

A Role for the Pineal Gland in Neurological Damage Following Aluminum-adjuvanted Vaccination



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Faculty Disclosure

Company	Nature of Affiliation
• None	

Off-Label Product Usage

• None

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<http://people.csail.mit.edu/seneff/SeneffNice2014.pptx> (.pdf)

A Hypothesis

Many neurological diseases of the brain have a common origin:

- **Insufficient supply of sulfate to the brain**
- Enhanced toxic metal exposure (e.g., aluminum, mercury) due to impaired ability to detoxify and eliminate them
- Toxic metals interfere with sulfate synthesis
- This results in accumulation of cellular debris



Outline

- Heparan sulfate in the lysosomes is critical for recycling cellular debris
 - Heparan sulfate deficiency leads to autism
- Pineal gland delivers sulfate to cerebral spinal fluid via melatonin
- Aluminum and mercury disrupt pineal gland
- Sunlight deficiency is a contributing factor
- Glyphosate works synergistically with aluminum
- Summary

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An Important Role for Sleep

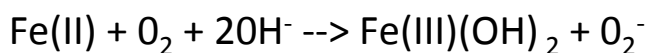
- It has recently been argued that a crucial role for sleep is to clear cellular debris*
- This takes place in the lysosome, which depends upon sulfate in heparan sulfate proteoglycans to protect from free radicals**
- I will argue later that melatonin plays a critical role in supplying the sulfate

*Sleep Drives Metabolite Clearance from the Adult Brain. L Xie et al., Science 342:373-377, 2013

**Inhibition by heparin of Fe(II)-catalysed free-radical peroxidation of linolenic acid. M.A. Ross et al., Biochem. J. 1992, 286: 717-720.

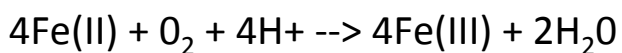
Heparin Protects from ROS due to Iron*

Free radical production (*Fenton* reaction):

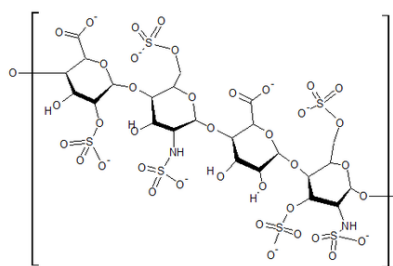


superoxide

But, in the acid environment of heparin:



water



*M.A. Ross et al., Biochem. J. 1992, 286: 717-720.

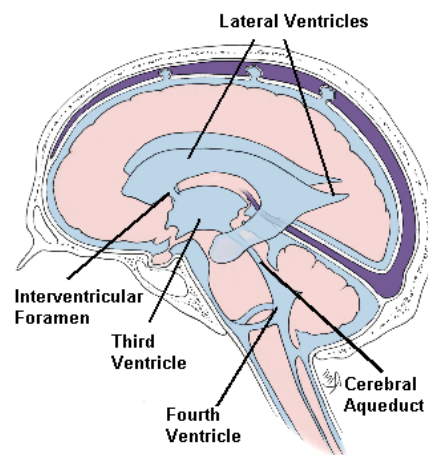
Autism-like socio-communicative deficits and stereotypies in mice lacking heparan sulfate*

- Experiment with “designer” mice: impaired heparan sulfate synthesis in brain
- Mice exhibited all the classic features of autism – both cognitive and social

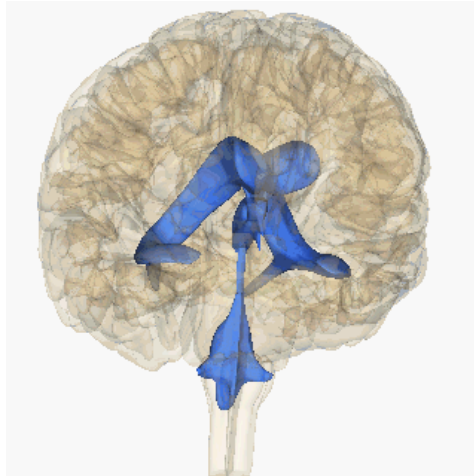


* F. Irie et al., PNAS Mar. 27, 2012, 109(13), 5052-5056.

