

## **Is Elevated Noradrenaline [Norepinephrine] an Aetiological Factor in a Number of Diseases?**

**Autonomic & Autacoid Pharmacology**  
**October 2009, Vol. 29, No 4.; pp. 143-156**

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 Noradrenaline (NA) = Norepinephrine; Sympathetic Nervous System (SNS)

This is a theoretical study with 153 references to support the biological plausibility of how increased sympathetic nervous system tone and release of NA is a etiological factor in a broad range of diseases, including, cancer, bipolar disorder, excessive body weight, hypertension, type I autoimmune diabetes, type II diabetes, glaucoma, osteoarthritis, rheumatoid arthritis, asthma, and immune system function.

FROM ABSTRACT:

- 1) Noradrenaline (NA) is a signaling molecule in the brain and sympathetic nervous system (SNS).
- 2) Elevated NA is a factor in various types of cancer.
- 3) Elevated sympathetic tone (elevated NA levels) predisposes a large number of individuals to a broad range of diseases.
- 4) Psychological stress is associated with increased release of NA which may cause or exacerbate diseases.

THIS AUTHOR ALSO NOTES:

- 5) "Noradrenaline (NA) is the principle signaling molecule used at the output of the sympathetic nervous system (SNS), and thereby plays a critical role in the body's 'fight or flight' response to environmental stressors."
- 6) The parasympathetic nervous system, whose principle signaling molecule is acetylcholine, "is more responsible for maintenance processes" know as 'rest and digest' functions.
- 7) The function of the SNS between individuals may be significant as a consequence of genetic differences; this includes the genetic ability to produce NA as well as the number of receptors (adrenoreceptors) NA uses to influence physiology.
- 8) There are genetic differences in NA sympathetic tone. **[tone]**

- 9) Different organs have different sympathetic innervation patterns and thus different sympathetic tones that can influence diseases in these organs.
- 10) Also, different diseases may share comorbidity because of shared patterns of sympathetic innervation.
- 11) Some individuals may have elevated sympathetic tone with "continuously elevated 'fight or flight' mode wherein the body is not devoting sufficient resources toward maintenance or homeostatic processes. These individuals may also have a deficiency of parasympathetic 'rest and digest' tone."
- 12) There are multiple lines of evidence showing that elevated NA levels from the SNS and adrenaline from the adrenal glands are etiological factors in diabetes mellitus, glaucoma, osteoarthritis, rheumatoid arthritis, and asthma.
- 13) The SNS innervates the lymphoid (immune) organs and thus modulates the immune response.
- 14) SNS NA may cause autoimmune diseases, including the "autoimmune destruction of the insulin secreting pancreatic beta cells," and therefore type I diabetes.
- 15) SNS NA also regulates the release of insulin from the pancreatic beta cells (type II diabetes).
- 16) Elevated intraocular pressure damages the optic nerve. Increased SNS NA increases the secretions of the aqueous humour and also decreases the drainage, thereby elevating intraocular pressure (glaucoma).
- 17) The radial muscles of the eye are innervated by the SNS, and they dilate the pupil. Increased sympathetic tone causes radial muscle hypertrophy, which is also associated with glaucoma.
- 18) Elevated SNS tone may also cause glaucoma by altering the tone of the blood vessels of the eye.
- 19) SNS fibers innervate the joints. Elevated SNS tone increase inflammation from a number of mechanism, including increased production of inflammatory cytokines, resulting in degeneration (osteoarthritis).
- 20) Elevated SNS tone causes vasoconstriction, inflammation, and degeneration (osteoarthritis).
- 21) SNS catecholamine production of pro-inflammatory cytokines can perpetuate the inflammation of rheumatoid arthritis.

22) SNS fibers innervate human airways and can cause chronic inflammation and asthma.

