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INTEGRATIVE PATHOLOGY SERVICES
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RADO FALETIC
11-Feb-1976 Male

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-.SIEW LO
FLOREY MEDICAL CENTRE
19/21 KESTEVEN ST
FLOREY ACT 2615

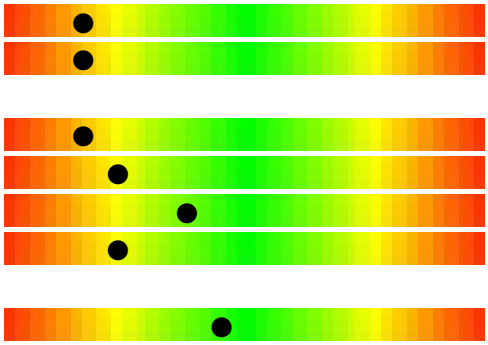
LAB ID : 3935363
UR NO. : 6633420
Collection Date : 15-Nov-2023
Received Date: 20-Nov-2023

3935363

Clinical Notes: MELATONIN

INTEGRATIVE MEDICINE

URINE, SPOT	Result	Range	Units
EXTENSIVE NEUROTRANSMITTER PROFILE			
Inhibitory Neurotransmitters			
SEROTONIN Urine	**52.3**	47.6 - 140.3	ug/gCR
GABA, Urine	***155.0*** ***L**	167.0 - 463.0	ug/gCR
Excitatory Neurotansmitters			
GLUTAMATE Urine	***869.0*** ***L**	1213.0 - 4246.	ug/gCR
DOPAMINE, Urine	**115.0**	103.0 - 282.0	ug/gCR
NORADRENALIN (Nor-Epinephrine)	**19.3**	10.0 - 35.7	ug/gCR
ADRENALIN (Epinephrine)	**1.4**	0.8 - 6.2	ug/gCR
Adrenal Adaptation Index			
Noradrenalin/Adrenalin Ratio	**13.8**	2.9 - 25.2	RATIO



(*) Result outside normal reference range
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Optimal Ranges Table

Biomarker	Adult Optimal Range (>11 Yrs)	
INHIBITORY TRANSMITTERS:		
Tryptophan	3970 - 8450	ug/gCr
SEROTONIN	100 - 215	ug/gCr
5HIAA	2988 - 5850	ug/gCr
GABA	400 - 600	ug/gCr
Glycine	61 - 159	ug/gCr
Taurine	24.5 - 134	ug/gCr
EXCITATORY TRANSMITTERS:		
Glutamine	37 - 71	ug/gCr
GLUTAMATE	2520 - 3700	ug/gCr
Histidine	19.7 - 58.4	ug/gCr
Histamine	5.2 - 15.3	ug/gCr
PEA	5.3 - 16.1	ug/gCr
Tyrosine	4790 - 10278	ug/gCr
Tyramine	279 - 588	ug/gCr
DOPAMINE	200 - 330	ug/gCr
DOPAC	658 - 1449	ug/gCr
HVA	3737 - 7048	ug/gCr
Noradrenaline	18.5 - 25.5	ug/gCr
Normetanephrine		
VMA	2580 - 4766	ug/gCr
Adrenaline	1.4 - 4.2	ug/gCr
INFLAMMATORY MARKERS:		
Kynurenine	257 - 960	ug/gCr
Kynurenic Acid	639 - 1200	ug/gCr
3-Hydroxykynurenine	147 - 467	ug/gCr
Xanthurenic Acid	694 - 1510	ug/gCr

There are multiple factors that play roles in neurotransmitter levels (Lifestyle, receptors, meds, supplements, diet, stress, etc).
The optimal reference ranges stated above have been determined/derived statistically from historical patient data.
Historically, these levels were achieved in the majority of patients as they experienced symptom relief or improvement.

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URINE, SPOT Result Range Units

CORRELATIONS TO QUESTIONNAIRE

The following section is designed to give you an analysis of neurotransmitter and adrenal hormone values and an observation of how they affect one another. This approach targets the underlying cause of chronic symptoms by addressing the root imbalance. In this section, we will observe trends in the lab values, correlating those with the symptoms that were marked by the patient in the questionnaire.

