Therapeutic Plasma Exchange History, Evidence Basis for Use & Clinical Applications

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DISCLOSURE

Dr. Savage does not have any relevant financial relationships to disclose during the last 24 months with ineligible companies whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients.

TPE Origins

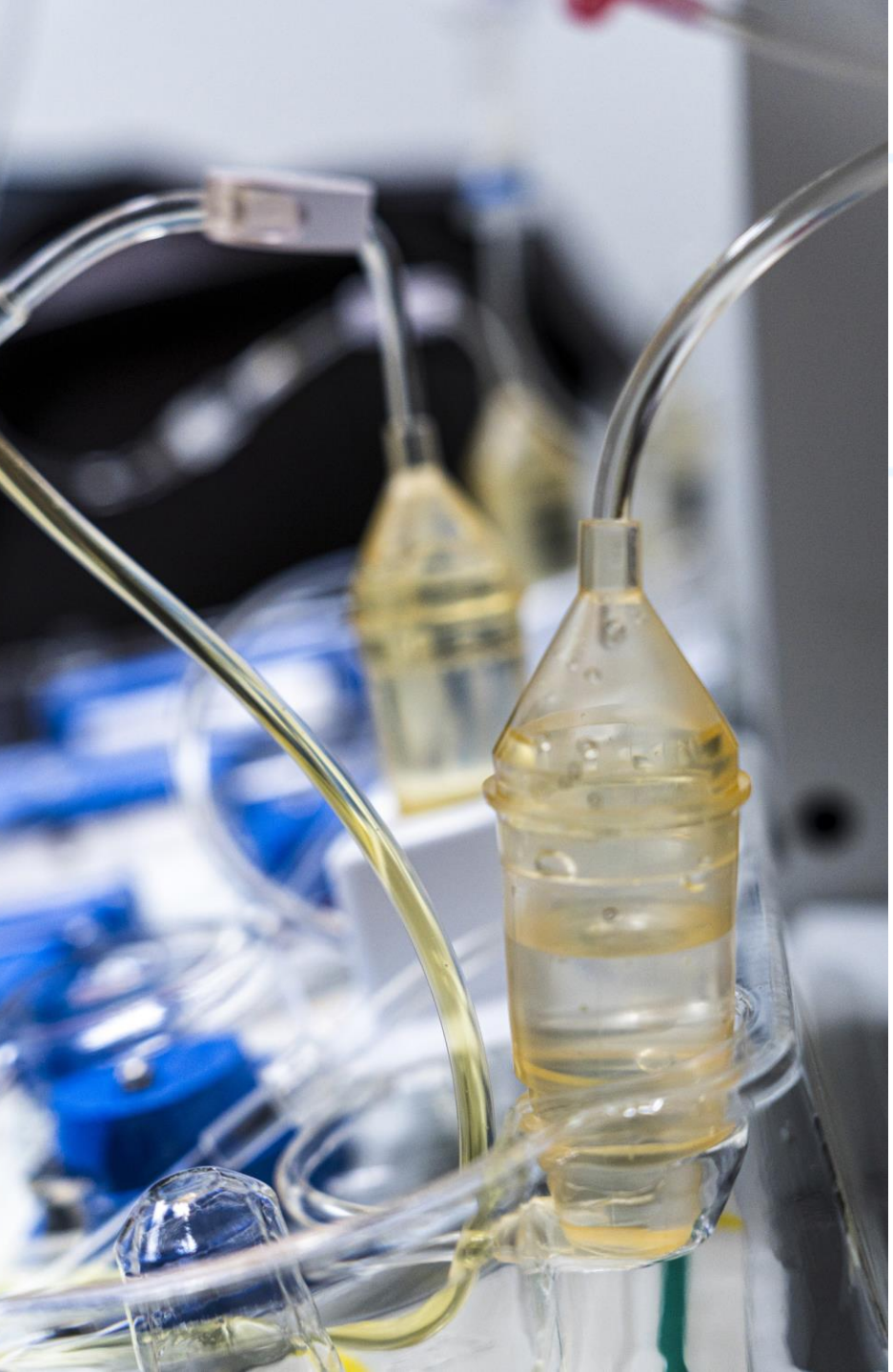
Technological Advancements:

The modern plasmapheresis process originated in the U.S. National Cancer Institute between 1963 and 1968, drawing upon dairy creamer separation technology and refining it with Edwin Cohn's centrifuge.

In Situ Plasmapheresis:

In 1965, Dr. Víctor Grifols-Lucas patented the device and procedure for performing plasmapheresis in situ, enabling blood components to be extracted, separated, and returned to the donor in a single procedure.

Therapeutic Plasma Exchange: Core Curriculum 2023: Transfusion. 2010;50(7):1413-1426. https:// doi.org/10.1111/j.1537-2995.2009.02505.



TPE Origins

First Therapeutic Use:

The first successful therapeutic application of plasmapheresis was in 1952, in a patient with hyperviscosity syndrome due to Waldenström's Macroglobulinemia.

Development of Automated Systems:

The development of continuous flow cell separators in the 1960s and 1970s spurred wider interest in the clinical application of plasmapheresis.

Therapeutic Plasma Exchange: Core Curriculum 2023: Transfusion. 2010;50(7):1413-1426. https:// doi.org/10.1111/j.1537-2995.2009.02505.

Expansion into Neurological Disorders:

By the 1970s, TPE had evolved as a treatment modality for a number of neurological diseases, including Goodpasture's Syndrome, myasthenia gravis, and thrombotic thrombocytopenic purpura (TTP).

Modern Applications:

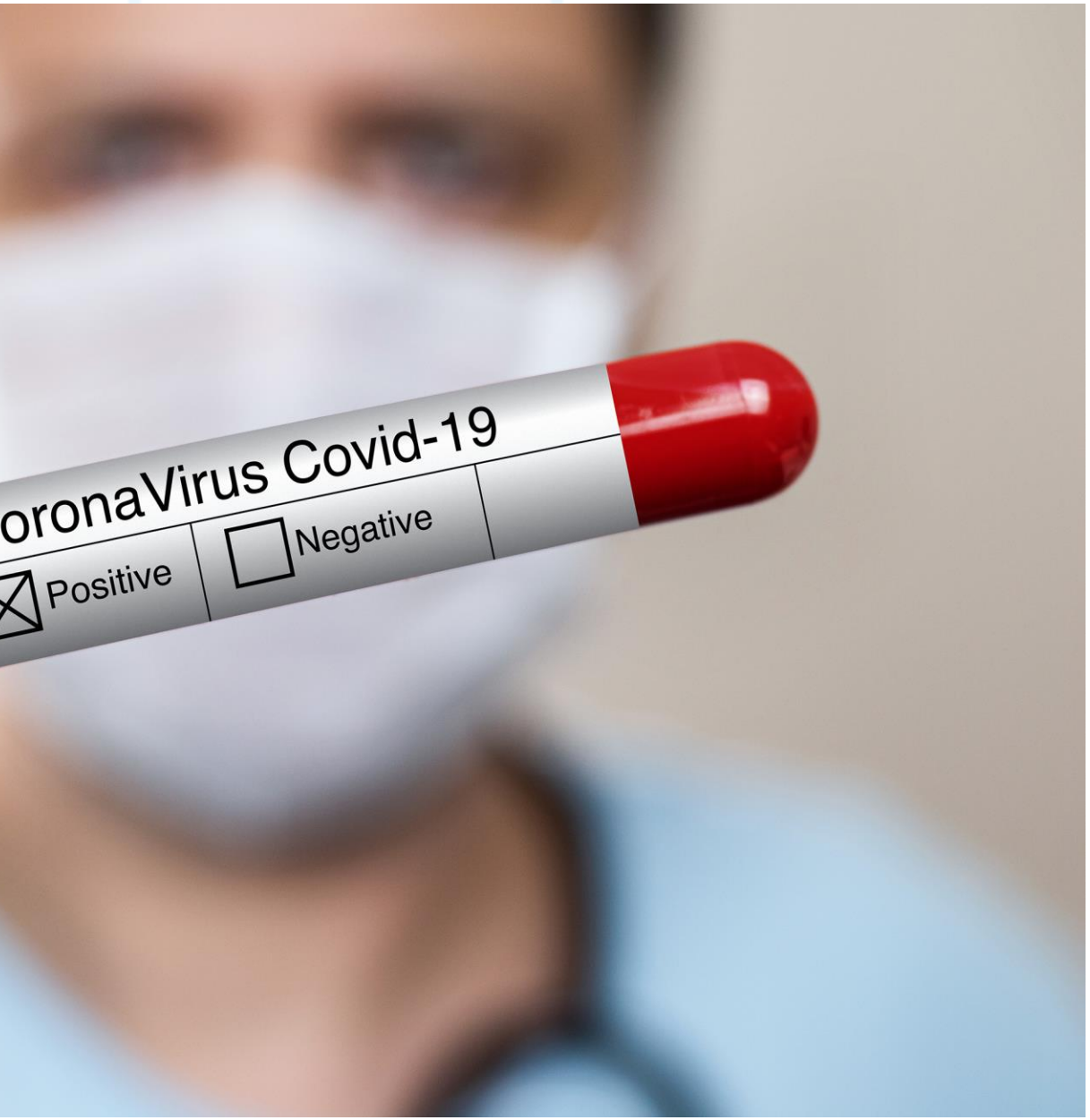
Today, TPE is used to remove harmful substances (like autoantibodies, toxins, or abnormal proteins) or replace missing substances in the plasma, treating a wide range of conditions, including neurological disorders , autoimmune diseases, kidney disorders, blood disorders, and age management.

Therapeutic Plasma Exchange: Core Curriculum 2023: Transfusion. 2010;50(7):1413-1426. https:// doi.org/10.1111/j.1537-2995.2009.02505.

Neurological Disorders:

- **Guillain-Barré Syndrome (GBS):** A condition where the body's immune system attacks the peripheral nerves.
- **Chronic Inflammatory Demyelinating Polyneuropathy (CIDP):** A chronic form of nerve damage similar to GBS.
- **Myasthenia Gravis (MG):** An autoimmune disorder causing muscle weakness.
- **Lambert-Eaton Syndrome:** A rare autoimmune disorder affecting the neuromuscular junction.
- **Neuromyelitis Optica Spectrum Disorders (NMOSDs):** A group of autoimmune diseases affecting the optic nerves and spinal cord.
- **Autoimmune Encephalitis:** A condition where the body's immune system attacks the brain.
- **Stiff-person syndrome:** A neurological disorder that causes muscle stiffness.
- **Paraneoplastic Neurological Syndromes:** Neurological disorders associated with cancer.

