissue fetal lines have been similarly developed, in 1975, 1985, and 1995.

Vaccines in current use which were made from these fetal cell lines include the following:
Chickenpox vaccine
Rubella vaccine
Hepatitis A vaccine
The polio portion of Pentacel (a combination shot for DTaP +Polio+ HiB)
Rabies vaccine
Smallpox vaccine
Shingles vaccine.

“Because these vaccines are from viruses grown in human fetal cells, the vaccines contain fetal DNA and other fetal cellular proteins. This means that each time an individual is immunized with one of these vaccines, they receive a portion of the aborted baby’s cell contents from the cell lines used for these vaccines.”

KEY POINTS FROM DAN MURPHY

1) “Autistic disorder (AD) is a subset of the Autism Spectrum Disorders (ASDs), a group of developmental disabilities that have reached epidemic levels.”

2) “The Centers for Disease Control released a study in 2013 estimating US ASD prevalence at 1 in 50 children aged 6 to 17 in 2011 to 2012.”

3) “In addition to ASD, there are also apparent epidemic levels of other early onset neuro-developmental (ND) syndromes such as childhood onset schizophrenia and bipolar disorder.”

4) “Regardless of the cause(s), diagnoses of autistic disorder have risen dramatically, adding a significant public health burden and therefore demanding critical assessment of environmental triggers that may be responsible for this apparent epidemic.”

5) The aim of this study was to investigate a universal environmental factor as related to the prevalence of autistic disorder (AD): human fetal and retroviral contaminants in childhood vaccines. “This study is the first laboratory and ecological study conducted to date that has examined the question of a relationship between human fetal cell line manufactured vaccines and autism.”
6) Human fetal and retroviral contaminants in childhood vaccines were absent prior to change points (CPs) in prevalence.

7) Human fetal and retroviral contaminants in childhood vaccines show both a dose-effect with the prevalence of autism, and has “known pathologic mechanisms of action.”

8) The design of this study was a worldwide population based cohort study, using the United States, Western Australia, United Kingdom and Denmark. The authors assessed all live born infants who later developed autistic disorder, delivered after January 1970, through publicly available databases.

9) The change points in autism prevalence in the assessed countries “corresponded to introduction of or increased doses of human fetal cell line-manufactured vaccines.”

10) No relationship was found between paternal age and autism prevalence. No relationship was found between Diagnostic and Statistical Manual (DSM) revisions (ie, a change in diagnostic criteria) and autism prevalence. “Increased paternal age and DSM revisions were not related to rising autistic disorder prevalence.”

11) “Linear regression revealed that Varicella and Hepatitis A immunization coverage was significantly correlated to autistic disorder cases.”

12) “Autistic disorder change points years are coincident with introduction of vaccines manufactured using human fetal cell lines, containing fetal and retroviral contaminants, into childhood vaccine regimens. This pattern was repeated in the US, UK, Western Australia and Denmark.”

13) “Thus, rising autistic disorder prevalence is directly related to vaccines manufactured utilizing human fetal cells.”

14) These authors did an extensive assessment to determine whether Diagnostic and Statistical Manual [for mental disorders] (DSM I-1952, II-1968, III-1980, IV-1994, IV-TR-2000) revisions were related to an increased prevalence of autistic disorder. They concluded “DSM revisions are unlikely to be the primary trigger for increased autistic disorder prevalence.” “DSM revision printing schedules do not correlate with calculated autistic disorder change points and cannot be the primary environmental or sociological trigger responsible for current autistic disorder prevalence.”

15) An analysis of paternal age as related to the prevalence of autistic disorder “did not reveal a relationship.”
16)  Autistic disorder rose conspicuously around 1988 to 1989. This autistic disorder change point followed a switch from animal cell line to human fetal cell line manufacture of MMR vaccine in October 1988. This was noted in both the UK and Denmark. [Important]

17) “The US 1980 to 1981 autistic disorder change point followed the January 1979 approval of MeruvaxII® and MMRII®, which are manufactured in the human fetal cell line WI-38.”