ADRENAL INFLUENCES
Although the patient chose to only test neurotransmitter levels, an adrenal panel is suggested should any of the following symptoms arise: allergies, symptoms of hypoglycemia (shakiness when a meal is skipped), decreased stamina, fatigue, insulin resistance (sugar cravings, fatigue, abdominal weight gain, poor sleep), decreased libido, stress, salt cravings, which are all related to low adrenal function.

Patient checked ALLERGIES on the questionnaire.
The presence of ALLERGIES is often a result of poor adrenal function, where cortisol, the body's anti-inflammatory hormone, is low. Of our patient population marking moderate to severe allergies, 88% have low morning cortisol. Low cortisol can allow inflammatory conditions, such as allergies, to increase. Though cortisol is usually low, it is common to observe a rise in cortisol late in the evening, causing poor sleep, which often accompanies allergies. Excitatory neurotransmitters (e.g., norepinephrine) may also be elevated, contributing to the poor sleep pattern so often seen in allergic individuals. Allergies should be thought of as a total load that a patient is carrying. Thus, in addition to HPA balance, environmental support such as adding a HEPA filter to the bedroom and encasing the mattress and pillow cases and/or eliminating as much clutter as possible, through limiting pillows, stuffed animals, carpets and curtains, etc. may be helpful. Also anti-inflammatory nutraceuticals such as quercetin and nettle extract may be of value.
FURTHER ASSESSMENTS:
An adrenal hormone assessment is highly recommended for this patient.

Patient checked FATIGUE/DECREASED STAMINA on the questionnaire.
Chronic fatigue can be caused by numerous conditions, the most common of which are
1) inadequate sleep (consider sleep pathologies),
2) low or high blood sugar,
3) hypothyroidism, and
4) adrenal fatigue, usually demonstrated by inadequate cortisol, particularly low morning levels (87% of patients indicating fatigue of moderate or severe intensity measure low a.m. cortisol). Low stores of excitatory neurotransmitters, such as norepinephrine, epinephrine, and glutamate, can also influence energy levels. Other reasons for fatigue involve inadequate dietary protein or B vitamins, dysregulation of mitochondrial function, anemia, depression, acute or chronic illnesses, heavy metal toxicity as well as acute and chronic environmental toxins, and certainly many medications.
FURTHER ASSESSMENTS:
Assessment of thyroid, iron status, blood sugar, diet and adrenal function are all warranted.

INHIBITORY NEUROTRANSMITTERS

Patient complained of HEADACHES/MIGRAINES.
While the exact mechanisms behind migraines are not fully known, some studies have shown that

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serotonin levels may impact the frequency and severity of this type of headache. One of the ways serotonin may act is through its vasoconstrictive properties. Research indicates that during an attack, serotonin levels decrease rapidly. This decrease may allow the blood vessels to dilate, triggering a migraine. Imbalances in the excitatory and inhibitory neurotransmitters serotonin and norepinephrine, as well as imbalanced sex hormones (especially estrogen) may be causative. New research indicates that many of the tension headaches and/or sinus headaches experienced by patients may actually be variants of migraine headaches.

Migraine prevalence and intensity have been shown to be associated with the decline of estrogen during the menstrual cycle. Thus, migraines seem to be triggered by the withdrawal of estrogen after levels of estrogen were higher earlier in the period. Withdrawal of estrogen is associated with a concomitant drop in serotonin. Remember that the serotonin pathways are usually regarded as one of the major components of pain mediation. Serotonin determines "pain" behavior and influences the perception of pain. Consider addressing serotonin levels, and balancing excitatory neurotransmitters if inappropriately high.
FURTHER ASSESSMENTS:
In addition, sex hormone evaluation may be indicated.