2020 Therapeutic Plasma Exchange as a Treatment for Autoimmune Neurological Disease: PMCID: PMC7415086 PMID: 32802495: https://pmc.ncbi.nlm.nih.gov/articles/PMC7415086/



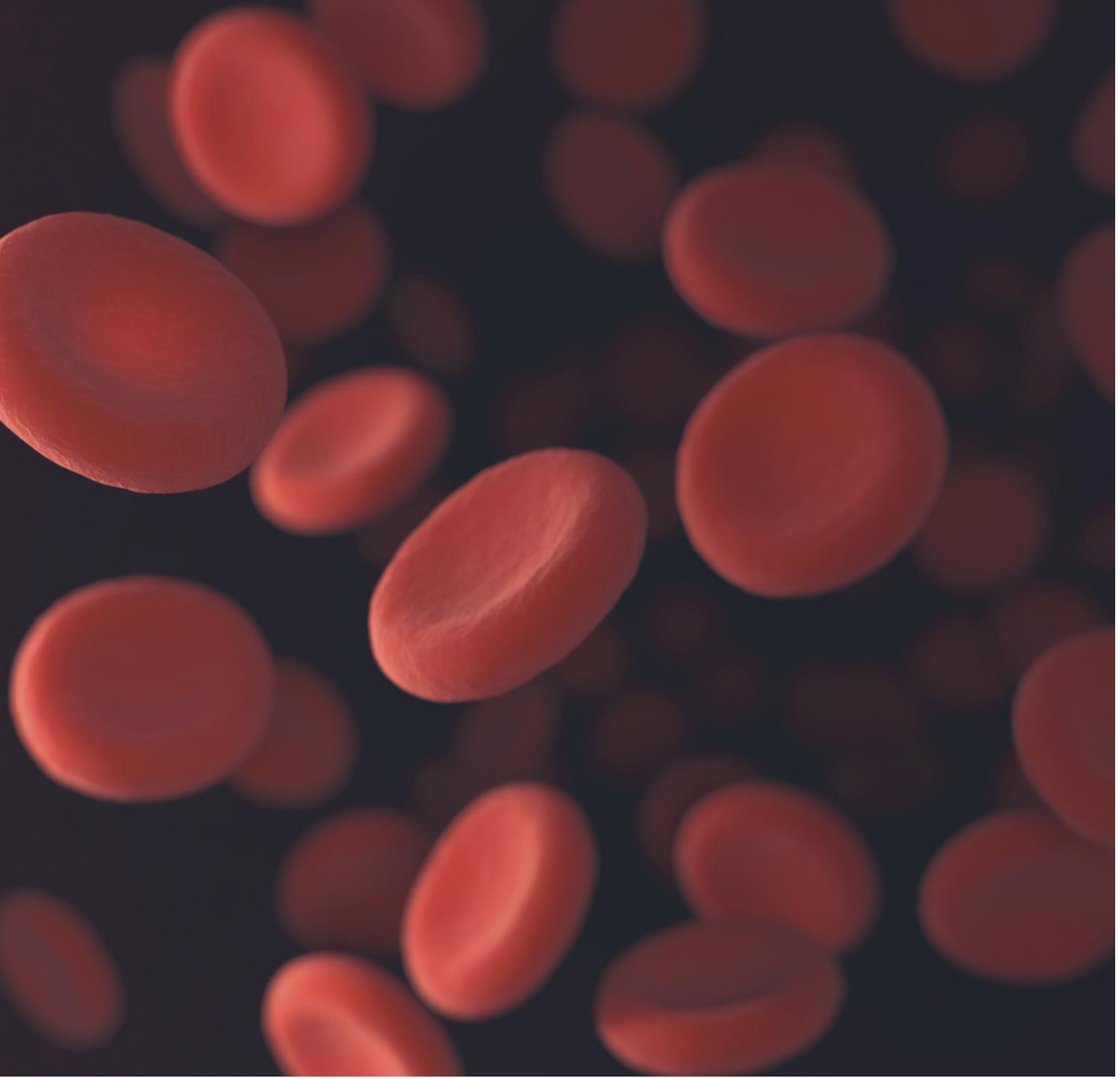
Autoimmune Disorders

- **Systemic Lupus Erythematosus (SLE):** A chronic autoimmune disease affecting multiple organs.
- **Autoimmune Hemolytic Anemia:** A condition where the body's immune system attacks red blood cells.
- **Liver Transplantation: Desensitization:** Used to desensitize patients for liver transplant.
- **Thrombotic microangiopathy, complement mediated:** A condition where the blood clots form in small blood vessels
- **Long Covid:** A chronic condition that occurs after SARS-CoV-2 infection and is present for at least 3 months.

2017: Therapeutic Plasma Exchange - An Emerging Treatment Modality in Patients with Neurologic and Non-Neurologic Diseases: . 2017 Aug 1;11(8):EC35–EC37. doi: 10.7860/JCDR/2017/27073.10480

Kidney Disorders

- **Thrombotic Thrombocytopenic Purpura (TTP):** A disorder causing blood clots in small blood vessels.
- **Hemolytic Uremic Syndrome (HUS):** A condition characterized by kidney damage and blood clots.
- **Goodpasture's Syndrome:** An autoimmune disease affecting the kidneys and lungs.
- **Anti-Glomerular Basement Membrane (GBM) Disease:** A type of kidney disease caused by antibodies attacking the basement membrane of the glomeruli.
- **Focal Segmental Glomerulosclerosis (FSGS):** A kidney disease that can be recurrent in transplanted kidneys.
- **ANCA-associated rapidly progressive glomerulonephritis:** A kidney disease associated with certain antibodies.
- **Renal Transplantation: Desensitization and antibody-mediated rejection:** Used to prevent or treat antibody-mediated rejection after kidney transplant.



Blood Disorders:

- **Hyperviscosity Syndrome:** A condition where the blood becomes too thick.
- **Cryoglobulinemia:** A condition where abnormal proteins (cryoglobulins) clump together in the blood, causing inflammation and organ damage.
- **Waldenström Macroglobulinemia:** A type of cancer affecting the immune system.
- **Idiopathic Thrombocytopenic Purpura (ITP):** A disorder characterized by low platelet count.
- **Wilson Disease (fulminant):** A rare genetic disorder that causes copper to build up in the body.

2023 Plasmapheresis: Shane R. Sergent; John V. Ashurst. Stat Pearls
https://www.ncbi.nlm.nih.gov/books/NBK560566/

The Newest Way of Using TPE:

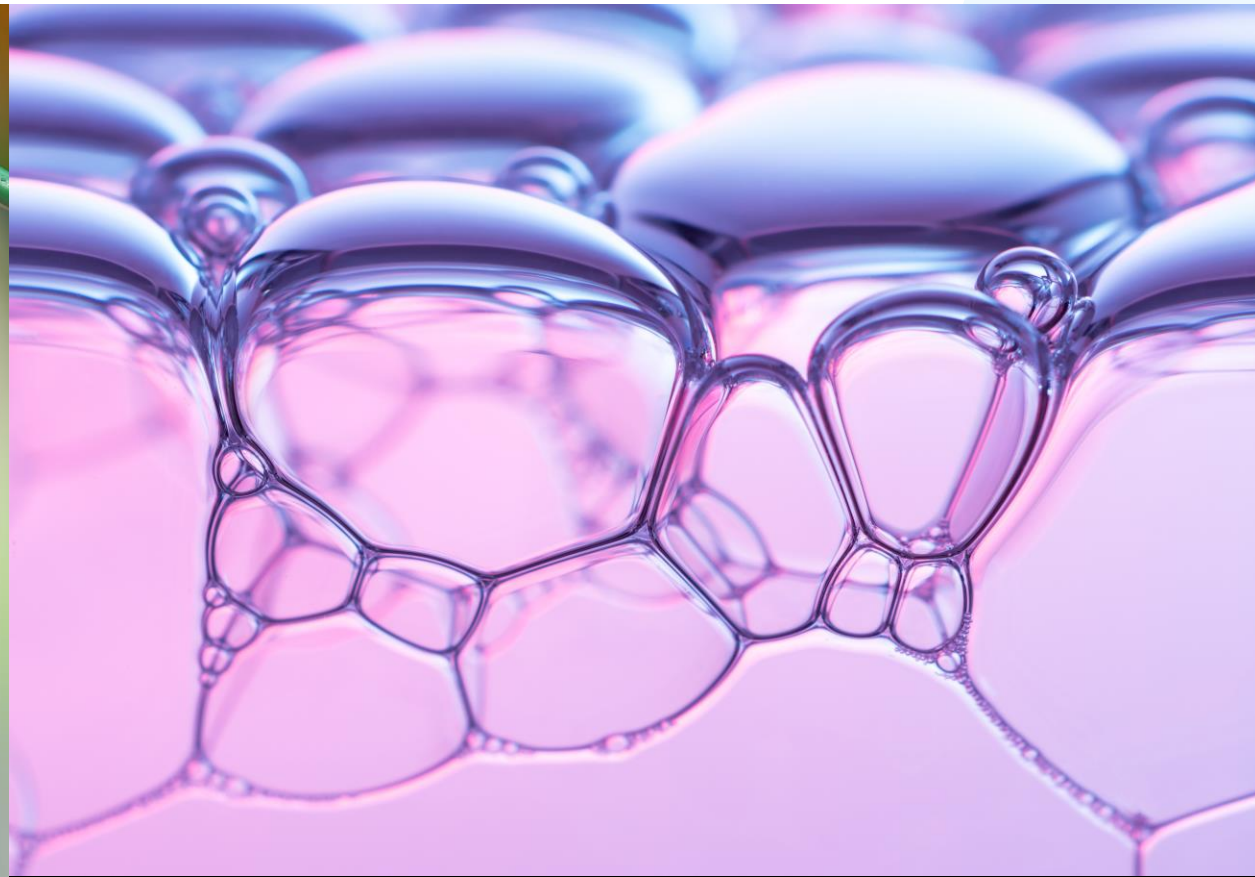
- ✓Age Management
  - ✓Autoimmune diseases
  - ✓Cancer prevention
  - ✓Coronary Artery Disease
  - ✓Maternal and fetal health
  - ✓Idiopathic Environmental Intolerances
  - ✓Neurodegenerative diseases

Qualifying Patients for TPE

Rules for Qualifying a Patient for TPE

It is not so much about what you are ***putting in***, as what you are ***taking out***

It is not so much about who can get TPE, as much as ***who should not get TPE in an outpatient setting***.



TPE Evaluation

- **Unstable medical conditions**
  - Recent or Frequent Congestive Heart Failure
  - Recent MI or CVA (within 6 months)
  - Unstable angina
  - Non-ambulatory Patients - Dysautonomia
- **Medical Conditions Tightly Controlled with Medications**
  - Status Epilepticus
  - Status Asthmaticus
  - Ventricular Arrhythmias
  - Recent or Recurrent DVT/PE
- **Uncooperative Patients**
  - Severe Alzheimer's/Dementia
- **Pregnancy**
- **Under 18 years of age**

- **Individualized Assessment:** Thorough evaluation and consultation are crucial

Patient Safety Protocols

- Ultrasound-guided catheter placement.
- Pre-procedure meal to prevent hypoglycemia.
- Citrate toxicity monitoring.
- Calcium supplementation to mitigate hypocalcemia.
- Emergency preparedness.
- Ongoing staff training and education.

Clinical Assessments for Qualification

- **Toxin Exposure**
  - Toxin Testing
- **Immune System Function**
  - Lymphocytes, Antibodies
- **Inflammation and Oxidation**
  - CRP, ESR, Interleukin, TNKa
  - MPO, TMAO, ox-LDL
- **DNA**
  - Detox genes
  - Telomeres
- **Cancer Markers**
- **Cardiovascular Health**
  - Cleerly
- **Cognitive Function**
  - CNS Vital Signs
- **Surveys/inventories**
  - CNS Vital Signs
  - Fatigue
  - Depression
  - Quality of Life
  - QEESI

Summary: Integration of TPE into Practice

List of strategies and tools to help integrate TPE into clinical care

- ✓**Plan Carefully:** Integrate TPE using a step-by-step approach.
- ✓**Equip and Train:** Acquire necessary equipment and ensure staff are properly trained.
- ✓**Establish Procedures:** Develop guidelines for emergencies, side effects, patient education, and safe disposal.
- ✓**Standardize Protocols:** Create treatment protocols tailored to patient needs and conditions.
- ✓**Collaborate and Review:** Engage interdisciplinary teams and regularly update protocols.
- ✓**Patient Selection:** Conduct thorough assessments to identify suitable candidates.