Ventricles in the Brain



Another View



“Heparan sulfate deficiency in autistic postmortem brain tissue from the subventricular zone of the lateral ventricles”*

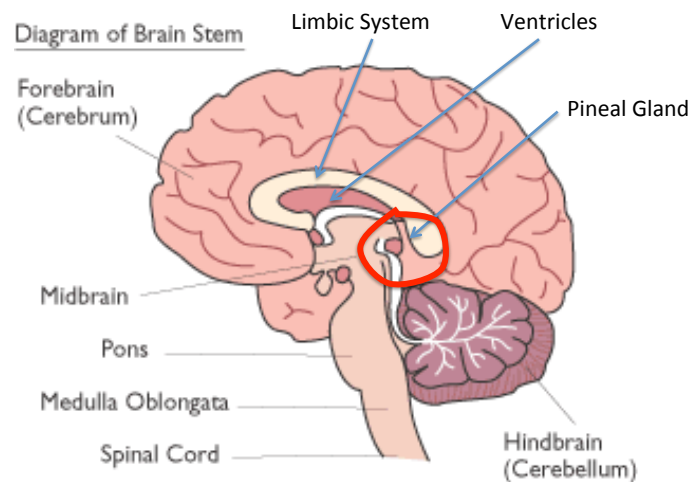
“Aberrant extracellular matrix glycosaminoglycan function localized to the subventricular zone of the *lateral ventricles* may be a biomarker for autism, and potentially involved in the etiology of the disorder.”

*BL Pearson et al., Behav Brain Res. 2013;243:138-45

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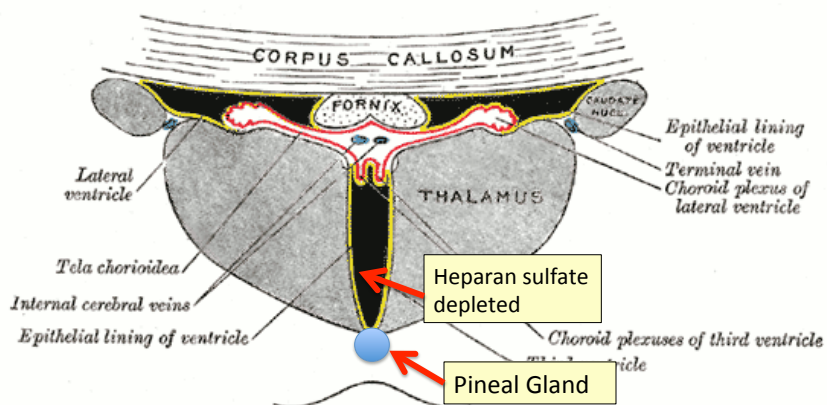
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The Brain



Third Ventricle and Pineal Gland

The third ventricle is depleted in heparan sulfate in association with autism in both humans and mice^{*,**}

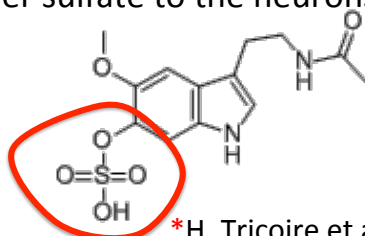


*B.L. Pearson et al., Behav Brain Res. 2013 Apr 15;243:138-45.

