

BIBLIOGRAPHY OF ARTICLES ON
ENDOCRINE AND BIOCHEMICAL
ABNORMALITIES IN INTRACTABLE
PAIN SYNDROME



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References

1. Abs R, Verhelst J, Maeyaert J, et al. Endocrine consequences of long term intrathecal administration of opioids. *J Clin Endocrinol Metab.* 2000; 85:2215–22.
2. Addison T. On the constitutional and local effects of disease of the supra-renal capsules. Samuel Highley, London (1855).
3. Akil H, Shiomi H, Mathews J. Induction of the intermediate pituitary by stress: synthesis and release of a non-opioid form of B-endorphin. *Science.* 1985; 227:424–8.
4. Aloisi AM, Buonocore M, Merlo L, et al. Chronic pain therapy and hypothalamic-pituitary-adrenal axis impairment. *Psychoneuroendocrinology.* 2011; 36:1032–9.
5. Aloisi AM, Ceccarelli I, Fiorenzani P, et al. Testosterone affects pain-related responses differently in male and female rats. *Neurosci Lett.* 2004; 361:262–4.
6. Aloisi AM, Bonifazi M. Sex hormones, central nervous system and pain. *Horm Behav.* 2006; 50:1–7.
7. Arnold G, Angeli A, Atkinson AB, et al. Diagnosis and complications of Cushing Syndrome: a consensus statement. *J Clin Endocrinol Metab.* 2003; 88:5593–602.
8. Atkinson JH Jr, Kremer EF, Ward HW, et al. Pre- and post-dexamethasone saliva cortisol determination in chronic pain patients. *Biol Psychiatry.* 1984; 19:1155–9.
9. Barnes PJ. Anti-inflammatory actions of glucocorticoids: molecular mechanisms. *Clin Sci (Lond).* 1998; 94:557–72.
10. Bateman A, Singh A, Kral T, et al. The immune–hypothalamic–pituitary adrenal axis. *Endocr Rev.* 1989; 10:92–112.
11. Ceccon M, Runbaugh G, Vicini S. Distinct effect of pregnenolone sulfate on NMDA receptor subtypes. *Neuropharmacology.* 2001; 40:491–500.
12. Chikanza IC, Petrou P, Kingsley G, et al. Defective hypothalamic response to immune and inflammatory stimuli in patients with rheumatoid arthritis. *Arthritis Rheum.* 1992; 35:1281–88.
13. Chrousos GP. The hypothalamic–pituitary–adrenal axis and immune-mediated inflammation. *N Engl J Med.* 1995; 332:1351–62.
14. Cutolo M, Foppiani L, Prete C, et al. Hypothalamic–pituitary–adrenocortical axis function in premenopausal women with rheumatoid arthritis not treated with glucocorticoids. *J Rheumatol.* 1999; 26:282–8.
15. Daniell HW. The association of endogenous hormone levels and exogenously administered opiates in males. *Amer J Pain Man.* 2001. 3:133-34.
16. Daniell HW. Hypogonadism in men consuming sustained-action oral opioids. *J Pain.* 2002; 3: 377–84.
17. Daniell HW. DHEA deficiency during consumption of sustained-action prescribed opioids: evidence for opioid-induced inhibition of adrenal androgen production. *J Pain.* 2006; 7:901–907.
18. Daniell HW. Opioid endocrinopathy in women consuming prescribed sustained-action opioids for control of nonmalignant pain. *J Pain.* 2008; 9:28–36.
19. Dawson-Basoa M, Gintzler AR. Estrogen and progesterone activate spinal kappa-opiate receptor analgesic mechanisms. *Pain.* 1996; 64:608–15.