PlasmaXchange = Advanced Serial TPE

- Patent Pending 19/073,986
  - Serial TPE (five) with albumin 5% performed every 4 weeks
  - IV Nutrient therapy
  - IV Immunoglobulin
  - Oral nutrient therapy daily
  - Oral medications
  - Avoidance training

TPE VS. PLASMAXCHANGE: KEY DIFFERENCES

Feature	TPE	PlasmaXchange
Purpose	Focuses on plasma exchange to reduce certain substances	TPE + regenerative wellness and maintenance protocols
Scope	Used primarily for specific medical conditions	Designed for health and wellness optimization
Additional Programs	None	Includes IV therapies, supplements, regenerative wellness, and lifestyle guidance
Maintenance	Not included	Personalized medicine plans to prevent toxin buildup and promote continued healing

Phases Of PlasmaXchange

Serial TPE
Nutrients

Exosomes
Stem Cells
Peptides
Low Dose Naltrexone
Chelation

Avoidance Training
Nutrients
Plasma Donations

Detox

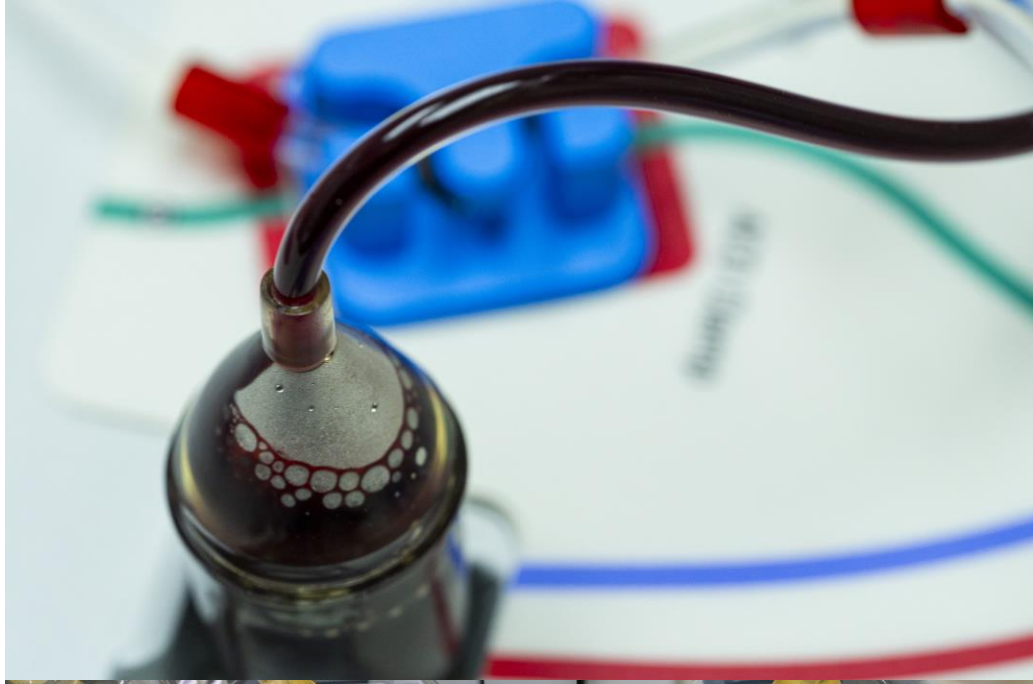
Serial TPE
Nutrients

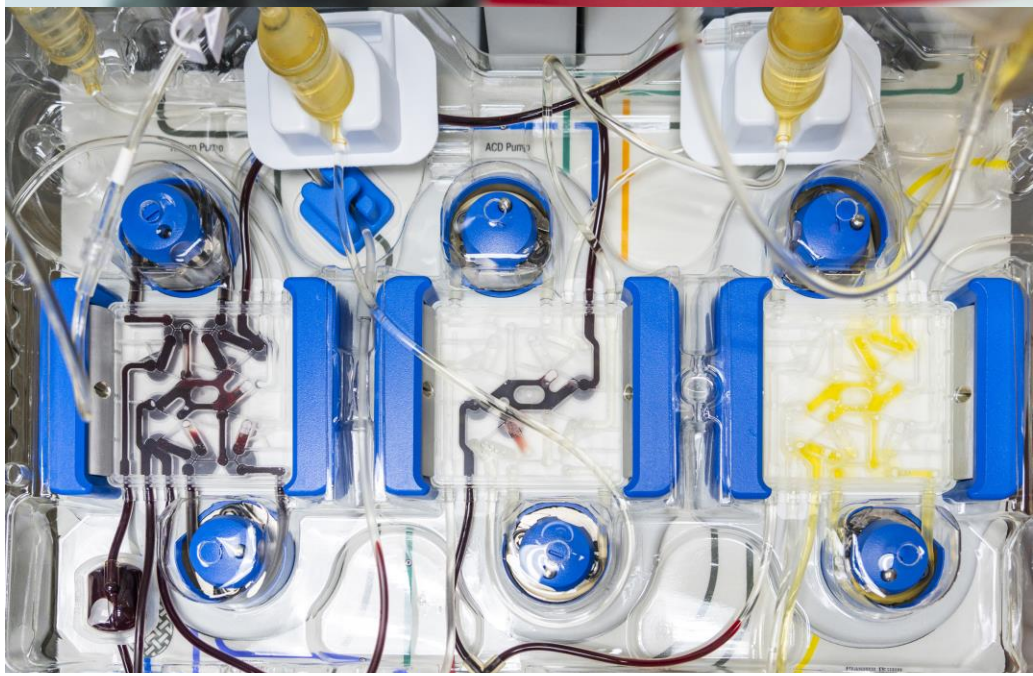
What is Therapeutic Plasma Exchange (TPE)?

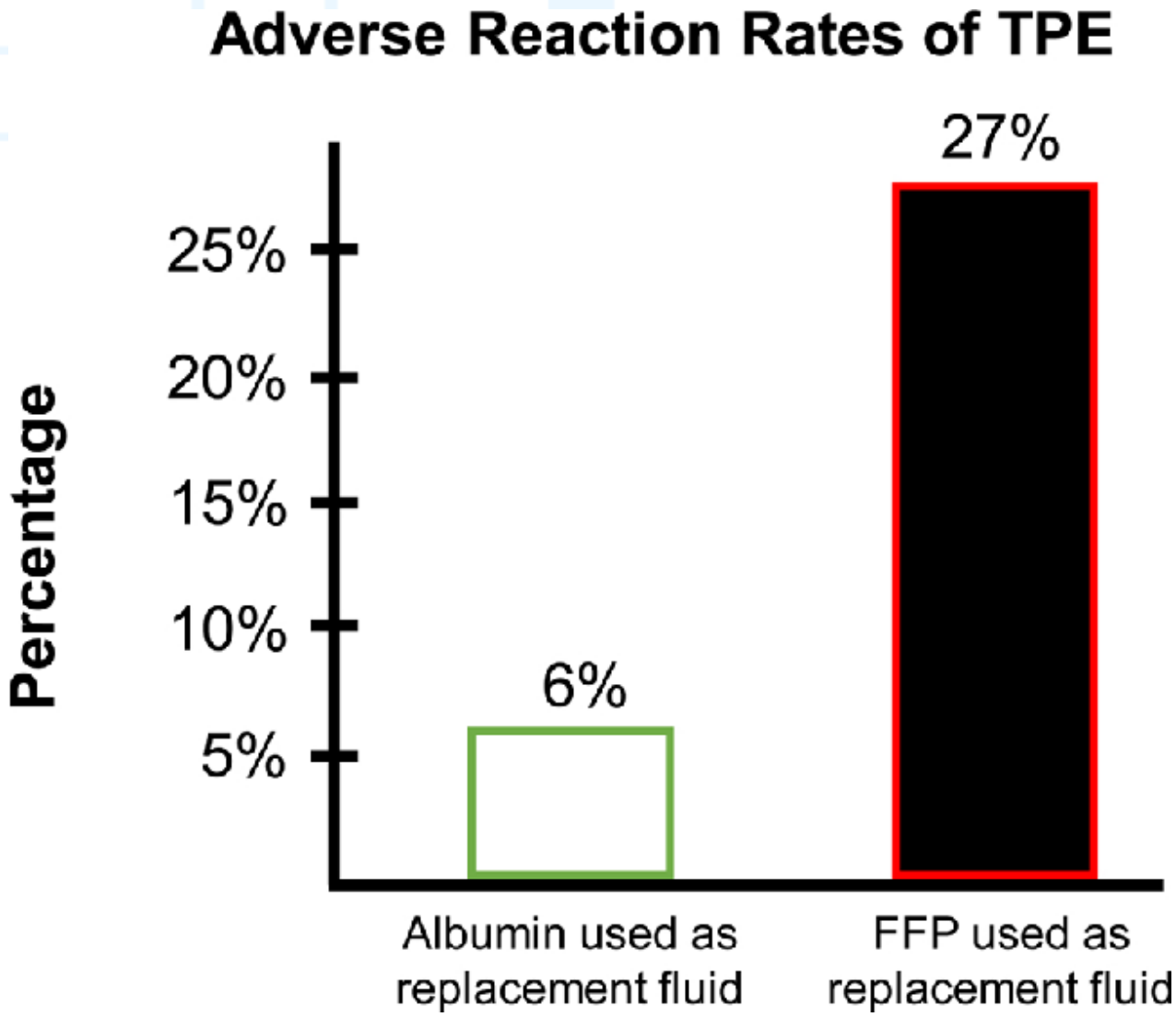
Therapeutic Plasma Exchange (TPE) is a procedure in which the patient's blood is passed through an apheresis machine, where the separated plasma is removed and discarded THEN the red blood cells are reinfused along with a replacement fluid, most frequently albumin.

Plasmapheresis: Refers only to the removal of plasma

Used to treat diseases by removing harmful substances (antibodies, proteins, toxins).