Patient indicated symptoms of ANXIETY, NERVOUSNESS, and IRRITABILITY.
These symptoms are often the result of decreased inhibitory neurotransmission and/or excess excitatory neurotransmission. Additionally, in the presence of up-regulated adrenal function, anxiety, irritability, and/or nervousness may also be present; therefore, consider assessing adrenal hormone levels. As the main inhibitory neurotransmitters, GABA, glycine, and serotonin function to promote calm and prevent over excitation. As GABA is the primary inhibitory neurotransmitter, it can be thought of as "the great balancer" of the nervous system. Also, serotonin often functions as a modulator of GABA activity. Low serotonin or depletion of GABA alone may cause anxiety. Research indicates that inositol and glycine supplementation may be beneficial for those suffering from anxiety, especially acute anxiety and panic disorders. Avoid supporting excitatory neurotransmitter function before restoring serotonin and GABA levels. When up-regulated, thyroid hormones may also generate feelings of nervousness, irritability, and anxiety for the patient; therefore, consider a comprehensive thyroid hormone assessment.

The patient's questionnaire indicated GENERAL PAIN to be an issue.
Approximately 70% of patients who marked moderate or severe pain issues measure low serotonin. Both serotonin and norepinephrine are known to provide an inhibitory influence on pain, and under stressful conditions, may provide nearly complete pain inhibition. Norepinephrine can also reduce pain by stimulating beta-endorphin release. If the level of serotonin is deficient, pain perception increases. Often norepinephrine is elevated (if adrenal function is adequate), likely responding to the stress of the painful experience. Another possible area of imbalance is dopamine function. Research indicates altered dopamine activity at the receptors, and an abnormal dopamine response in the experience of pain. Replenishing serotonin, supporting dopamine, and balancing norepinephrine can often be helpful in cases of pain. At times, if pain is severe, the body may perceive this pain as stress, resulting in the up-regulation of adrenal hormone levels.
FURTHER ASSESSMENTS:
Consider assessing cortisol and DHEA levels and function.

The patient has indicated problems with SLEEP on the questionnaire.
Serotonin function may not be optimal to support proper sleep. Serotonin is the biochemical precursor to melatonin, another very important sleep hormone. GABA levels must also be adequate since serotonin serves as a modulator for GABA at the receptor level. That is, without adequate GABA, serotonin cannot function optimally. Most of the new generation sleep medications are GABA receptor agonists. In cases of SAD (seasonal affective disorder), serotonin is being utilized at a much higher rate to produce melatonin due to the shorter days

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Clinical Notes: MELATONIN

and less daylight. Serotonin stores deplete more quickly during the winter months. Serotonin support in this patient, as well as melatonin support, may be warranted.
Individuals with thyrotoxicosis often present hypermetabolic features; therefore, consider assessing thyroid hormone levels.
FURTHER ASSESSMENTS:
Assessment of thyroid, sex hormones and adrenal function are all warranted.

EXCITATORY NEUROTRANSMITTERS

Patient checked HIGH BLOOD PRESSURE on questionnaire.
Studies show a link between high norepinephrine and elevated blood pressure. Norepinephrine has vasoconstrictive properties, and when elevated, will increase blood pressure. Elevations in norepinephrine may be the result of the sympathetic nervous system's response to stress. High stress levels will trigger Cortisol Releasing Factor (CRF) release, which in turn will increase cortisol and norepinephrine levels in the body. Insulin resistance is also found more frequently among patients with hypertension. In a recent study, researchers concluded that insulin and norepinephrine cooperate independently to the development of the metabolic syndrome. Supporting the inhibitory pathway (serotonin and GABA) may be helpful in regulating catecholamine levels, and can help maintain calm. Supplemental methylation and/or cortisol support can help to lower norepinephrine levels by conversion to epinephrine. Proper nutrition, exercise, sleep architecture, and stress reducing techniques may also be beneficial. If this patient is using blood pressure medications and has stated that blood pressure is under control, a low norepinephrine level may be present.

Of the patient population who indicated moderate to severe focus problems, 71% demonstrate low or low-normal dopamine. When **POOR FOCUS** is a symptom, use concurrent inhibitory support (to prevent over-excitation) with catecholamine pathway support to rebuild dopamine to restore focus and directed attention. Poor focus and memory issues can also be related to chronic stress and adrenal dysfunction. Decreased thyroid function is known to impede cognitive function; therefore, consider assessing thyroid hormone levels.