**F Mercie et al., Neurosci Lett 506, 2012, 208-213.

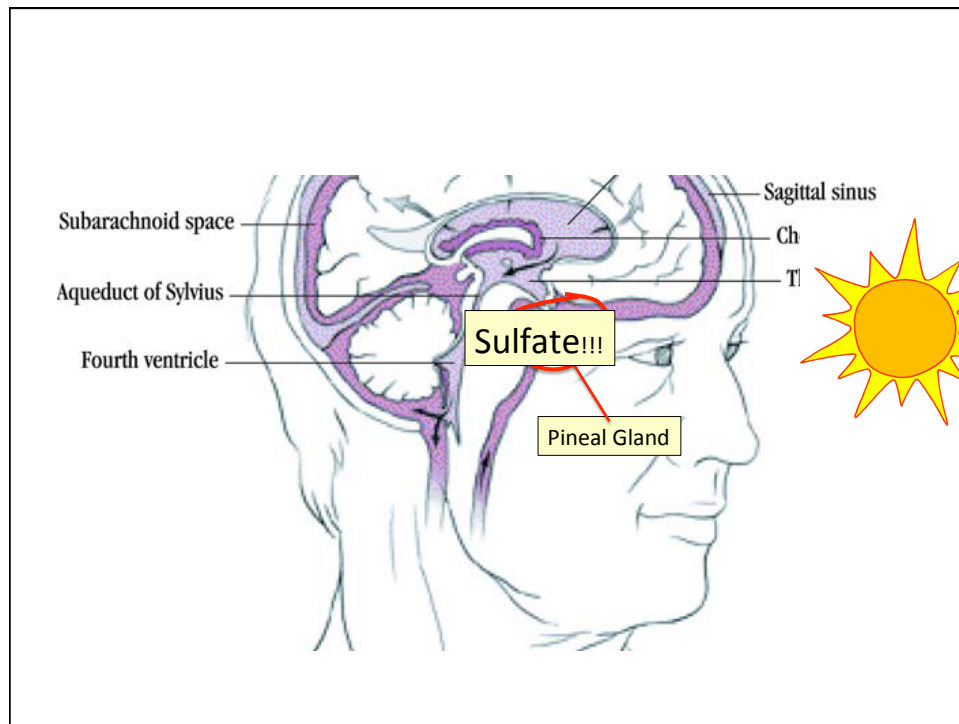
“Melatonin Enters the Cerebrospinal Fluid through the Pineal Recess”^{*}

- The tip of the third ventricle is encased in the pineal gland
- The pineal gland delivers melatonin *sulfate* to the third ventricle and it diffuses to all the cerebrospinal fluid
- I propose that a key purpose of melatonin is to deliver sulfate to the neurons at night.



Melatonin sulfate

^{*}H. Tricoire et al., Endocrinology 143(1):84–90



“Light-induced 3-O-Sulfotransferase Expression Alters Pineal Heparan Sulfate Fine Structure : A Surprising Link to Circadian Rhythm”*

- Pineal gland builds up heparan sulfate supplies *by day*
- Melatonin is sulfated in transport *at night*
 - Highly lipophilic molecule needs sulfate to make it water-soluble
 - This allows it to move through the cerebrospinal fluid
- When melatonin is delivered, sulfate is released!

Melatonin is a sulfate-delivery system!!

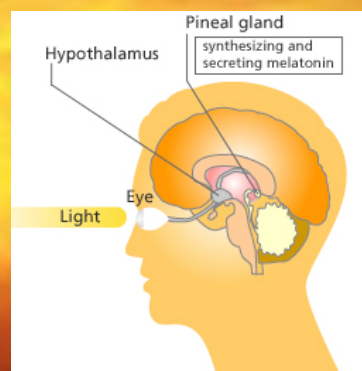
*B. Kuberan et al., J. Biol. Chem. 2004, 279:5053-5054.

A Really Bad Idea!



Pineal Gland: “Seat of the Soul”

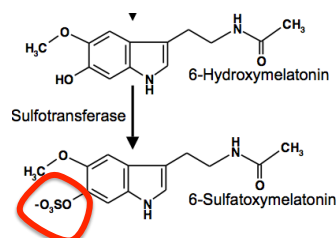
The pineal gland produces sulfate by day (responding to light) and stores it in heparan sulfate molecules



The pineal gland produces melatonin in the evening and transports it as melatonin sulfate to various parts of the brain

REM Sleep Cycle

- Melatonin Induces REM sleep
- Alzheimer's is associated with reduced REM sleep cycle AND calcified pineal gland*



- Pineal gland calcification correlates inversely with REM sleep**
- DHEA SULFATE but not DHEA injections increase melatonin production in rats***

*R. Mahlberg et al., Neurobiol Aging. 2008 Feb;29(2):203-9

**R. Mahlberg et al., Sleep Med. 2009 Apr;10(4):439-45.

***Y. Djeridane et al., Steroids. 2004 May;69(5):343-9.

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Sleep Disorder, Aluminum, and the Pineal Gland

