METALLOTHIONEIN

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Walsh Research Institute

- Nonprofit public charity
- Experimental research
- Expertise in biochemical therapy
- International physician training
Human Metallothionein

- Family of zinc dependent cysteine-rich proteins,
- Short linear arrays of 61 to 68 amino acids,
- 20 cysteine residues,
- S-configuration with extraordinary metal-binding capability.
Metallothionein Family

- MT-I  Found throughout body,
- MT-II  Found throughout body,
- MT-III  Expressed in brain (growth inhibition)
- MT-IV  Squamous cells in GI tract, Skin
Genetic Expression of apo-Metallothionein I and II

- Housekeeping proteins,
- Induced by oxidative stress, toxic metals, radiation,
- Ample zinc, histidine, cysteine needed,
- Rapid binding to seven atoms of Zn after expression to form Zn-MT.
Genetic Expression of apo-Metallothionein III

- Growth-inhibition factor in brain,
- Rapidly binds to Cu and Zn atoms,
- Expression separate from MT-I and MT-II
Metallothionein Promotion Therapy

- Developed initially for autism patients
- Efficient removal of mercury and other toxic metals,
- Enhances homeostasis of Cu and Zn
- Excellent antioxidant properties
- Promising therapy for Alzheimer’s Disease.
MT-Promotion Protocol

- 22 nutrients known to promote genetic expression and functioning of metallothionein,

- Step 1: Zinc normalization

- Step 2: MT-Promotion nutrients
Why is Metallothionein Important?

- Required for pruning, growth and growth-inhibition of brain cells in early development,
- Prevents Hg, and other metal toxics from passing intestinal and blood/brain barriers,
- Required for homeostasis of Cu and Zn,
- Supports immune function,
- Major antioxidant system in body & brain.

Note: MT functioning can be disabled by severe oxidative stress.
Teamwork Between Metallothionein, Glutathione, and Selenium

- GSH is first line of defense against toxic metals.
- When 10-20% of GSH is oxidized, toxic metals are transferred from GSH to MT.
- Se increases kinetics of the GSH/MT antioxidant system by more than 50%.
- Most toxic metals depart body in MT form.
MT & GSH Are Abundant in Intestinal Mucosa and Blood-Brain Barrier

- 95% of ingested Hg, Pb, Cd is stopped by MT & GSH at the intestinal mucosa.
- 80% of toxic metals entering portal blood stream become bound to MT/GSH in liver.
- 95% of remaining toxic metals are sequestered at B/B barrier by MT & GSH.
- Additional MT & GSH are present in the brain and provide antioxidant neuroprotection.
Oxidative Stress Can Impair Brain Development

- High oxidative stress depletes glutathione,

- Ample glutathione is required for proper functioning of metallothionein,

- Metallothionein is a key factor in early brain development.
Unique Advantages of Metallothionein-Promotion Therapy

- Directly aimed at development of brain cells,
- Potential for permanently correcting the intestinal and blood/brain barriers,
- Restores a key antioxidant system.

Limitation: Does not directly enhance development of dendrites and synapses.
Low Metallothionein Levels in Autism

p < 0.0092
Clear improvement in autism outcomes shown in separate studies by Holmes, Walsh,

Many cases of “recovery”,

Best results for early intervention (ages 2-4).
Alzheimer’s Disease

- Gradual degeneration of brain cells resulting in progressive senility and death,
- Amyloid plaque and neurofibrillary tangles,
- Severe oxidative stress and inflammation,
- Elevated toxic metals,
- Present treatments unable to stop death of brain cells: Average time between diagnosis and death is eight years.
Rationale for MT-Promotion Therapy for Treatment of Alzheimer’s Disease

- Amyloid plaques are known to result from interaction of metal free-radicals with natural substances in the brain.
- Metallothionein proteins provide natural protection against free-radical metal ions.
- Metallothionein protein levels are less than 1/3 of normal levels in Alzheimer brains.
Most patients reported partial improvement of memory followed by stabilization of condition.

Some patients exhibit continuing improvement after years of treatment,

Several patients have lost the diagnosis of AD due to lack of progression of the disease after several years.

Caretaker needed for effective compliance.
Explanation for Memory Improvements Following MT-Promotion Therapy

- Destroyed brain cells are lost forever,
- The untreated AD brain is afflicted by inflammation and oxidative stresses,
- MT-Promotion therapy has powerful antioxidant and anti-inflammation properties,
- Many Alzheimer researchers believe that memory and other brain functions would improve if the inflammation and oxidative stresses were reduced.
Reliable MT Assay Needed

- Early commercial MT assays badly flawed,

- Research lab assays involved radioactive mercury – A poor candidate for commercial lab test,

- MT assay development underway in Kansas City.
THANK YOU!

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