

## **Healing the Blood Brain Barrier (BBB):**

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1. Assume that in most/all neurological problems, there are one and or two things going on;
  - A) BBB is leaking
  - B) Neuro-inflammation from immune cell activation
2. We address both with the same techniques:
3. Turn off what is causing the leak--the *Cell Danger Response (CDR)*, assaulting the brain.
4. Improve brain homeostasis while up-regulating mitochondrial function and the body's way of cleaning out damaged cells, in order to regenerate newer, healthier cells (*autophagy*).
  - A) The cells making up the BBB; glial cells & astrocytes are RICH in mitochondria.
  - B) Some things that help boost mitochondrial function are;
    - 01) Intermittent fasting; Ketogenic diet promotes autophagy.
    - 02) In mice studies, 24 hours of fasting was best for the brain since in the brain it takes longer to turn on autophagy.
5. Heal the Gut: the gut brain connection is a BIG deal Metabolic products produced by the microbiome, such as short-chain fatty acids, can cross the BBB to affect brain function.  
<https://www.ncbi.nlm.nih.gov/pubmed/29392733>
6. Exercise
7. Sleep
  - A) The brain needs BOTH the BBB and the glymphatic for clearing mechanisms Disruption of these mechanisms can lead to protein accumulation and may initiate neurodegenerative disorders <https://www.ncbi.nlm.nih.gov/pubmed/29608988>
8. Sunlight and Vit D:
  - A) Vit D deficiency affects brain 'scaffolding'
  - B) Low Vit D has been linked to neuropsychiatric diseases like schizophrenia
9. Reduce stress
  - A) There's strong validity to the argument that it helps the brain relax, increases the blood flow to the brain, and reduces cortisol levels.
  - B) A regular meditation practice has been shown to increase gray matter
  - C) Loneliness increases inflammation  
[https://www.sciencedirect.com/science/article/pii/S0889159119303174?dgcid=raven\\_sd\\_aip\\_email](https://www.sciencedirect.com/science/article/pii/S0889159119303174?dgcid=raven_sd_aip_email)
10. Photo modulation with Red light therapy promotes mitochondrial function
11. Heat Stress/IR sauna
12. Support NAD:
  - A) NAD is called *the essence of life and* has a key role in mitochondrial function
    - 01) Like Nadovim [https://nadovim.com/science/#the\\_formula](https://nadovim.com/science/#the_formula) 2 q am which is a mixture of
      - (a) a highly bioavailable form of NAD
      - (b) Cats claw
      - (c) Coenzyme Q 10
      - (d) Mg
      - (e) Thiamine
13. Other Mitochondrial function and autophagy supplements:
  - A) Resveratrol 150 mg to 250 mg/day

- B) D-Ribose (Studies have looked at D-Ribose in neurodegenerative diseases such as early ALS and MS with promising results)
  - C) High dose antioxidants (Vitamin's C, D, E & A)
  - D) Coenzyme Q 10 or Ubiquinone if older
  - E) ALA (alpha lipoid acid) 200 mg bid
  - F) N-acetyl cysteine-Human trials done after injury of active duty military NAC showed decreased brain inflammation and oxidative stress markers
  - G) Metformin may help with autophagy/studies are mixed
  - H) Isorhynchophylline, a natural alkaloid, promotes the degradation of alpha-synuclein in neuronal cells via inducing autophagy
14. Autophagy, 8:1, 98-108, DOI: 10.4161/auto.8.1.18313 <https://doi.org/10.4161/auto.8.1.18313>
15. Control glucose and address insulin resistance:
- A) High blood sugar which
  - B) Produces oxidative stress and inflammation and leads to...
  - C) Insulin resistance in the brain
16. Reduce obesity:
- A) Leads to inflammation August 20, 2019; 93 (8) ARTICLE Neurology July 24, 2019, In this study,
  - B) Measures of obesity are associated with MRI markers of brain aging
    - 01) Reduced gray matter
    - 02) High-fat diet or
    - 03) Overeating
  - C) Leads to leptin resistance
17. Look to the Liver:
- A) Liver damage releases a signal called MMP9 into the bloodstream that increases BBB permeability
18. Reduce overall toxic load:
- A) Chemical
  - B) Heavy metals
  - C) Up regulate detox mechanisms
    - 01) Avoid exposure
    - 02) Optimize oral microbiome
19. Hormone balance:
- A) Studies have found that brain energy decreases up to 40% on average during peri- and early menopause, and
  - B) Women in this group have more Alzheimer's plaques than men of similar age or younger women.
  - C) Progesterone and estradiol are steroid hormones that has neuroprotective effects on injured brain cells &...
  - D) Progesterone potentiates the effect of vitamin D.
  - E) Pregnenolone benefits the brain by helping regulate myelination.
  - F) Make sure thyroid is optimized
20. Reduce homocysteine
- A) Elevated Homocysteine damages the brain