20. Dons RF, Shaki KM. Changes in triiodothyronine mark severe pain syndrome: a case report. *Military Med.* 1994; 159:465–6.
21. Edmondson EA, Bonnet KA, Friedhoff AJ. The effect of hyperthyroidism on opiate receptor binding and pain sensitivity. *Life Sci.* 1990; 47:2283–9.
22. Elliott JA, Horton E, Fibuch EE. The endocrine effects of long-term oral opioid therapy: a case report and review of the literature. *J Opioid Manag.* 2011; 7:145–54.
23. Finch PM, Roberts LJ, Price L, et al. Hypogonadism in patients treated with intrathecal morphine. *Clin J Pain.* 2000; 16:251–4.
24. Fischer L, Clemente JT, Tambeli CH. The protective role of testosterone in the development of temporomandibular joint pain. *J Pain.* 2007; 8:437–42.
25. Forman IJ, Tingle V, Estilow S, Caler J. The response to analgesia testing is affected by gonadal steroids in the rat. *Life Sci.* 1989; 45:447–54.
26. Glynn CJ, Lloyd JW. Biochemical changes associated with intractable pain. *Br Med J.* 1978; 1:280–1.
27. Griep EN, Boersma JW, Lentjes EG, et al. Function of the hypothalamic–pituitary–adrenal axis in patients with fibromyalgia and low back pain. *J Rheumatol.* 1998; 25:1374–81.
28. Grossman A, Gaillard RC, McCartney P, et al. Opiate modulation of the pituitary–adrenal axis: effects of stress and circadian rhythm. *Clin Endocrin.* 1982; 17:279–86.
29. Guth L, Zhang Z, Roberts E. Key role for pregnenolone in combination therapy that promotes recovery after spinal cord injury. *Proc Natl Acad Sci.* 1994; 91:308–12.
30. Harbuz MS, Perveen-Gill Z, Lightman SL, et al. A protective role for testosterone in adjuvant-induced arthritis. *Br J Rheumatol.* 1995; 34:1117–22.
31. Holaday JW, Law PY, Loli HH, et al. Adrenal steroids indirectly modulate morphine and betaendorphin effects. *J Pharmacol Exp Ther.* 1979; 208:176–83.
32. Horner HC, Packan DR, Sapolsky RM. Glucocorticoids inhibit glucose transport in cultured hippocampal neurons and glia. *Neuroendocrinology.* 1990; 52:57–63.
33. Jain R, Zwickler D, Hollander CS, et al. Corticotropin-releasing factor modulates the immune response to stress in the rat. *Endocrinology.* 1991; 128:1329–36.
34. Joels M, DeKloet E. Control of neuronal excitability by corticosteroid hormones. *Trends Neurosci.* 1992; 15:25–30.
35. Jones KJ. Gonadal steroids and neuronal regeneration: a therapeutic role. *Adv Neurol.* 1993; 59:227–40.
36. Jorgensen C, Bressot N, Bologn C, et al. Dysregulation of the hypothalamic-pituitary axis in rheumatoid arthritis. *J Rheum.* 1995; 22:1829–33.
37. Khorami S, Muniyappa R, Nackers L, et al. Effect of chronic osteoarthritis pain on neuroendocrine function in men. *Clin Endocrinol Metab.* 2006; 11:4313–8.
38. Kibaly C, Meyer L, Patte-Mensah C, Mensah-Nyagan AG. Biochemical and functional evidence for the control of pain mechanisms by dehydroepiandrosterone endogenously synthesized in the spinal cord. *FASEB J.* 2008; 22:93–104.
39. Kimonides VG, Khatibi NH, Svendsen CN, et al. Dehydroepiandrosterone (DHEA) and DHEAsulfate (DHEAS) protect hippocampal neurons against excitatory amino acid-induced neurotoxicity. *Proc Natl Acad Sci USA.* 1998; 95:1852–7.
40. Krakoff L. Glucocorticoid excess syndromes causing hypertension. *Cardiol Clin.* 1988; 6:537–45.