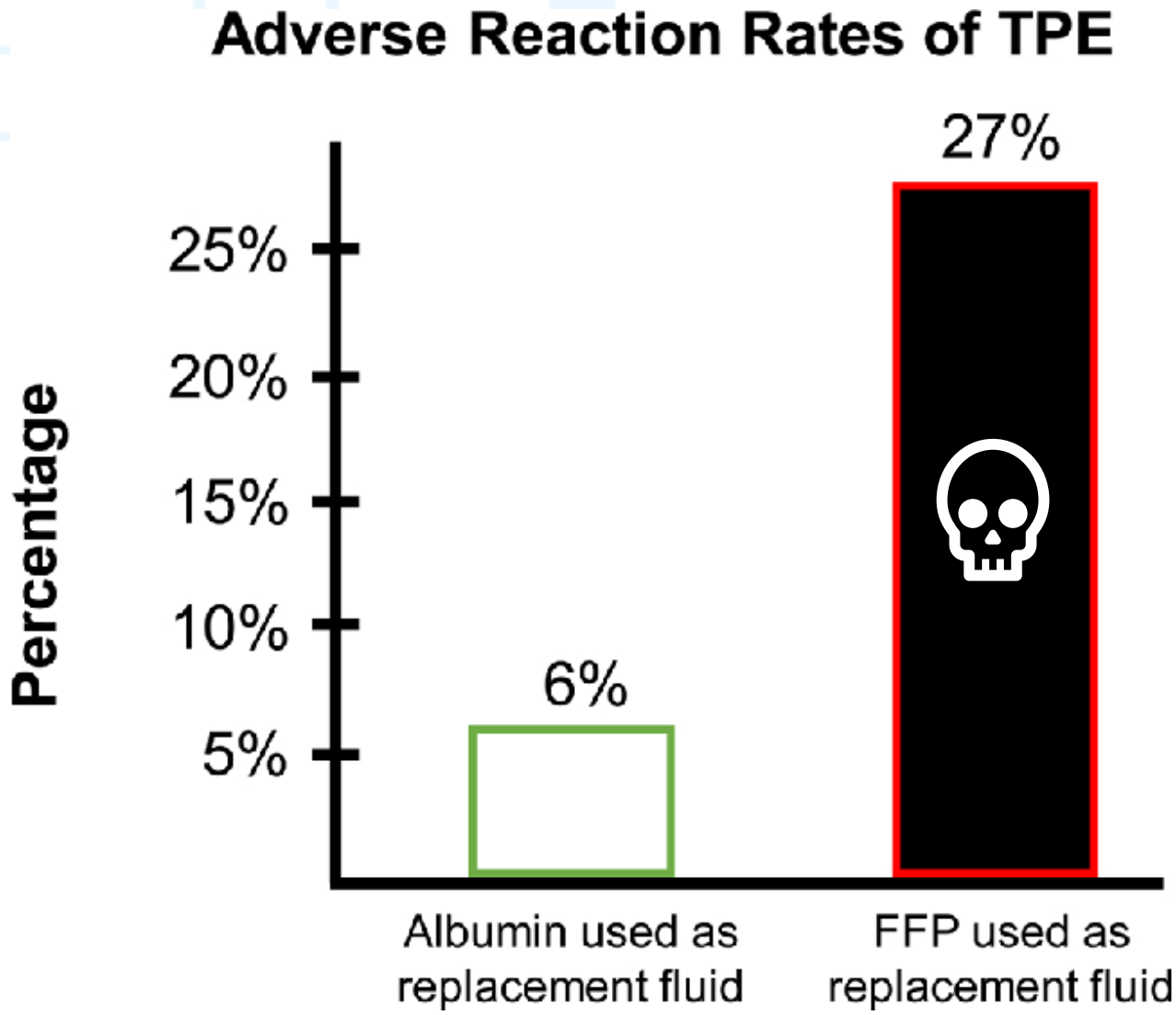




Adverse Reactions with TPE using 5% Albumin

- Hematomas
- Pruritus
- Urticaria
- Low blood pressure
- Low blood sugar

https://www.sciencedirect.com/science/article/pii/S1473050221001282

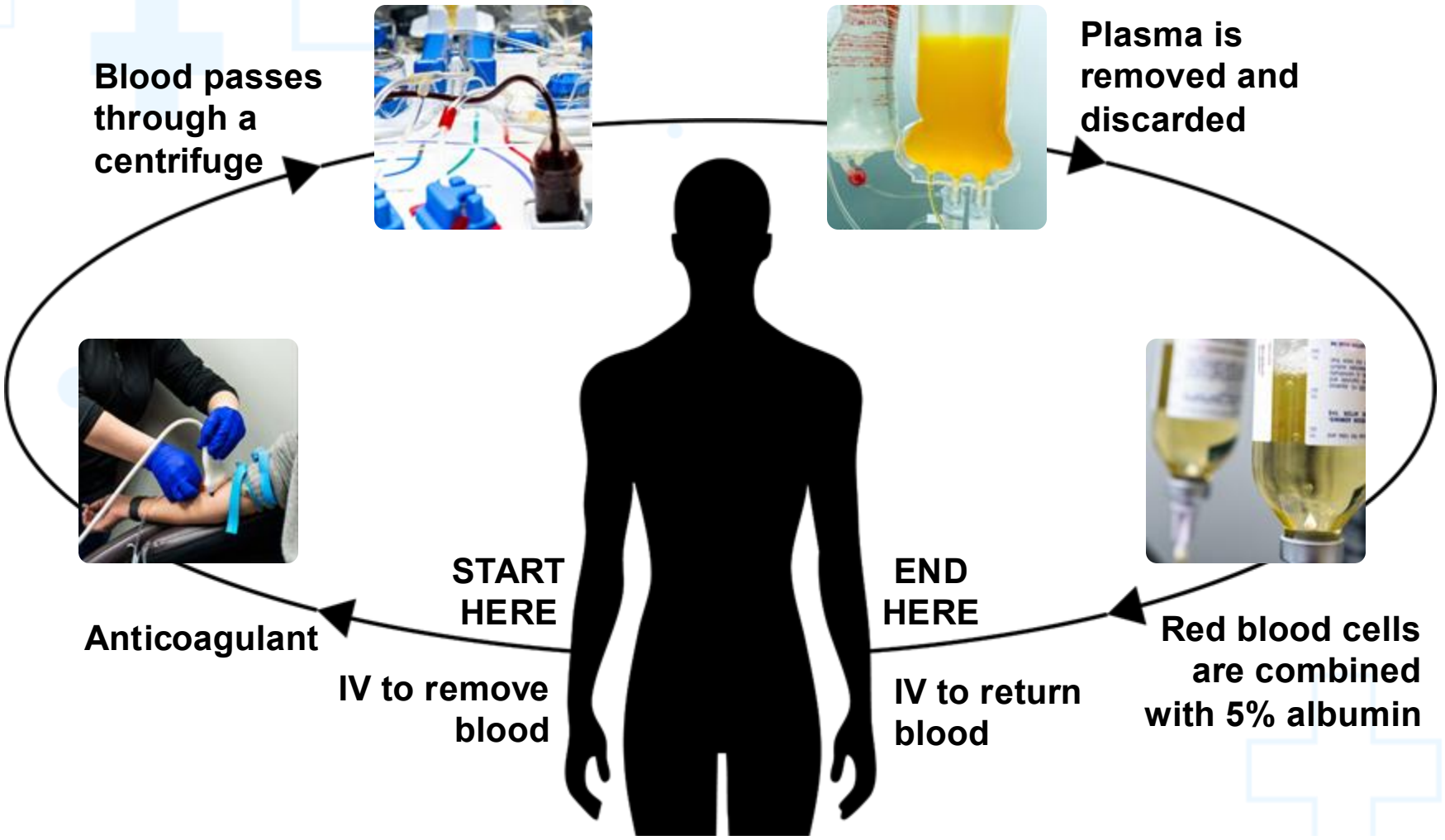


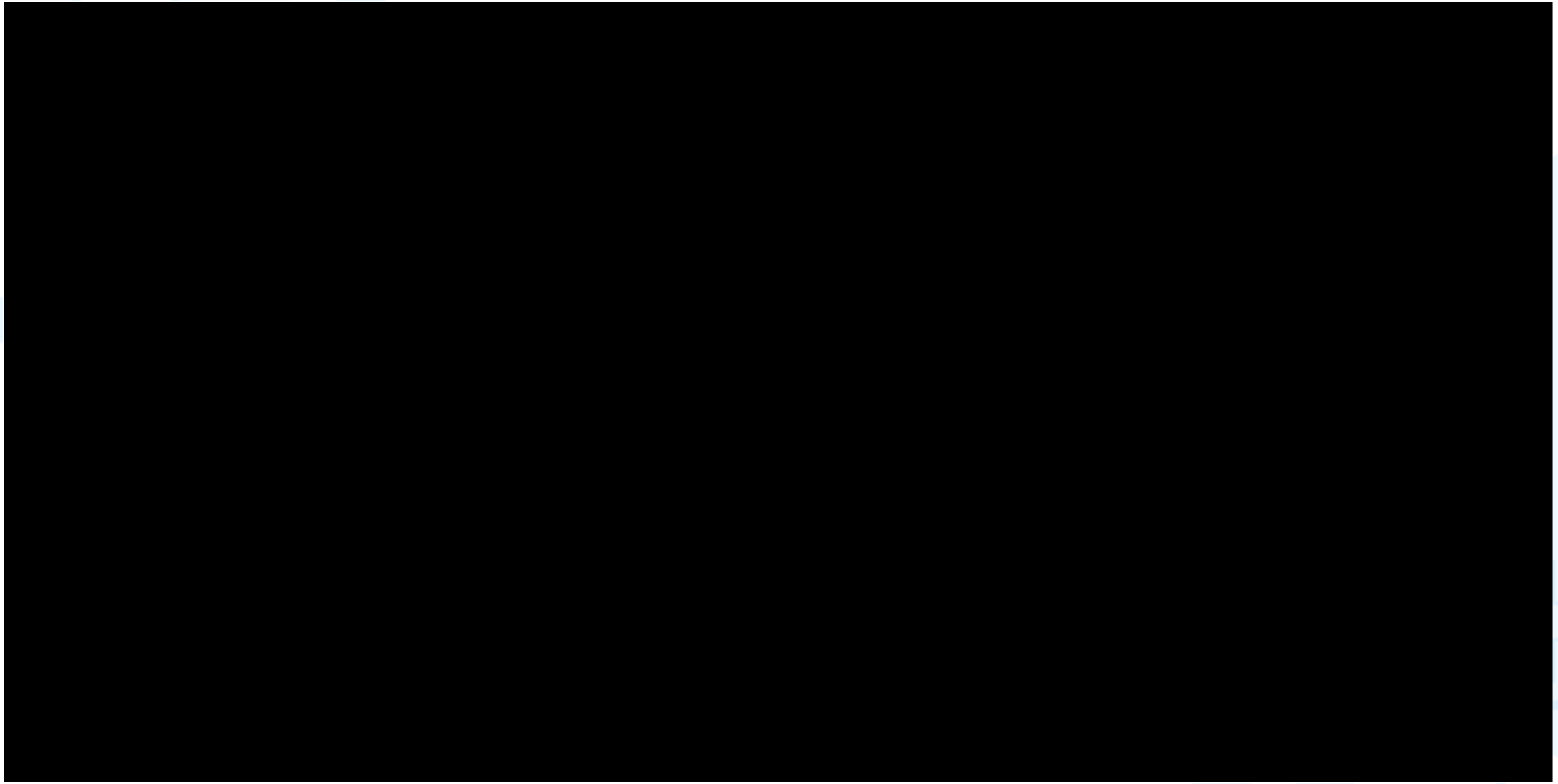
Adverse Reactions with TPE using Fresh Frozen Plasma

- Pruritus
- Urticaria
- Hematomas
- High blood pressure
- Low blood pressure
- Low blood sugar
- Severe anaphylaxis
- Transfusion related Acute Lung Injury

https://www.sciencedirect.com/science/article/pii/S1473050221001282

What Therapeutic Plasma Exchange (TPE)?





IV Nutrients

Given after every TPE

Supplement Facts

Ascorbic Acid
Dexpanthenol
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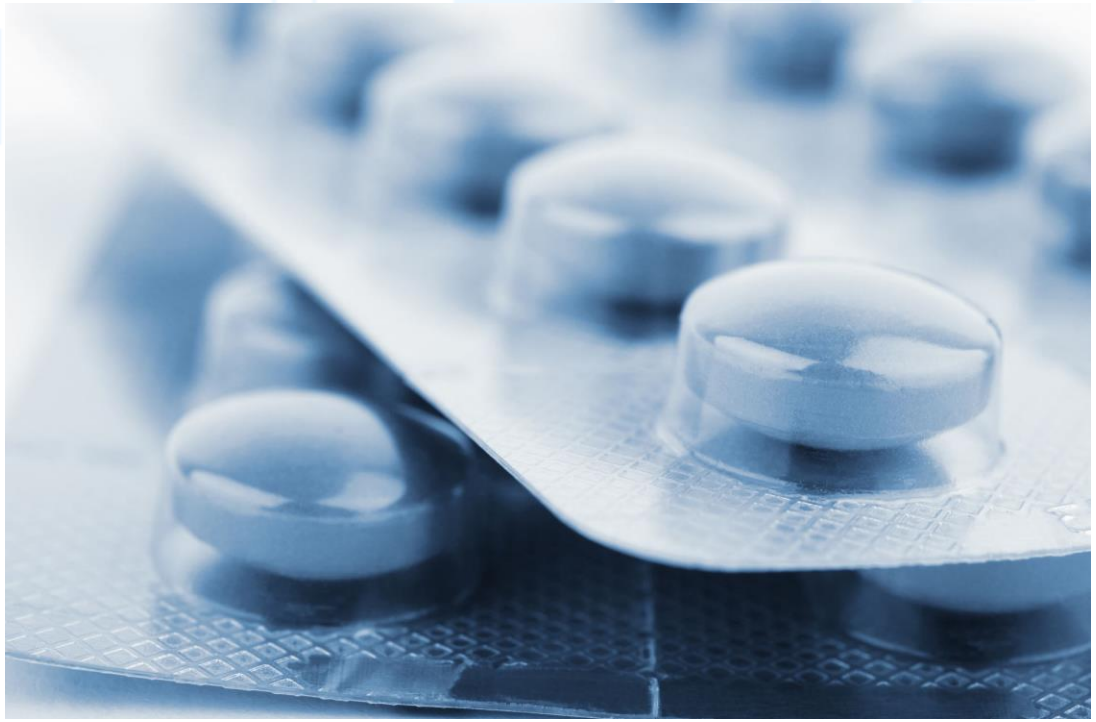
Hydroxocobalamin
Niacin
Pyridoxine
Riboflavin
Thiamine
Calcium Gluconate
Magnesium Chloride
Potassium chloride
Zinc sulfate
Various Amino Acids
Glutathione