23) Elevated SNS NA and increased sympathetic tone should be viewed in two categories:

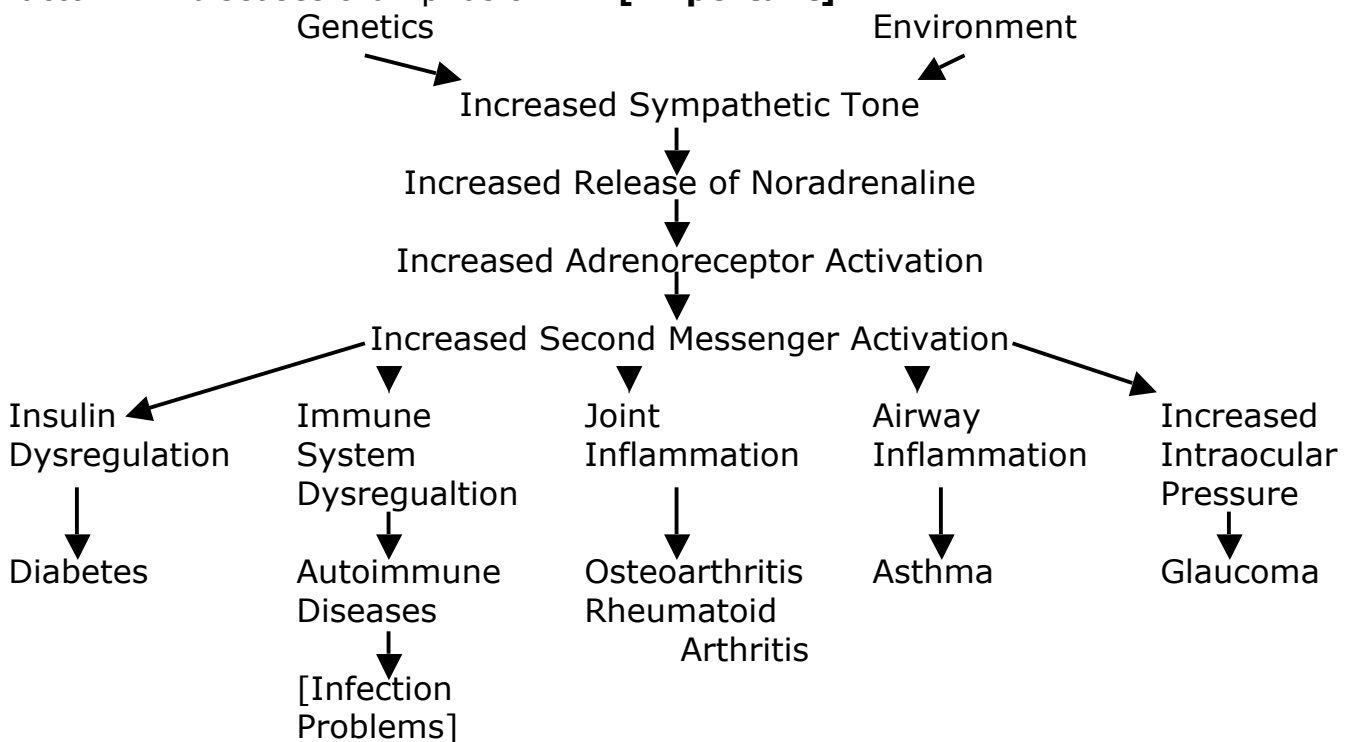
Phasic: A transient burst of NA

Tonic: The steady output of the SNS

[During exercise there is elevated sympathetic tone {phasic} and release of NA, but in the periods between exercise the sympathetic tone is reduced {tonic} because of that same exercise.]

[An adjustment may spike the sympathetic tone {phasic} and release of NA, but the improvement of biomechanical function that occurred as a consequence of that adjustment may reduce the steady output from the SNS {tonic}.]

24) "Tonic NA, through its sustained presence, is the more important aetiological factor in ... diseases than phasic NA." **[Important]**



#### COMMENTS FROM DAN MURPHY

Since the time of Korr (1979) there has been biological plausibility that the subluxation complex results in increased sustained sympathetic tone (tonic), becoming an etiological factor in visceral disease, and that improvement of mechanical integrity (the adjustment) inhibits this adverse tonic release of NA.

This article adds to that biological plausibility.