- Sleep disorder is linked to many neurological diseases:
 - Autism, Alzheimer's, depression, schizophrenia, ALS, Parkinson's disease, etc.
- Insomnia occurs much more frequently as an adverse reaction in VAERS to vaccines containing aluminum than to those not containing aluminum ($p = 0.0025$)
- Pineal gland is heavily perfused and outside of the blood brain barrier
 - Susceptible to aluminum toxicity

New Paper

Int. J. Environ. Res. Public Health **2013**, *10*, 3771-3800; doi:10.3390/ijerph10083771

OPEN ACCESS

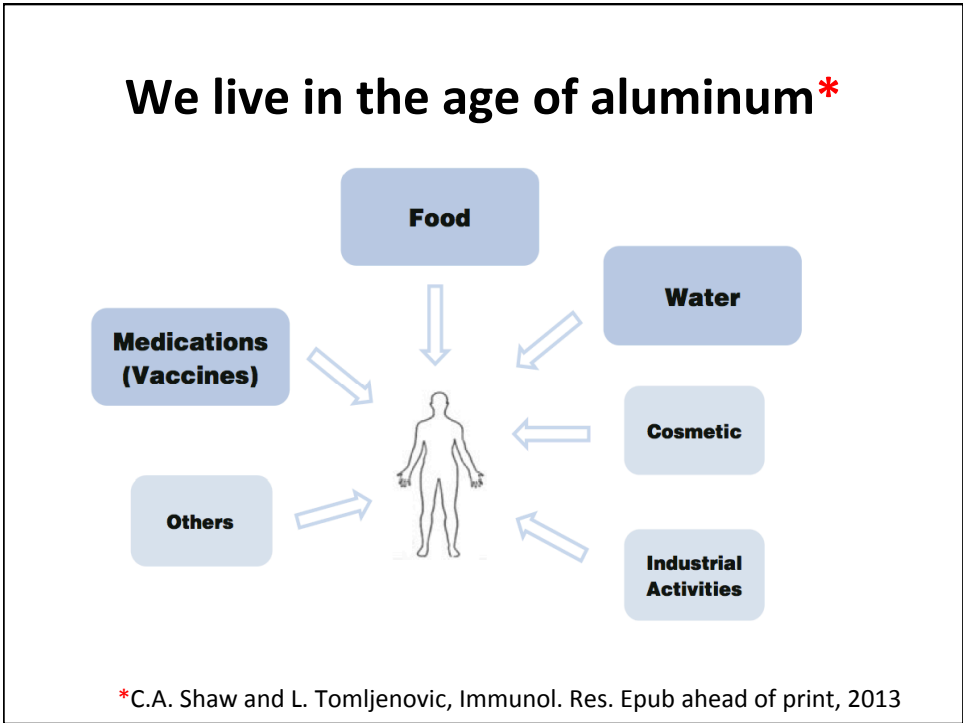
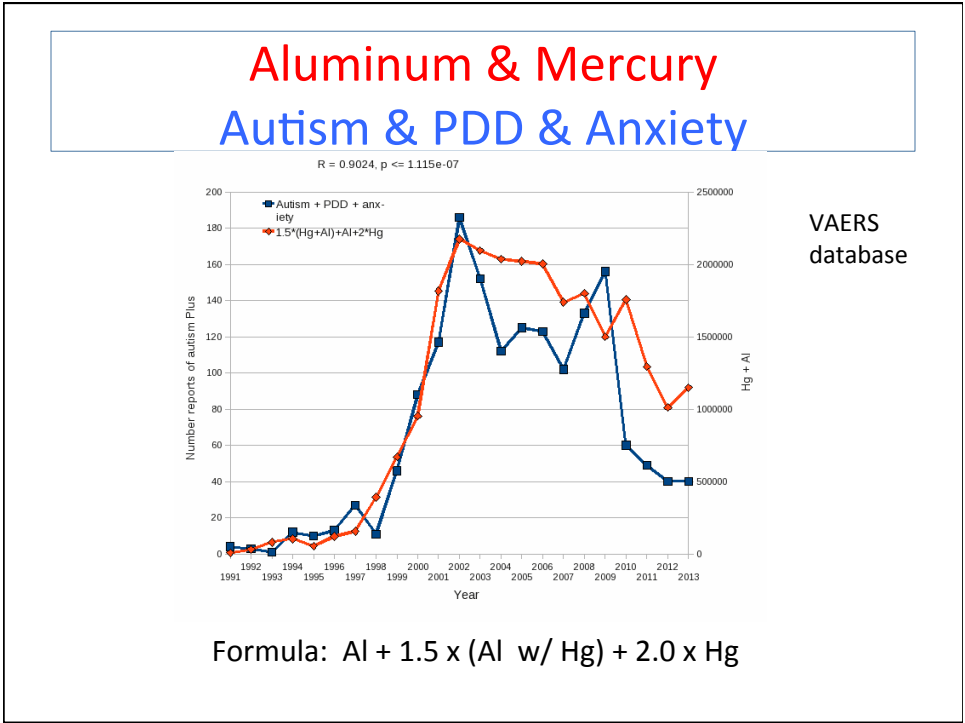