Oral Nutrients

Taken Daily for 6 months



Supplement Facts

Serving Size 6.5 tbsp
Servings Per Container 30

	Amount Per Serving	%DV
Vitamin A (as Vitamin A Palmitate)	300 mcg	33%
Vitamin C (as Ascorbic Acid)	500 mg	556%
Vitamin D (as Cholecalciferol)	62.5 mcg (2500 IU)	313%
Vitamin E (as Mixed Tocopherols)	33.5 mg	223%
Thiamin (as Thiamine Mononitrate)	1 mg	83%
Riboflavin (as Riboflavin 5 Phosphate)	15 mg	1154%
Niacin (as Niacinamide)	15 mg	94%
Vitamin B6 (as Pyridoxine HCl)	15 mg	882%
Folate (as Quatrefolic® L-5-Methyltetrahydrofolate, Glucosamine Salt)	1700 mcg DFE	425%
Vitamin B12 (as Methylcobalamin)	500 mcg	20833%
Biotin (as D-Biotin)	50 mcg	167%
Pantothenic Acid (as Calcium Pantothenate)	100 mg	2000%
Calcium (as Calcium D-Glucarate, as Calcium Pantothenate)	68 mg	5%
Iodine (as Potassium Iodide)	25 mcg	17%
Magnesium (as Albion® Magnesium Bisglycinate)	100 mg	24%
Zinc (as Albion® Zinc Bisglycinate)	5 mg	45%
Copper (as Copper Gluconate)	1 mg	111%
Manganese (as Manganese Glycinate)	5 mg	217%
Chromium (as Chromium Polynicotinate)	25 mcg	71%
Molybdenum (as Albion® Molybdenum Glycinate)	50 mcg	111%
Proprietary Blend	23235 mg	†

Rice Protein (RisaPro1000®), L-Glutamine, Trimethyl Glycine (TMG) - Betaine Anhydrous, Larch Arabinogalactan (Larix Occidentalis), 1,3 Beta Glucan 85% (BGF-Immune®), L-Lysine (as L-Lysine HCl), Calcium D-Glucarate, Quercetin, L-Glycine, Skullcap Root Extract (30% Baicalin), L-Proline, Bromelain 2400 GDU, Pomegranate Fruit Extract, Turmeric Extract - LONGVIDA®, Cat's Claw (Unicaria tomentosa) Bark Extract (3% Oxindole Alkaloids), Dandelion Root Extract, Ginger Rhizome Extract (5% Gingerols), Omega-3 EPA/DHA (AvailOm® High EPA), L-Alanine, Hops Extract, N-Acetyl-L-Cysteine (NAC), L-Arginine (as L-Arginine HCl), L-Glutathione (reduced), Taurine, Resveratrol (Polygonum cuspidatum) Root Extract, Artichoke Flower Extract, Boswellin® HBD(Boswellia Serrata Extract), Grape Seed Extract (95% Proanthocyanidins), Alpha Lipoic Acid, Schisandra Berry Extract, Shilajit Extract (PrimaVie®), Bitter Melon Extract, Rosemary Dry Extract, Milk Thistle Seed Extract (80% Silymarin), Green Tea (Camellia sinensis) Leaf Extract (50% EGCG), TruBroc® SGS Broccoli Seed Extract, Extramel® (SOD-B), L-Methionine, L-Ornithine (as L-Ornithine HCl), L-Tyrosine, CoQ10 Blend (Rice powder, sunflower lecithin)Pterostilbene, Noni Fruit Extract 4:1, Micro PQQ, Astaxanthin, D-Ribose, Monk Fruit Extract, Nicotinamide Riboside Chloride (NR)

† Daily Value (DV) not established

Regenerate

Immunoglobulins
Naltrexone
Chelation
Peptides
Exosomes
Stem Cells

Personalize Treatment: Enhance TPE benefits with concomitant therapies.

- **Immunoglobulins:** Can further modulate the immune system and reduce inflammation.
- **Low Dose Naltrexone:** Enhance anti-inflammatory effects and immune regulation.
- **Chelation:** Improves removal of heavy metals
- **Peptides:** Improves healing
- **Exosomes and Stem Cells:** Support healing and tissue regeneration.

Maintenance

Avoidance Training
Nutrients
Plasma Donations

- Continue supplementation x 6 months
- Continue Avoidance Training
- Recommend donating plasma every 4 months if possible

Avoidance Training

KEEP CLEAN AIR

Your essential resource for understanding and improving indoor air quality, strategies, device recommendations

KEEP CLEAN WATER & FOOD

Your essential resource for understanding and improving your water purity with recommended devices. Food vendors, food prep tips, for keeping toxin free.

KEEP CLEAN HOME

Your essential resource for understanding getting rid of dangerous chemicals and fabrics, options for natural and non-toxic cleaners, storage of toxic chemicals to protect you and your loved ones.

Avoidance Training

https://mdlifespan.com/guidebooks/

KEEP CLEAN BABY

Your essential resource for creating a toxin-free environment that nurtures your child's growth and development. Options from bottles to baby wipes, and everything in-between.

KEEP CLEAN BEAUTY

Your essential resource for discovering all the new innovative mobile applications designed to help you make informed choices about the products you use and the food you eat.

KEEP CLEAN APPS

Your essential resource for understanding and improving indoor air quality, ensuring a safer, healthier environment, options for filters.

Avoidance Training

GET CLEAN GUIDEBOOK

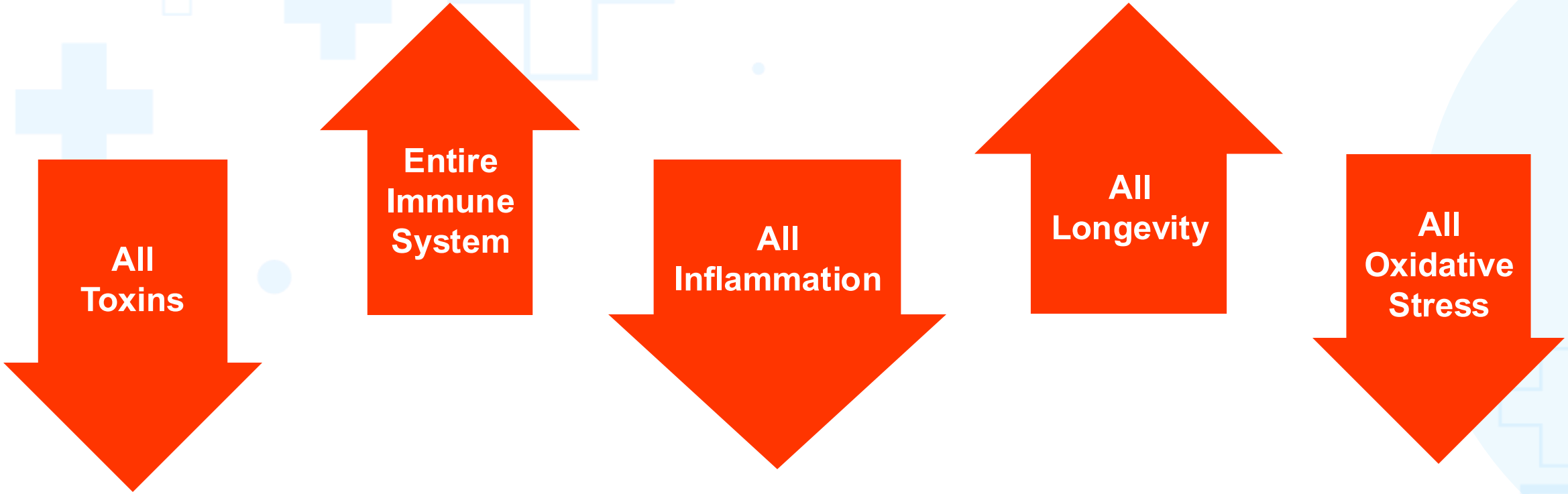
By following the strategies outlined in GET MDL CLEAN guidebook, you'll be equipped to naturally cleanse your body, boost your energy levels, and enhance your overall health.

PLASMAXCHANGE GUIDEBOOK

Transform your health by experiencing the profound benefits of removing toxins and enhancing your body's natural healing processes, focusing on brain, heart, cancer, immunity, and toxins. Which protocols is the best choice for you?

HERE COME THE NUMBERS

Quick Peek!


All Toxins
Entire Immune System
All Inflammation
All Longevity
All Oxidative Stress

AGING BIOMARKERS

TPE Only

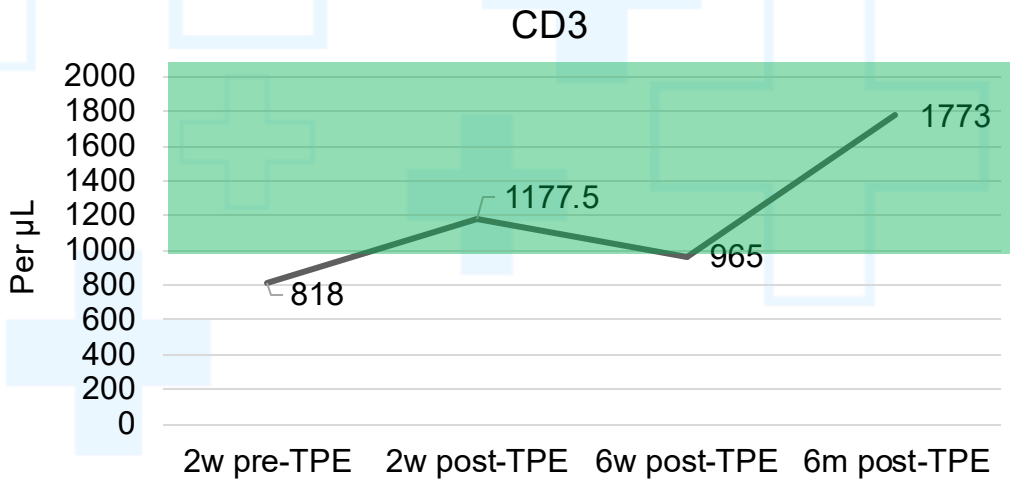
VS.