Patient indicated POOR MEMORY.
Memory is dependent upon balance among many central neurotransmitters. Adequate glutamate is required for learning and memory; 60% of patients marking moderate or severe memory issues have low/low normal glutamate. Adequate dopamine is also necessary; low levels can impair working memory, in particular. 70% have low or low-normal dopamine. Norepinephrine is also required-both short-term memory and long-term memory depend on adequate NE levels. Acetylcholine is a primary neurotransmitter for the laying down of memory traces and, though not measured, can be supported by increasing dietary choline or supplementing with phosphatidylcholine or DMAE. Serotonin is also required for proper memory (acute tryptophan depletion can directly impair memory). There is evidence in the literature, however, that extreme excesses of norepinephrine, glutamate and serotonin can also impair memory. Additionally, chronic elevations of cortisol damage the hippocampus, center for short-term memory. DHEA should be repleted when low, since it is known to be neuroprotective to the hippocampus. Balance, then, among the neurochemicals, is of utmost importance for establishment and maintenance of memory. Decreased thyroid function is known to impede cognitive function; therefore, consider assessing thyroid hormone levels.

Patient checked a number of symptoms on the questionnaire that are associated with hypothyroidism. Symptoms such as FATIGUE, DEPRESSION, LOW LIBIDO, POOR MEMORY or BRAIN FOG, WEIGHT GAIN or INABILITY TO LOSE WEIGHT, CONSTIPATION, HAIR LOSS or THINNING HAIR or EYEBROWS, COLD EXTREMITIES, and LOW STAMINA are common signs and symptoms of inadequate thyroid function. Thyroid hormone supports serotonin function, and serotonin contributes to the release of pituitary TSH.
Thus, low serotonin can be a compounding factor in hypothyroidism. High levels of GABA

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Thus, low serotonin can be a compounding factor in hypothyroidism. High levels of GABA may have an inhibitory effect on thyroid function. Excess cortisol negatively effects thyroid homeostasis in at least four different ways. With relation to the sex hormones, estrogen elevates thyroid binding globulin, which decreases the amount of free thyroid hormone available - thus inhibiting overall thyroid function. Progesterone and testosterone are associated with improving thyroid function. Menopausal and andropausal patients may benefit from a sex hormone evaluation and possibly bio-identical hormone replacement to optimize thyroid function.
A comprehensive thyroid hormone assessment is recommended based on the presence of noted concerns.

Retesting is an important part of this process. NT levels need to be monitored. Retesting for this patient is recommended in 9 weeks.

Additional Recommendations
* It is recommended that all patients on a program to balance HPA axis function should also supplement with B complex, a multi-mineral and multi-vitamin as well as EPA/DHA.

Disclaimers
* These products are not intended to diagnose, treat, cure, or prevent any disease.
*The statements above are recommendations to the clinician. All final therapeutic decisions are the responsibility of the treating physician.
* Please call Nutripath on 1300 688 522 with your technical and clinical questions. For further reading and references, please refer to Nutripath's Technical guide and Clinical guide.

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INHIBITORY NEUROTRANSMITTERS.

SEROTONIN LEVELS LOW NORMAL

Generally regarded as the happiness molecule, serotonin has calming effects and contributes to the feelings of well-being. Serotonin elevates mood, decreases anxiety, appetite, and libido, improves sleep and memory, eases depression, and helps regulate body temperature. Most of serotonin in the human body is produced in the gastrointestinal tract, where it stimulates gut motility.

Research shows that urinary serotonin levels are reduced in patients with depression (Nichkova et al., 2012), depleted neuron stores (poor nutrition with high demand), Interference from other signaling chemicals, Low carbohydrate diet, High protein competition, Heavy metal toxicity, Inflammation.

Clinically, low serotonin is associated with anxiety, depression, changes in appetite, cravings, excessive worry, heightened sensitivity to pain, hot flashes, hunger, low mood, migraine, obsessive compulsive disorder, panic disorder, sleep disturbances, and worsened PMS symptoms.

TREATMENT:

When serotonin is low, supplementation with cofactors to promote biosynthesis (e.g. vitamin B6), precursors (tryptophan/5-HTP), theanine, SAMe, Carnitine, St Johns Wort, SSRI, Massage, Melatonin, Hydroxy-tryptophan, Vit B6, Fish Oils, and probiotics may be helpful.

Additionally, lifestyle modifications, such as regular exposure to bright light, healthy diet, sufficient exercise, and positive self-talk are all effective strategies that result in increased serotonin levels.