- 01) At Lewis Katz School of Medicine at Temple University,  
 (a) they show in mice that diet-induced increases in homocysteine levels directly contribute to the  
 (b) development of damaging neurofibrillary tangles,  
 (c) which result from the progressive accumulation of abnormal tau protein in the brain.  
 (d) Homocysteine should be 6-7 or less.
- 21. Supplements to increase Brain-Derived Neurotrophic Factor (BDNF)**  
 A) Curcumin 750-1500 mg / day  
 B) Cats Claw please note that Nadovim has this in it  
 C) Exercise  
 D) Sleep  
 E) Lions Mane mushroom 500 mg once or twice a day  
 F) Liposomal melatonin (given 2-3hr before bedtime) to reduce brain inflammation.  
 01) I like to work up to 20 mg / day if tolerated for brain health/some say 100 mg is needed for optimal brain health but it's tough to tolerate very high doses  
 G) Cordycepin: Reduced pro inflammatory cytokines and increased BDNF in mice w MS  
 Int Immunopharmacol. 2019 Jul 26;75:105777. doi: 10.1016/j.intimp.2019.105777.
- 22. Brain neurotrophics;**  
 A) DHE/DHA has been shown to promote amyloid- $\beta$  plaque clearance from the brain  
 B) DHA has been shown to decrease tau tangles  
 C) Phosphatidylserine (PS)  
 D) important role in cell signaling  
 E) Desensitizes hypothalamic cortisol receptors, and  
 F) Serine can be converted into glycine, an inhibitory NT given at 100–300 mg/d in divided doses.  
 G) Bacopa used in ancient medicine practices for 1000's of years for memory and cognitive  
 200–600 mg/d in divided doses  
 H) Green tea/ polyphenols or Whole coffee fruit extract (WCFE), 100 mg once or twice per day for three months, then withdraw slowly over one month. Eat 1 to 2 servings of dark chocolate • Consider 100– 300 mg green tea extract  
 I) Synapsin  
 J) Selegiline: Acts as an antioxidant and protects against glutamate toxicity  
 K) PQQ, or pyrroloquinoline quinone.  
 01) PQQ is an enzyme cofactor possessing  
 02) Antioxidative  
 03) Neuroprotective; protects neurons by preventing the long term over-activation of the NMDA receptor 10 to 20 mg/ day  
 L) Scutellarin baicalinase's:  
 01) Antioxidant  
 02) Attenuates microglial activation  
 03) Reduces neuroinflammation  
 04) 2 or 3 teaspoons or 2 capsules per day, to enhance branching of neurons in the hippocampus.  
 M) Other mast cell stabilizers like  
 01) Luteolin  
 02) Quercetin

- 03) Mirica
  - (a) Dr Ackerly uses: Miraca at 2 tid in worst pain patients plus
  - (b) Neuroprotek 2 qd plus working up to 4.5 mg
  - (c) LDN
- N) Taurine
  - 01) Taurine helps with neurogenesis
  - 02) Increases cerebral blood flow, and
  - 03) Activates neuronal stem cells.
  - 04) Also great for liver support
- O) Glycine
- P) Magnesium threonate blocks the NMDA receptor
- Q) L-tyrosine: 500mg/ day improves memory and focus
- R) Citicoline; 250 mg twice per day
- S) Vit B 6 20 mg tid
- T) L theanine Helps with
  - 01) Sleep
  - 02) Depression
  - 03) Anxiety
  - 04) Memory
  - 05) L-Theanine: 100–200 mg/d. up to 800 mg/day in dd/blocks glutamate receptors
- U) Rhodiola
  - 01) For mental fatigue & stress
    - (a) 200mg once or twice a day or
  - 02) Ashwagandha
  - 03) 500 mg, twice per day with meals
  - 04) Ashwagandha helps in
    - (a) The reduction of amyloid, as well as in
    - (b) Handling stress)
- V) Ginkgo biloba
  - 01) Neuroprotection
  - 02) Studies have found that it has
    - (a)-oxidant and
    - (b)Anti-amyloid properties
- W) Huperzine A
  - 01) Inhibits the breakdown of the neurotransmitter acetylcholine
- X) Grape seed extract
  - 01) Potent anti-inflammatory
  - 02) Antioxidant
  - 03) Helps mitochondria
- Y) Gotu kola
  - 01) 500 mg twice per day with meals, to
  - 02) Increase focus and
  - 03) Alertness
- 23.** Avoid Calcium supplementation in patients with PANS and PANDAS
  - A) It can fuel the NMDA receptor

**24. Boost immune function**

A) IVIG

- 01) One of the many reasons I love IVIG is because it has
- 02) Neuroprotective effects and studies have shown it can
- 03) Improve BBB function
- 04) Dose must be 2 gm/kg

B) LDN

C) *Tinospora cordifolia* (guduchi) is helpful to

- 01) Boost immune support.
- 02) It is taken at a dosage of 300 mg with meals, 2 or 3 times per day

D) CBD has many neurological and immune benefits