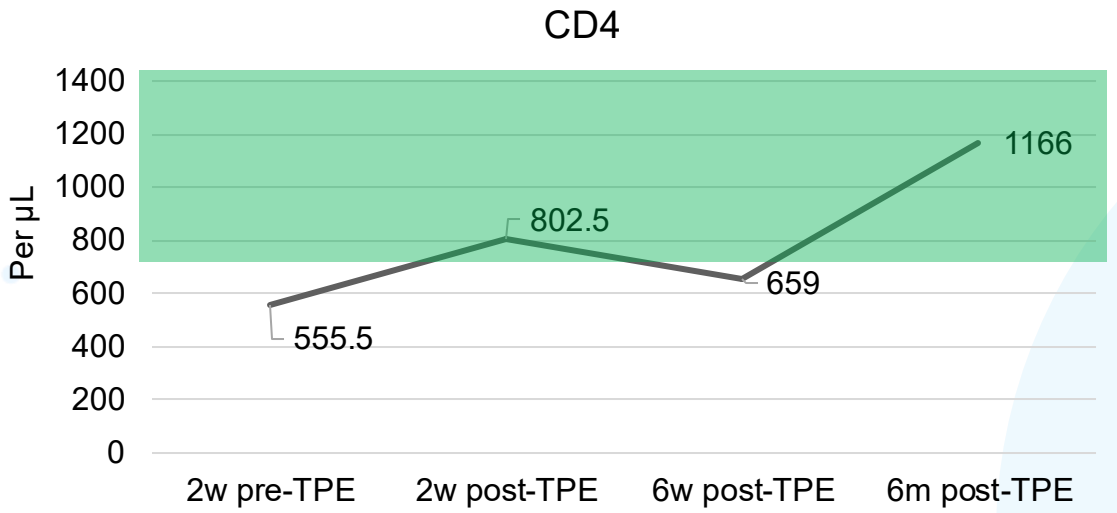
TPE Protocol

6 weeks post-procedure	TPE ONLY	TPE Protocol
Immune System		
CD3	10.82%	27.53%
CD4	17.67%	39.41%
CD8	10.40%	19.60%
CD19	6.68%	36.11%
CD56	-6.38%	53.49%
Inflammation		
Uric Acid (UA)	-9.59%	-22.83%
hs-C Reactive Protein	-6.98%	-35.52%
Interleukin-8	-51.42%	-35.92%
Tumor Necrosis Factor alpha	-12.73%	-93.20%
Oxidative Stress		
8-Oxoguanine	-29.64%	-46.28%
Myeloperoxidase	-12.88%	-26.29%
Longevity		
Klotho Protein	-13.02%	29.57%
NAD Intracellular	-16.36%	94.55%
SA-β-galactosidase	-39.62%	77.36%

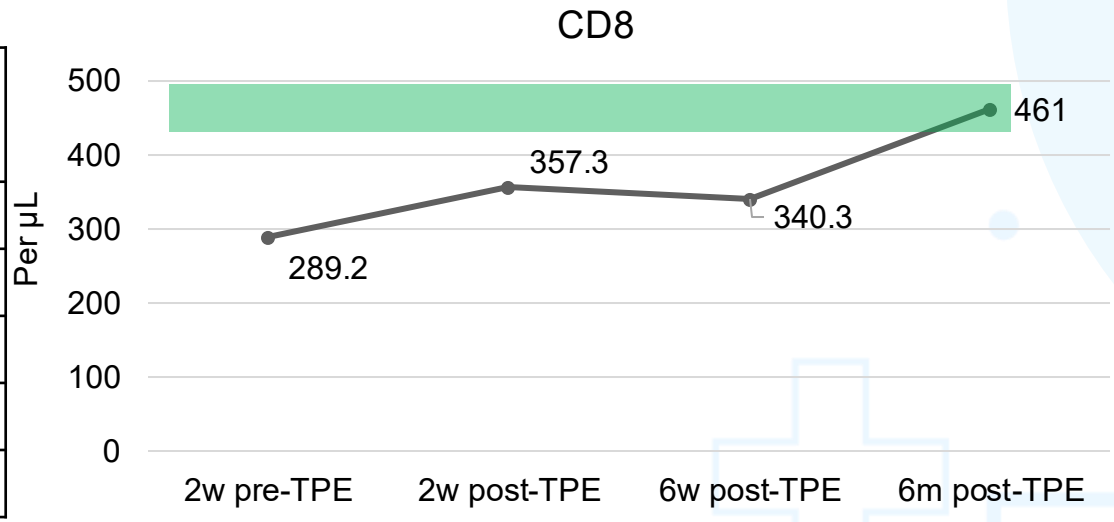
The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Protocol of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

IMMUNE SYSTEM





IMMUNE SYSTEM	Healthy Range		Units
	Min	Max	
CD3	1000	2300	/µL
CD4	700	1300	/µL
CD8	450	1000	/µL
CD19	300	650	/µL
CD56	225	600	/µL



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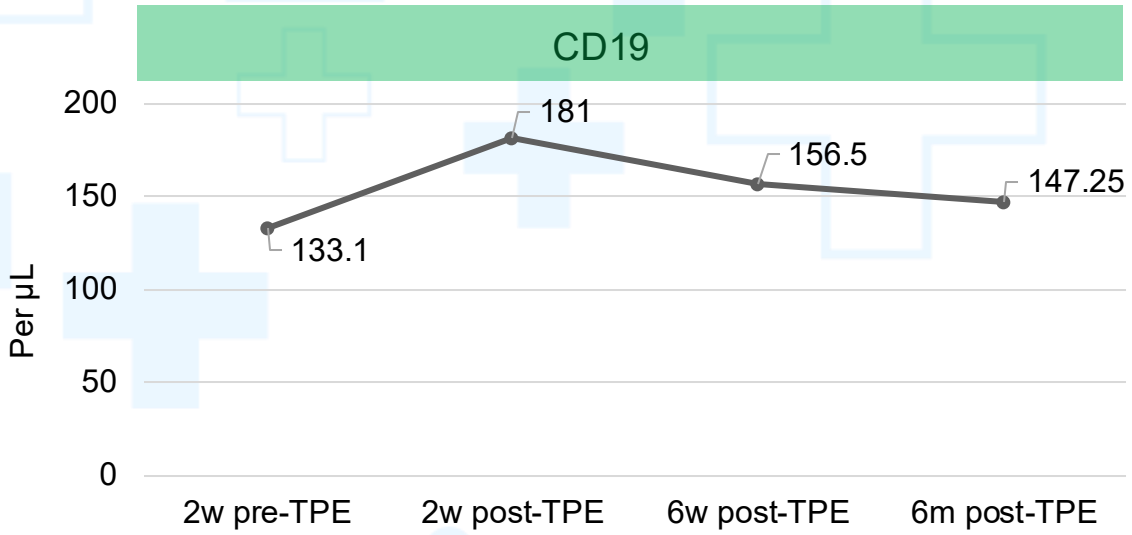

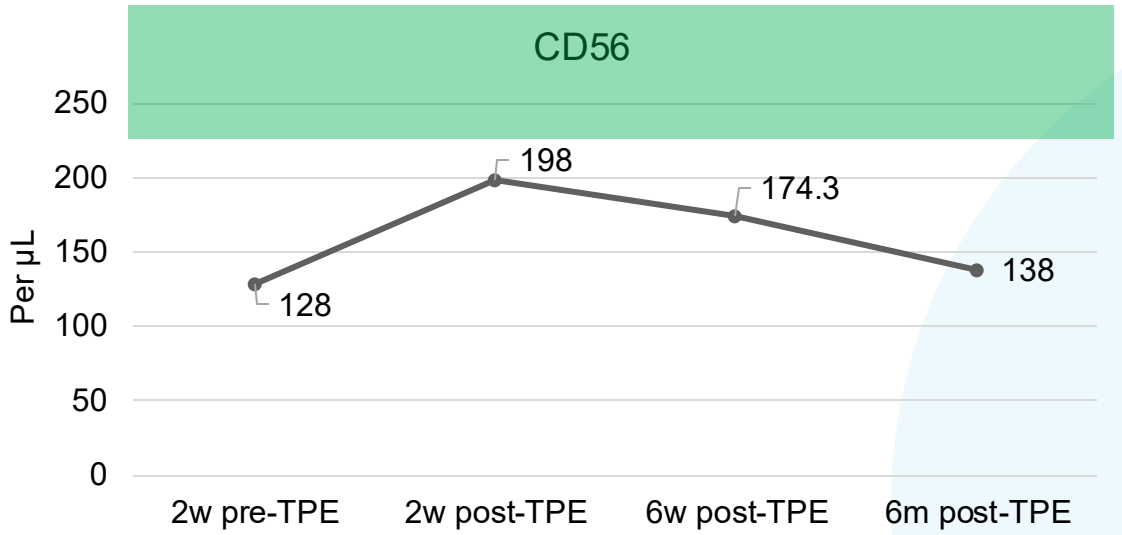

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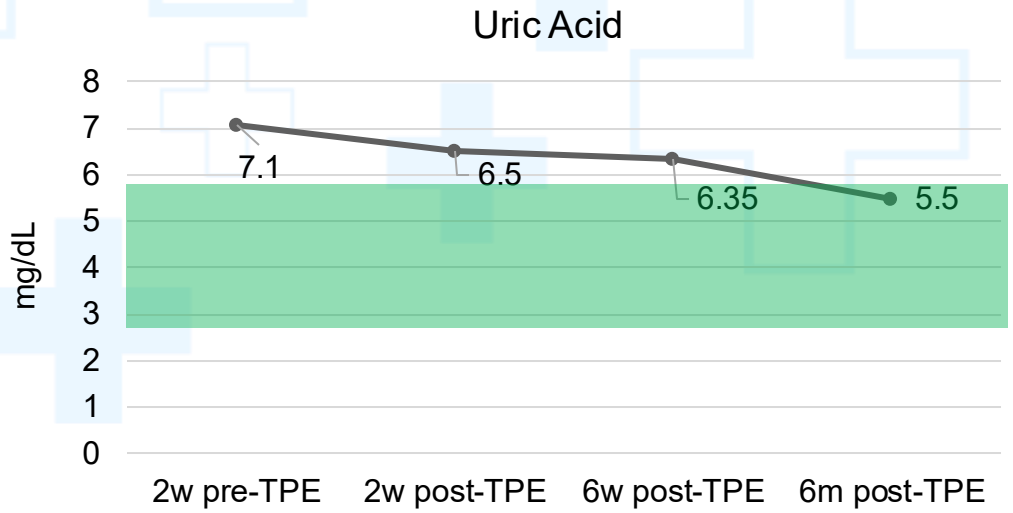
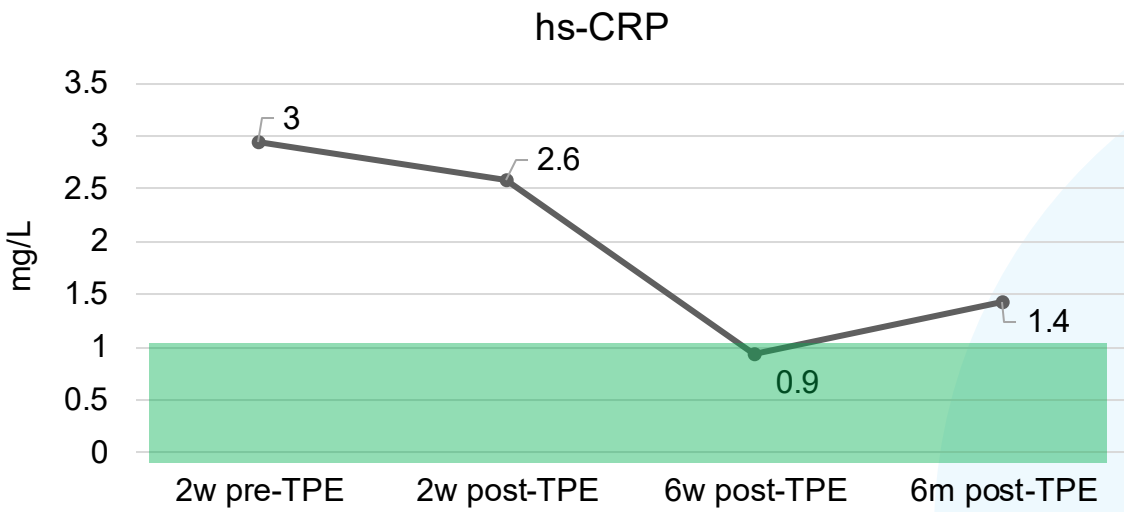
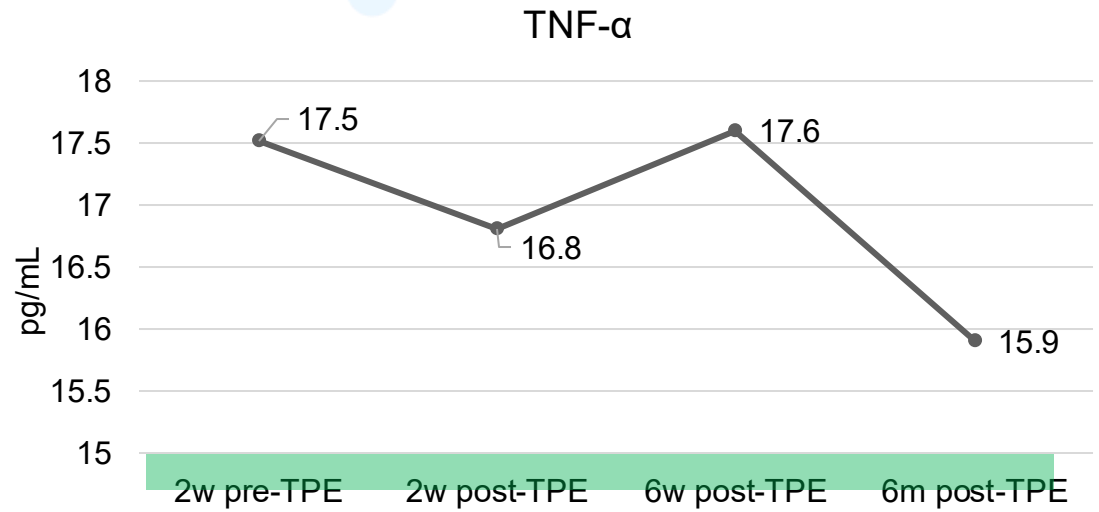
INFLAMMATION