Review

International Journal of
Environmental Research and
Public Health
ISSN 1660-4601
www.mdpi.com/journal/ijerph

Thimerosal Exposure and the Role of Sulfation Chemistry and Thiol Availability in Autism

Janet K. Kern ^{1,*}, Boyd E. Haley ², David A. Geier ¹, Lisa K. Sykes ³, Paul G. King ³ and Mark R. Geier ¹



Aluminum in the Pineal Gland*

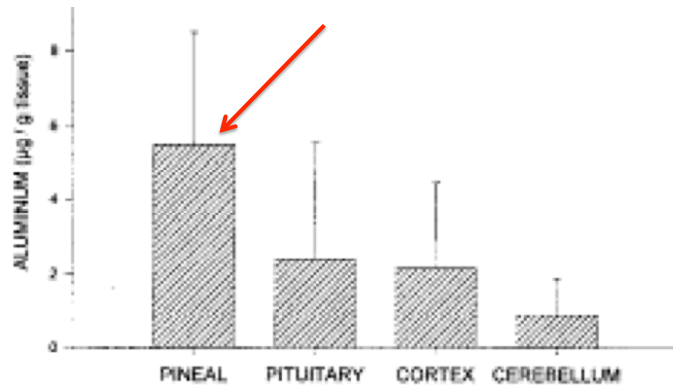


Fig. 6. Aluminum contents of brain tissues (mean \pm SD). The results are expressed per unit weight of dried tissues. Four samples of each tissue were examined.

*S.B. Lang et al./*Bioclectrochemistry and Bioenergetics* 41(1996)191–195

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A Critical Role for Sunlight*

- Hypothesis:
 - Endothelial and neuronal nitric oxide synthase (both present in the pineal gland) produce sulfate from reduced sulfur sources catalyzed by sunlight
 - Sulfate deficiency results when this process is impaired
- Aluminum and retinoic acid, present in high SPF sunscreens, interfere with sulfate synthesis
- Aluminum accumulation in pineal gland would disrupt sulfate supplies to brain

*S. Seneff et al., Entropy 2012, 14, 2492-2530.

We live in the age of aluminum*



*C.A. Shaw and L. Tomljenovic, Immunol. Res. Epub ahead of print, 2013

Aluminum Nanoparticles: Highly Destructive in the Brain*

- Destroyed mitochondria and severely depleted ATP
- Induced autophagy and programmed cell death
- Increased permeability of blood brain barrier
- Were persistent
- Far more damaging than larger sized aluminum particles



*L Chen et al., Nanomedicine Feb 2013; 9(2): 212–221.

Demographic Studies on 50 States

- Public schools in U.S. keep track of # students enrolled in each grade and # students enrolled in programs specifically targeting autism
 - Ratio becomes a measure for autism rate in the state
 - We used grades 1-6 only, in 2007-2008 school year
- We can obtain statistics for many other factors
 - Weather related factors indicate sun exposure
- Pearson's correlation coefficient can be used to detect correlations (ranges from -1.0 to 1.0)
 - Correlation does not necessarily mean causation

Demographics of 50 States

Demographic	Pearson Rating	Explanation
Rank, # clear days	-0.40	Sunlight exposure
Latitude	0.22	Sunlight exposure
Annual rainfall	0.16	Sunlight exposure
RMS (rainfall, latitude)	0.34	Sunlight exposure
Temperature	-0.16	Sunlight exposure
Elevation	-0.28	Sunlight exposure
Vaccination rate	0.38	Aluminum, mercury

Vitamin D Prevents Sulfate Wasting*

- Activated vitamin D prevents sulfate wasting from the kidney in urine
- Mice engineered to have defective vitamin D receptors or with vitamin D deficiency had significantly reduced serum sulfate levels
- This was associated with sulfate depletion in the skeleton

*M.J.G. Bolt et al., Am J Physiol Endocrinol Metab 287: E744 –E749, 2004.