41. Lentjes EG, Griep EN, Boersma JW, Romijn FP, de Kloet ER. Glucocorticoid receptors, fibromyalgia, and low back pain. *Psychoneuroendocrinology*. 1997; 22:603–14.
42. Leonelli E, Bianchi R, Cavaletti G, et al. Progesterone and its derivatives are neuroprotective agents in experimental diabetic neuropathy: a multi-modal analysis. *Neuroscience*. 2007; 144:1293–304.
43. Long JB, Holaday JW. Blood–brain barrier: endogenous modulation by adrenal–cortical function. *Science*. 1985; 227:1580–3.
44. Matoushek TA, Kearney TC, Lindsay TS, et al. Loss of antinociceptive effectiveness of morphine and oxycodone following titration of levothyroxine: case reports and a brief review of published literature. *J Opioid Manag*. 2012; 8:193–6.
45. Mayo W, Le Moal M, Abrous DN. Pregnenolone sulfate and aging of cognitive functions: behavioral; neurochemical, and morphological investigations. *Horm Behav*. 2001; 40:215–7.
46. McComb BA. Hormonal considerations in chronic pain patients. *The Pain Clinic*. 2002; Aug:17-23.
47. McEwen BS, Biron CA, Brunson KW, et al. The role of adrenocorticoids as modulators of immune function in health and disease: neural endocrine and immune interactions. *Brain Res Rev*. 1997; 23:79–133.
48. McEwen BS, de Kloet ER, Rostene W. Adrenal steroid receptors and action in the nervous system. *Physiol Rev*. 1986; 66:1121–88.
49. McMahon M, Gerich J, Rizza R. Effects of glucocorticoids on carbohydrate metabolism. *Diabetes Metab Rev*. 1988; 4:17–30.
50. Mellor DJ, Stafford KJ, Todd SE, et al. A comparison of catecholamine and cortisol responses of young lambs and calves to painful husbandry procedures. *Aust Vet J*. 2002; 80:228–33.
51. Moore RA, Evans PJ, Smith RF, et al. Increased cortisol excretion in chronic pain. *Anesthesia*. 1983; 38:788–91.
52. Mensah-Nyagan AG, Meyer L, Schaeffer V, Kibaly C, Patte-Mensah C. Evidence for a key role of steroids in the modulation of pain. *Psychoneuroendocrinology*. 2009; 34(Suppl. 1):S169–77.
53. Munck A, Guyre PM, Holbrook NJ. Physiological functions of glucocorticoids in stress and their relation to pharmacological actions. *Endocr Rev*. 1984; 5:25–44.
54. Nakagawa H, Hosokawa R. Study of the stress response to acute pain in the awake human. *Pain Clin*. 1994; 7:317–24.
55. Neeck G, Federlin K, Graef V, et al. Adrenal secretion of cortisol in patients with rheumatoid arthritis. *J Rheumatol*. 1990; 17:24–9.
56. Neeck G, Crofford LJ. Neuroendocrine perturbations in fibromyalgia and chronic fatigue syndrome. *Rheum Dis Clin North Am*. 2000; 26:989–1002.
57. Newell-Price J, Bertango X, Grossman AB, et al. Cushing’s Syndrome. *Lancet*. 2006; 367:1605–17.
58. Nieman LK, Biller BM, Findling JW, et al. The diagnosis of Cushing Syndrome: an endocrine society clinical practice guideline. *J Clin Endocrinol Metab*. 2008; 93:1526–40.
59. Orchinik M, Murray TF, Moore FL. A corticosteroid receptor in neuronal membranes. *Science*. 1991; 252:1848–51.
60. Orstavik K, Morheim I, Jorum E. Pain and small fiber neuropathy in patients with hypothyroidism. *Neurology*. 2006; 67:786–91.