INFLAMMATION	Healthy Range		Units
	Min	Max	
Uric Acid	3	6	mg/dL
hs-CRP	0	1	mg/L
IL-1β	0	0.5	pg/mL
IL-6	0	5	pg/mL
IL-8	0	20	pg/mL
TNF-α	0	12	pg/mL

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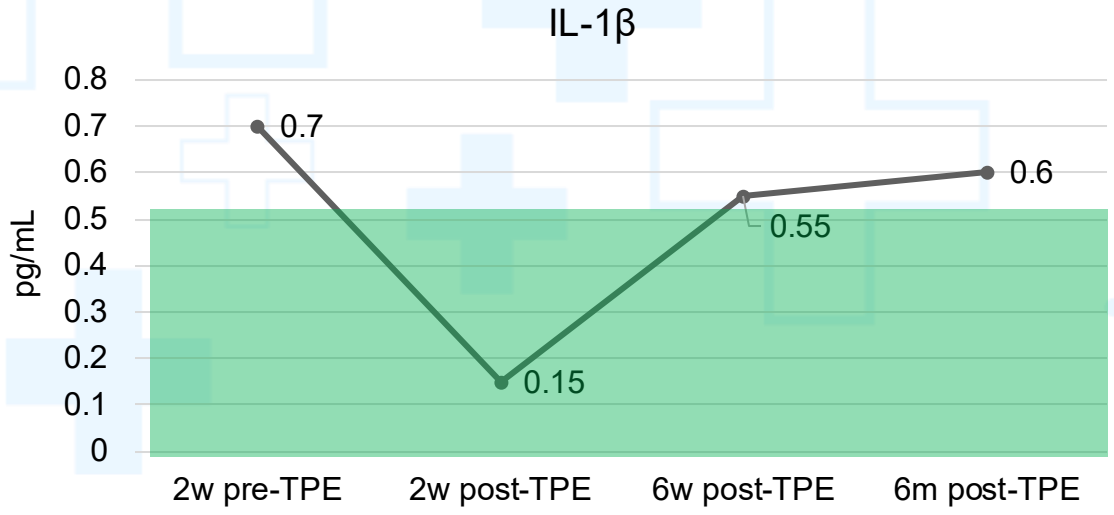
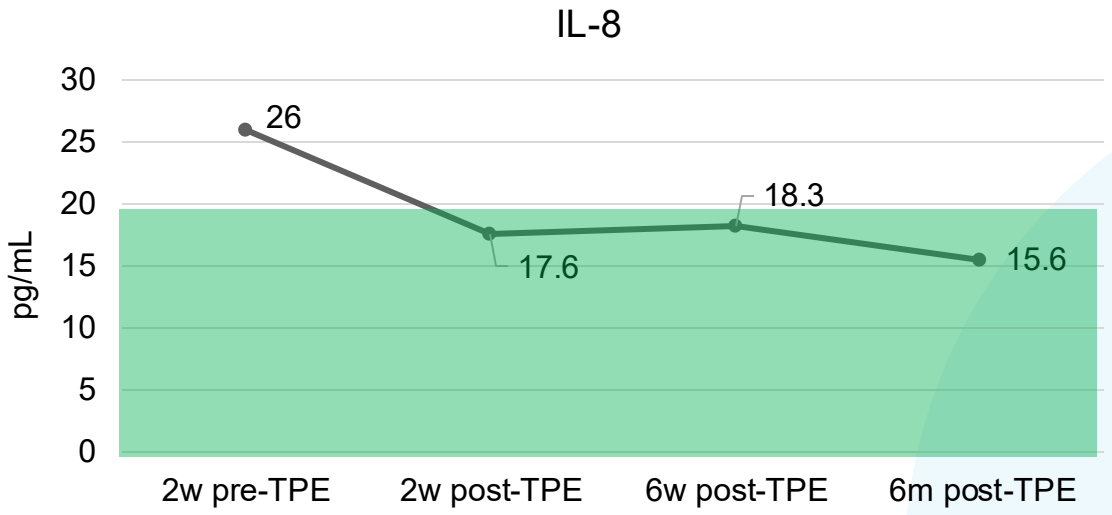
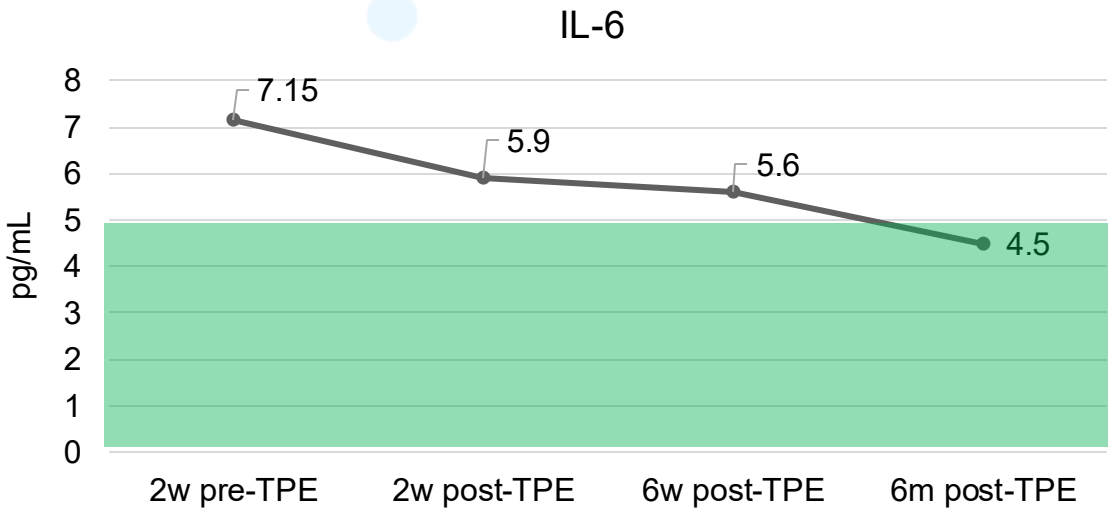


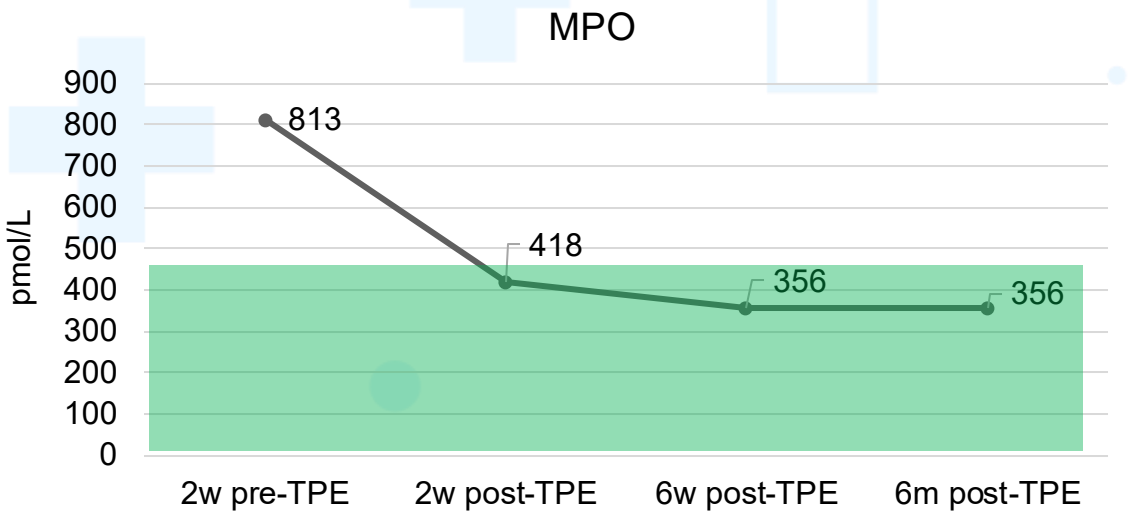




INFLAMMATION	Healthy Range		Units
	Min	Max	
Uric Acid	3	6	mg/dL
hs-CRP	0	1	mg/L
IL-1β	0	0.5	pg/mL
IL-6	0	5	pg/mL
IL-8	0	20	pg/mL
TNF-α	0	12	pg/mL

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

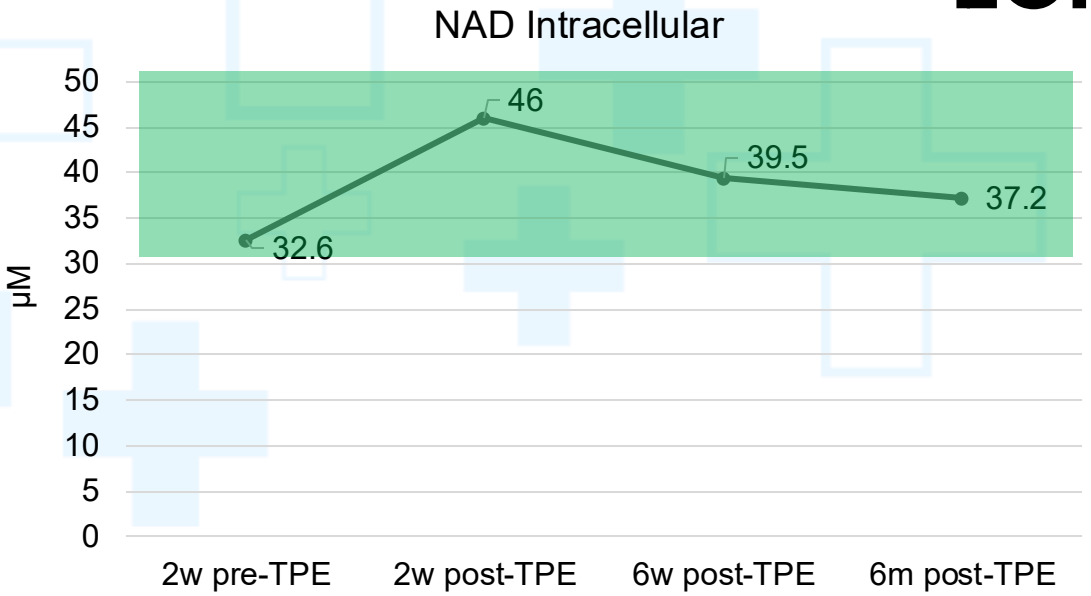
OXIDATIVE STRESS



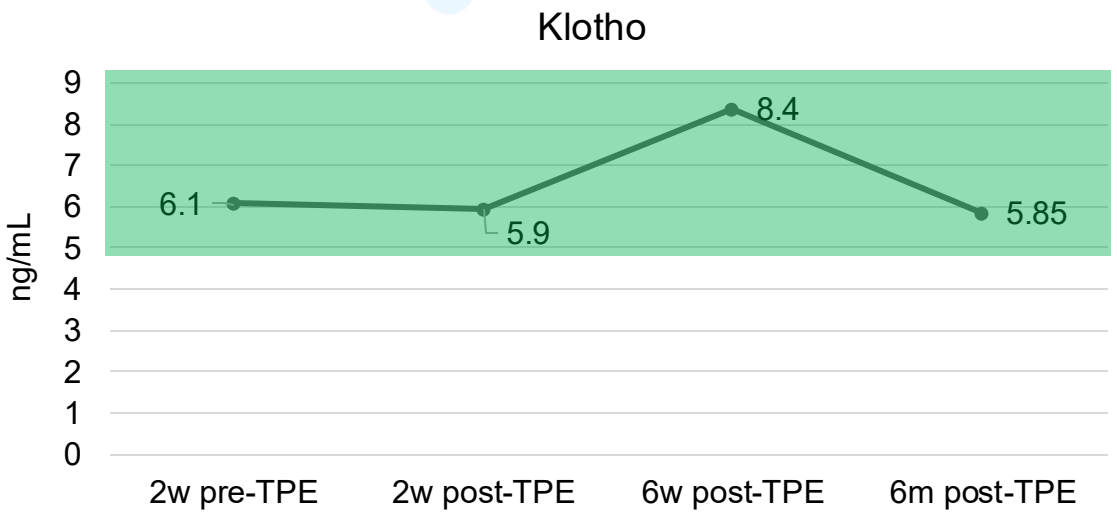
OXIDATIVE STRESS	Healthy Range		Units
	Min	Max	
Myeloperoxidase	0	450	pmol/L