GABA LEVELS LOWER THAN THE REFERENCE RANGE.

The brain's major inhibitory neurotransmitter GABA functions as the off switch in the brain. GABA is essential to limiting excitation so that input signals are balanced and not overdone. GABA prevents anxiety, improves mood, promotes sleep, lowers blood pressure, acts as a muscle relaxant, aids in formation and storage of fear memories, increases insulin secretion and decreases blood glucose levels. Clinically, low GABA levels are implicated in anxiety, depression, headaches, menopause symptoms, panic attacks, post-traumatic stress disorder, and sleep difficulties. Low GABA levels may also be associated with adrenal distress and HPA axis dysfunction, and disorders like attention deficit hyperactivity disorder and Tourette syndrome.

TREATMENT:

Supplementation with GABA, L-theanine, cofactor support (e.g. B6), growth hormone-releasing hormone, Ginko biloba, Ashwagandha, Kava, Valerian root, Melissa off (lemon balm), Scutellaria sinensis (skullcap), Gotu Cola, Magnolia and Phellodendron bark, and probiotics may be helpful. Caffeine has been found to inhibit GABA release, so avoidance may be beneficial. Additionally, yoga and meditation increase brain GABA levels.

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EXCITATORY NEUROTRANSMITTERS.

GLUTAMATE LEVELS LOW:
The brain's major excitatory neurotransmitter glutamate (also known as glutamic acid) functions as the "on" switch in the brain. Glutamate regulates appetite, thinking (cognition), increases gut motility, optimizes learning, modulates memory, improves libido, and decreases sleep. Low urinary glutamate levels have been reported in patients with migraines. Clinically, low glutamate levels are implicated in the causes of agitation, depression, chronic fatigue, lack of concentration, low energy levels, and sleep difficulties.
TREATMENT:
L-glutamine may be beneficial to restore glutamate to normal values.

DOPAMINE LEVELS LOW NORMAL.
Dopamine improves attention, focus, and motivation, helps with decision making, modulates movement control, promotes lactation, increases blood pressure, urine output and sodium excretion, and allows for feelings of reward and pleasure. Additionally, dopamine plays a central role in the etiology of addiction. Dopamine also serves as the parent precursor to norepinephrine and epinephrine.
Reduced urinary dopamine levels seen in patients with Alzheimer's disease, anorexia nervosa, anxiety with depression, fibromyalgia, and periodic limb movement disorder. Clinically, low dopamine is also implicated in apathy, cravings, fatigue, impulse control issues, increased sensitivity to pain, low libido, low mood, memory issues, sleep disturbances, and weight control issues.
TREATMENT:
Supplementation with precursors (tyrosine or L-DOPA) and/or cofactors (iron, vitamin B6, tetrahydrofolate) to promote biosynthesis may be beneficial.

NOREPINEPHRINE LEVELS NORMAL:
Norepinephrine functions both as a neurotransmitter and a hormone, participating in the body's "fight or flight" response. Norepinephrine increases alertness, focuses attention, fine-tunes vigilance, increases blood pressure, heart rate, and blood sugar, reduces digestive activity, pain, and sleep, prevents bladder emptying, and regulates body temperature. Norepinephrine is very similar in structure and physiological effects to epinephrine. The adrenal gland produces approximately 20% of the total output with 80% produced by the sympathetic nerve fibers.

EPINEPHRINE LEVELS LOW NORMAL.
Epinephrine functions both as a neurotransmitter and a hormone, participating in the body's "fight or flight" response. Approximately 80% of peripheral catecholamine output by the adrenal glands is epinephrine.
Reduced urine epinephrine is seen in Alzheimer's disease, metabolic syndrome, and obesity. Clinically, low epinephrine is implicated in attention impairment, chronic stress, depression, cold body temperature, dizziness, chronic fatigue, hypotension, low mood and libido, and memory issues.
TREATMENT:
Adrenal support may be beneficial to increase epinephrine levels.

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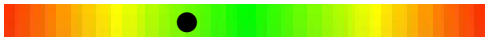
Creatinine, Urine Spot.	**12.7**	5.0 - 25.0	mmol/L	

Tests ordered: ENEUM,GOG262

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