18) “In 1979, coincident with the first autism disorder change point, vaccine manufacturing changes introduced human fetal DNA fragments and retroviral contaminants into childhood vaccines.”

19) “Human fetal DNA fragments are inducers of autoimmune reactions, while both DNA fragments and retroviruses are known to potentiate genomic insertions and mutations.”

20) “Infants and children are almost universally exposed to these additional vaccine components/contaminants, and these converging events are associated with rising autistic disorder in a dose-dependent fashion due to the increasing numbers of human fetal manufactured vaccines which have been added to the US immunization guidelines.”

21) “Vaccines that have been cultured on or manufactured using the WI-38 fetal cell line such as MeruvaxII®, MMRII®, Varivax®, Havrix® and Pentacel® are additionally contaminated with fragments of human endogenous retrovirus HERVK. Recent evidence has shown that human endogenous retroviral transcripts are elevated in the brains of patients with schizophrenia or bipolar disorder, in peripheral blood mononuclear leukocytes of patients with autism spectrum as well as associated with several autoimmune diseases.”

22) “Manufacture of childhood vaccines in human fetal cell lines, with its associated retroviral and human DNA fragment contaminants, fulfills all of the necessary requirements as a primary trigger for the ND disease autistic disorder. The contaminants were not present prior to the first US autistic disorder change point, they have continued to increase the environment with additional human fetal vaccine approvals and doses, and they have clinically documented adverse immunologic and mutagenic side effects.”

23) “The strong ecological association between human fetal cell line-manufactured vaccines and autistic disorder change points calls for further investigation of these childhood vaccine contaminants, and for the sake of preserving critical vaccination coverage, even a return to animal-based manufacturing.”
24) Diagnosis of autism at younger age may more likely be the result of introducing human fetal cell vaccine contaminates to younger children. “With the 2008 US approval of Pentacel® for children at 2, 4, and 6 months of age, we may be seeing age of onset of regressive autism decrease dramatically.”

[autism is being diagnosed at earlier and earlier ages]

25) “This overlooked potential trigger for the worldwide autism disorder epidemic demands additional studies in order to assure the safe manufacture of routine recommended childhood vaccines, particularly since reverting to animal based manufacturing methods is readily available.”

26) “Vaccinations have done tremendous good in the world; however, further investigation of fetal manufactured-vaccine contaminants as an environmental contributor to the current autistic disorder epidemic is called for.”

COMMENT FROM DAN MURPHY:

This is the second article we have reviewed suggesting that vaccines cultured in human fetal cells increase the prevalence of autism. The first was:

**Article Review 10-12:**
**Theoretical aspects of autism: Causes—A Review**
**Journal of Immunotoxicology, 2011**

1) “The rubella component of MMR II was propagated in a human cell line derived from embryonic lung tissue. The MMR II vaccine is contaminated with human DNA from the cell line. This human DNA could be the cause of the spikes in incidence.”

2) “An additional increased spike in incidence of autism occurred in 1995 when the chicken pox vaccine was grown in human fetal tissue.”

3) The human DNA from the vaccine can be randomly inserted into the recipient’s genes. This insertion occurs primarily on the X chromosome in genes involved in nerve cell synapse formation, central nervous system development, and mitochondrial function, accounting for autism primarily in boys. These data “support the hypothesis that residual human DNA in some vaccines might cause autism.”

4) “The incidence and prevalence data indicate the timing of introduction of vaccines and changes in the type and increasing number of vaccines given at one time implicate vaccines as a cause of autism.”
Complete Set of 4 DVD’s for $199 + $5.50 S&H
Featuring on-trend, up-to-date topics
for Doctors and Patients.

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<tr>
<th>Disc 1</th>
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-Fibrosis of Repair  
-The Sunshine Vitamin: D3 | -Statin Drugs  
-Whiplash  
-Kids & Chiropractic  
-Posture & Neurology  
-Laser Therapy |

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| -Pain Medications  
-Fish Oils & Omega 3’s  
-Excitotoxins | -Interview with Dr. Michael Underhill  
-Environment and Toxins  
-Fibrosis of Repair  
-The Sunshine Vitamin: D3 |

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<td>613 S. Mesa Dr.</td>
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Did You Know?