61. Pednekar J, Mulgaonker VK. Role of testosterone on pain threshold in rats. *Indian J Physiol Pharmacol.* 1995; 39:423–4.
62. Penza P, Lombardi R, Camozzi F, et al. Painful neuropathy in subclinical hypothyroidism: clinical and neuropathological recovery after hormone replacement therapy. *Neurol Sci.* 2009; 30:149–51.
63. Pillemer SR, Bradley LA, Crofford LJ, et al. The neuroscience and endocrinology of fibromyalgia. *Arthritis Rheum.* 1997; 40:1928–39.
64. Raff H, Findling JW. A physiologic approach to diagnosis of the Cushing Syndrome. *Ann Intern Med.* 2003; 138:980–91.
65. Ren K, Wei F, Dubner R, et al. Progesterone attenuates persistent inflammatory hyperalgesia in female rats: involvement of spinal NMDA receptor mechanisms. *Brain Res.* 2000; 865:272–7.
66. Roberts LJ, Finch PM, Pullan PT, et al. Sex hormone suppression by intrathecal opioids: a prospective study. *Clin J Pain.* 2002; 18:144–8.
67. Rubinstein AL, Carpenter DM, Minkoff J. Hypogonadism in men using daily opioid therapy for non-cancer pain is associated with duration of action of opioid. Poster presentation at the 2012 Annual Meeting of the American Academy of Pain Medicine, February 23–26, 2012; Palm Springs; Abstract #229.
68. Russell U. Neurohormonal aspects of fibromyalgia syndrome. *Rheum Dis Clin North Am.* 1989; 15:149–68.
69. Sapolsky RM, Krey LC, McEwen BS. Prolonged glucocorticoid exposure reduces hippocampal neuron number: implications for aging. *J Neurosci.* 1985; 5:1222–7.
70. Schlechte JA, Sherman BM. Decreased glucocorticoids receptor binding in adrenal insufficiency. *Clin Endocrinol Metab.* 1982; 54:145–9.
71. Shenkin HA. Effect of pain on diurnal pattern of plasma corticoid levels. *Neurology.* 1964; 14:1112–7.
72. Sonkin L. Therapeutic trials with thyroid hormones in chemically euthyroid patients with myofascial pain and complaints suggesting mild thyroid insufficiency. *J Back Musculoskeletal Rehabil.* 1997; 8(2):165–71.
73. Stafford EC, Ulibarri CM, Falk JE, et al. Gonadal hormone modulation of mu, kappa, and, delta opioid antinociception in male and female rats. *J Pain.* 2006; 6:261–74.
74. Straub RH, Cutolo M. Involvement of the hypothalamic–pituitary–adrenal/gonadal axis and the peripheral nervous system in rheumatoid arthritis: viewpoint based on a systemic pathogenetic role. *Arthritis Rheum.* 2001; 44:493–507.
75. Strittmatter M, Bianchi O, Ostertag D, et al. Altered function of the hypothalamic–pituitary– adrenal axis in patients with acute, chronic and episodic pain. *Schmerz.* 2005; 19:109–16 (Article in German).
76. Tennant F. Intractable pain is a severe stress state associated with hypercortisolemia and reduced adrenal reserve. *Drug Alcohol Depend.* 2000; 60(Suppl. 1):220–1.
77. Tennant F, Hermann L. Normalization of serum cortisol concentration with opioid treatment of severe chronic pain. *Pain Med.* 2002; 3:132–4.
78. Tennant F, Hermann L. Using biologic markers to identify legitimate chronic pain. *Am Clin Lab.* 2002; 21(5):14–5, 18

79. Tennant F. Complications of uncontrolled, persistent pain. *Pract Pain Manag.* 2004; 4(1):11–14.
80. Tennant F. Hormone therapies: newest advance in pain care. *Pract Pain Manag.* 2011; 11:98–105.
81. Tennant F. How to use adrenocorticotropin as a biomarker in pain management. *Pract Pain Manag.* 2012; 12:62–6.
82. Tennant F. Hormone testing and replacement in pain patients made simple. *Pract Pain Manag.* 2012; 12:54–62.
83. Tennant F. Corticotropin (ACTH) and cortisol serum concentrations help predict high dose opioids requirements. PAINWeek 2012 national conference on pain for frontline practitioners, Abstract 119.
84. Tennant F. The Physiologic Effects of Pain on the Endocrine System. *Pain Ther* (2013) 2:75-86.
85. Tennant F. Hormone testing and treatment enters pain care. *Hospital Practice.* 2014; 42(5):1-7.
86. Tennant F. Hormone abnormalities in patients with severe and chronic pain who fail standard treatments. *Postgrad Med.* 2015; 127(1):1-4.
87. Tennant F. Adrenocorticotropin (ACTH) in chronic pain. *Journal of Applied Biobehavioral Research.* 2017; 22(3):1-7.
88. Vuong C, Van Uum SH, O’Dell LE, Lutfy K, Friedman TC. The effects of opioids and opioid analogs in animal and human endocrine systems. *Endocr Rev.* 2010; 31:98–132.
89. Wieggers GJ, Reul JM. Induction of cytokine receptors by glucocorticoids: functional and pathological significance. *Trends Pharmacol Sci.* 1998; 19:317–21.
90. Wu FS, Gibbs TT, Farb DH. Pregnenolone sulfate: a positive allosteric modulator at the N-methyl-D-aspartate receptor. *Mol Pharmacol.* 1991; 40:333–6.
91. Yoshihara T, Shigeta K, Hasegawa H, et al. Neuroendocrine responses to psychological stress in patients with myofascial pain. *J Orofac Pain.* 2005; 19:202–8.