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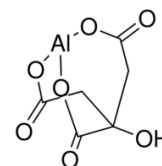
Glyphosate and Aluminum: Partners in Crime



- Glyphosate induces pathogens like *C. difficile* in gut, leading to *leaky gut syndrome*
 - *C. diff* produces *p-cresol* which promotes aluminum uptake by cells
 - p-Cresol is a known biomarker for autism
 - p-Cresol is an important factor in *kidney failure* which leads to aluminum retention in tissues → dementia
- Glyphosate *cages* aluminum to promote entry
- Glyphosate promotes *calcium uptake* by voltage-activated channels
 - Aluminum gains entry as calcium mimetic
- Aluminum promotes calcium loss from bones → pineal gland calcification

Aluminum Glyphosate*

Six different ways two glyphosate molecules can chelate aluminum



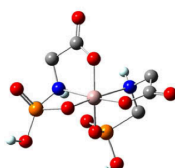
Aluminum citrate**



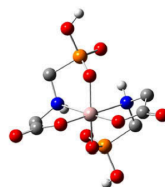
B1

B2

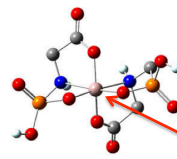
B3



B4



B5



B6



ALUMINA

aluminum

*M. Purgel et al., Journal of Inorganic Biochemistry 103 (2009) 1426–1438

** P. Sianina et al., Clin. Chem. 32/3, 539-541, 1986.

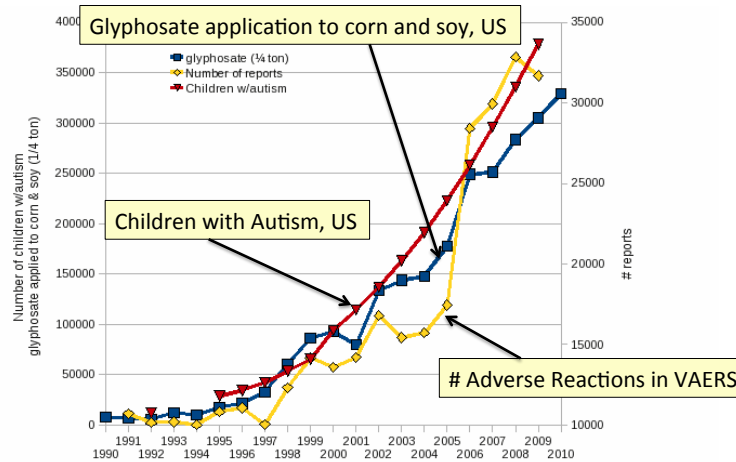
Glyphosate Suppresses Melatonin Synthesis!

- Glyphosate interferes with shikimate pathway in plants and microbes → tryptophan depletion*
- Tryptophan is sole precursor to melatonin
- Melatonin binds to aluminum, cadmium, copper, iron and lead, reducing their toxicity**

*N. de María et al., J Agric Food Chem 2006, 54, 2621-2628.

**J. Limson et al. J. Pineal Res. 1998; 24:15–21.

Autism, Glyphosate, Vaccine Reactions*



*Collaboration with Nancy Swanson

MIT Computer Science and Artificial Intelligence Laboratory

Summary

- Autism and Alzheimer's disease have reached epidemic proportions in the Western world
- Hypothesis: Both are caused by a severe deficiency in sulfate supplies to the brain
- Pineal gland can synthesize sulfate stimulated by sunlight and deliver it via melatonin sulfate
- Aluminum, mercury and glyphosate work synergistically to derail this process
- Sunlight deficiency contributes to the pathology