• Spinal stiffness was linked to visceral pathology with nearly 100% accuracy based upon sympathetic innervation. *(Medical Times, 1921)*

• 1,000 capsules of Tylenol in a lifetime doubles the risk of end stage renal disease. *(New England Journal of Medicine, 1994)*

• The average time for a whiplash-injured patient to achieve maximum improvement is 7 months 1 week. *(Spine, 1994)*

• 93% of patients with chronic whiplash pain who have failed medical and physical therapy care improve with chiropractic adjustments. *(Injury, 1996)*

• Taking the correct drug for the correct diagnoses in the correct dose will kill about 106,000 Americans per year, making it the 4th most common cause of death in the US. *(Journal of the American Medical Association, 1998)*

• Nonsteroidal anti-inflammatory drugs for rheumatoid and/or osteoarthritis conservatively cause 16,500 Americans to bleed to death each year, making that the 15th most common cause of death in the US. *(New England Journal of Medicine, 1999)*

• Glutamate and aspartame can cause chronic pain sensitization, and removing them from the diet for 4 consecutive months can eliminate all chronic pain symptoms. *(Annals of Pharmacotherapy, 2002)*

• Chiropractic spinal adjusting has been shown to be better than 5 times more effective than the NSAIDs pain drugs Celebrex and Vioxx in the treatment of chronic neck and low back pain. *(Spine, 2003)*

• In patients suffering from chronic pain subsequent to degenerative spinal disease, 59% can eliminate the need for pain drugs by consuming adequate levels of omega-3 essential fatty acids. *(Surgical Neurology, 2006)*

• Chiropractic adjustments have been shown to significantly lower blood pressure. *(Journal of Human Hypertension, 2007)*

• The estimated incidence of chronic pain from whiplash trauma is 15-40%. *(Jour of the Am Academy of Ortho Surg, 2007)*

• Meniere’s Disease has been linked to a disorder of the upper cervical spine facet joints. *(International Tinnitus Jour, 2007)*

• Supplementing with vitamin D3 has the potential to reduce cancer deaths in America by 75%. *(Ann of Epidemiology, 2009)*

• Potentially, the largest exposure of Americans to the neurotoxin mercury is through the consumption of products containing High Fructose Corn Syrup. *(Environmental Health, 2009)*

• Those who consumed the highest amounts of nonsteroidal anti-inflammatory pain drugs increased their risk of dementia, including Alzheimer’s dementia, by 66%. *(Neurology, 2009)*

• The newest estimate for the incidence of autism is 1 in 91 US children. *(Pediatrics, 2009)*

These published facts and hundreds more are available through my Article Review Service, now in its 11th year. Reviews are detailed, thorough, timely and cutting-edge, with KEY POINTS summary and chiropractic practical applications. The Reviews are in PDF format for easy printing. They are excellent for educating the chiropractor, staff, patients and for lecture preparation. Easy sign-up through the website with a credit card using PayPal. $100.00 per year. The Archives (past years) are also available.

Website: www.danmurphydc.com  
Assistant: Phyllis (925) 420-6564

SUBSCRIBER COMMENTS

Dr. Dan,
Any chiropractor that truly cares about his patients and not about just making a buck needs to be subscribing to your Article Review Updates. I certainly am going to do my part to see that each chiro I come in contact with knows what an absolutely invaluable resource it is. I sat in amazement at the last two articles you sent regarding antibiotic overuse and atopic disorders. What crucial information to pass on to my practice members. Thanks and keep up the awesome work.  
Dr. G.M.; August 1, 2002

Dear Dan,
I hope you can continue providing this information for many years to come. I have been in practice for 18 years and find these citations to be the most informative, chiropractically relevant information that I have received in my career. I would be willing to pay more for this information to make sure that it keeps coming. Again, thank you!!  
JR, DC; January 8, 2005