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

LONGEVITY



LONGEVITY	Healthy Range		Units
	Min	Max	
NAD Intracellular	40	100	µM
Klotho	5	30	ng/mL
SA β-galactosidase	0	750	JPM U
Creatinine	0.76	1.27	mg/dL



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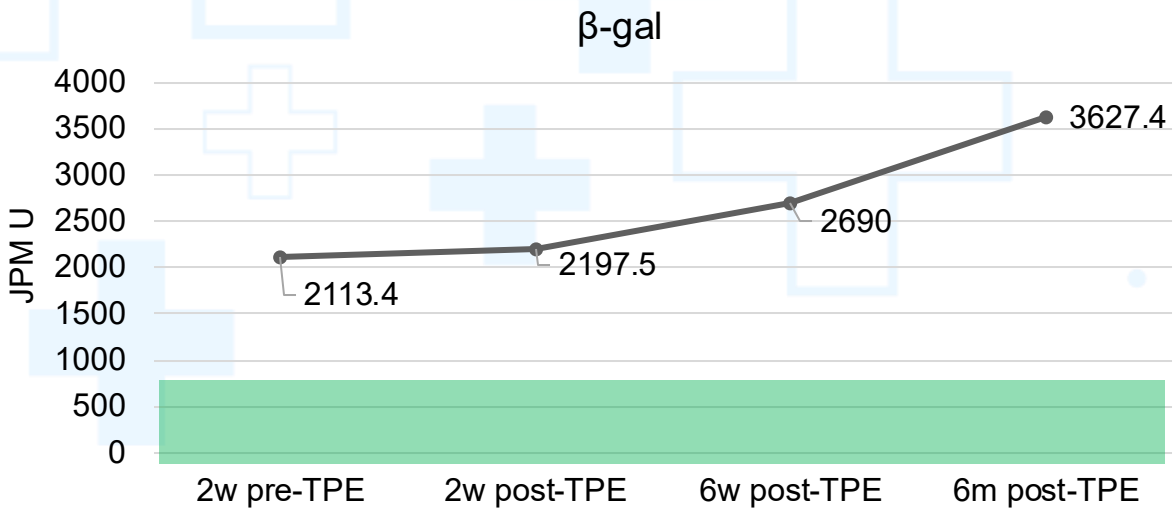
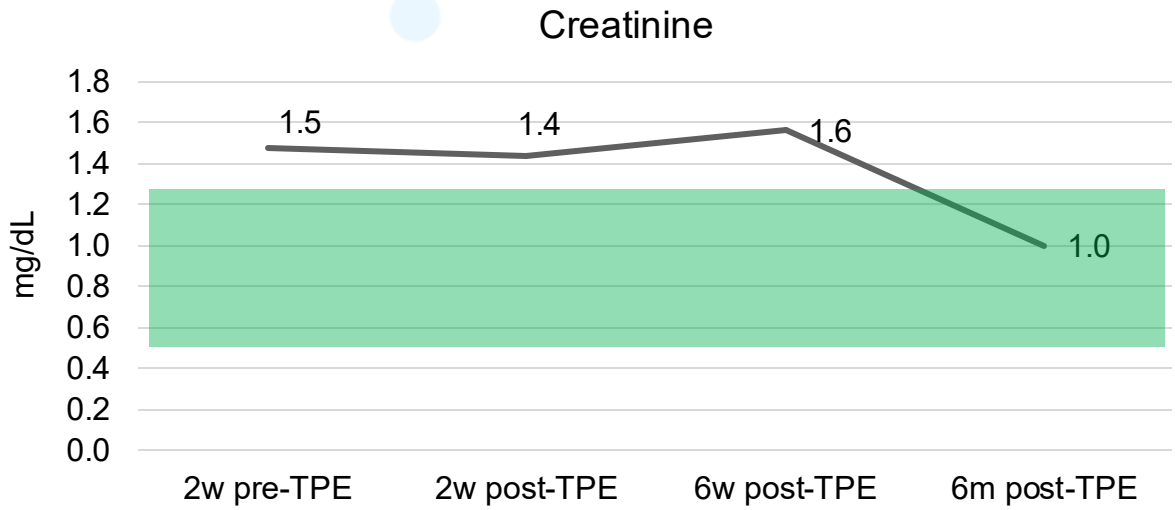
LONGEVITY





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TOXINS

TPE Only

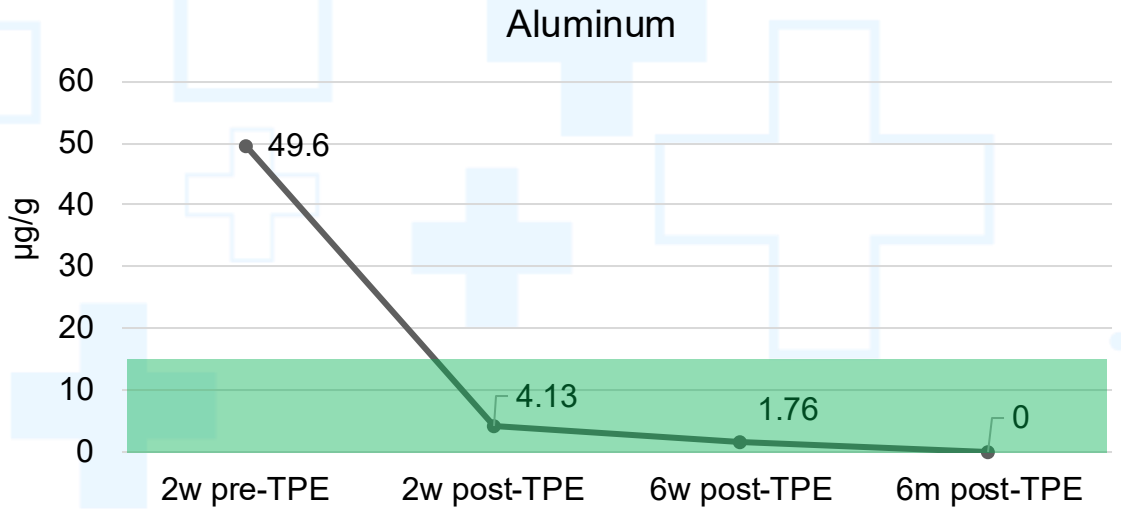
VS.

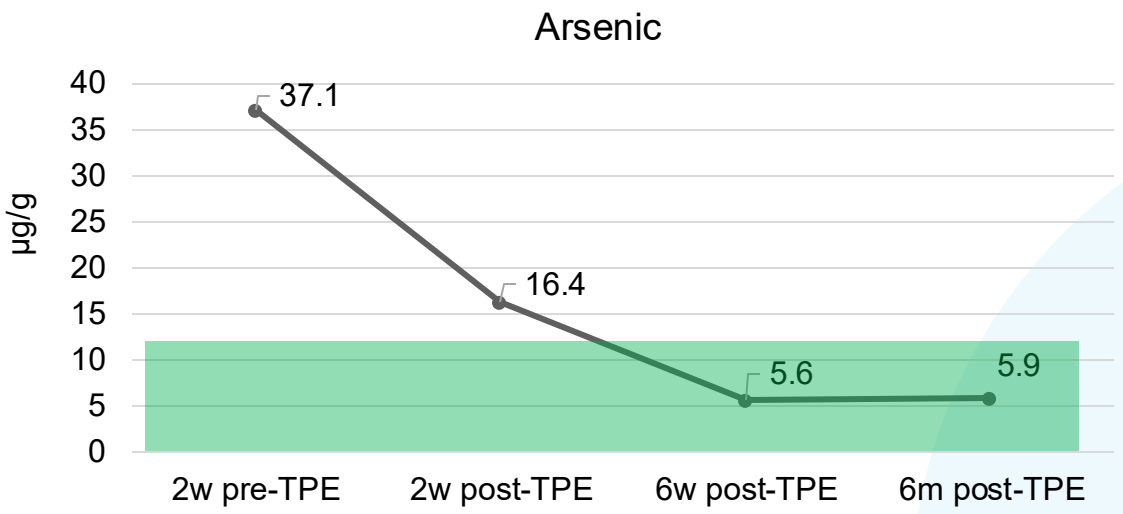
TPE Protocol

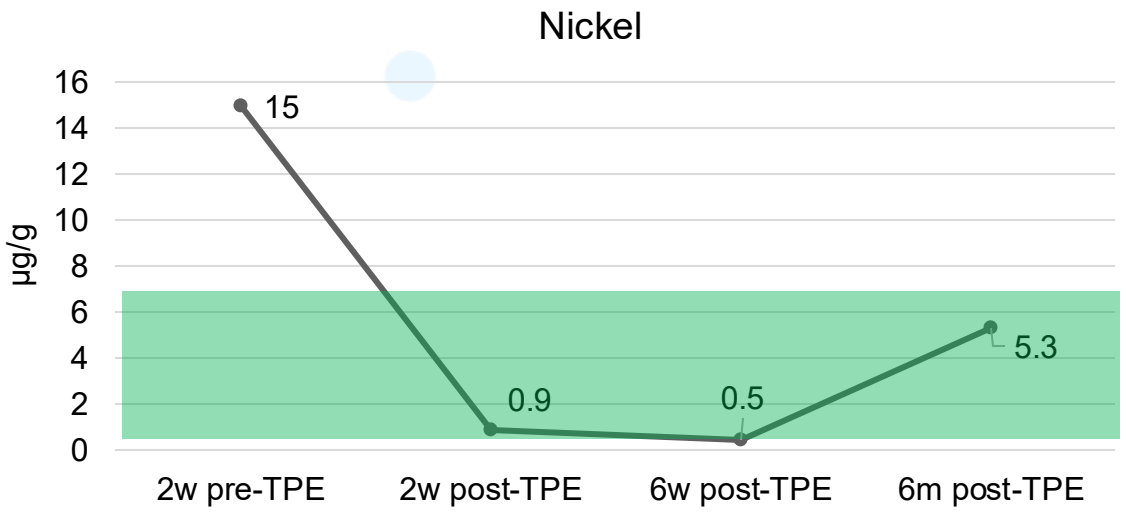
6 weeks post-procedure	TPE ONLY	TPE Protocol
Heavy Metals		
Aluminum	-79.45%	-100.00%
Arsenic	-59.69%	-62.30%
Mercury	-35.40%	-52.82%
Lead	-56.47%	-86.53%
Environmental		
Perchlorate	-24.81%	-40.71%
N-acetyl-S-(2-carbamoylethyl)-cysteine (NAE)	-28.21%	-64.21%
Herbicides		
Atrazine	-18.49%	-44.12%
Glyphosate	-49.94%	-45.21%
Pesticides		
DDA	-0.36%	-53.71%
Diethyldithiophosphate (DEDTP)	-26.53%	-51.22%
Dimethylphosphate (DMP)	-49.94%	-75.12%

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Protocol of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

HEAVY METALS



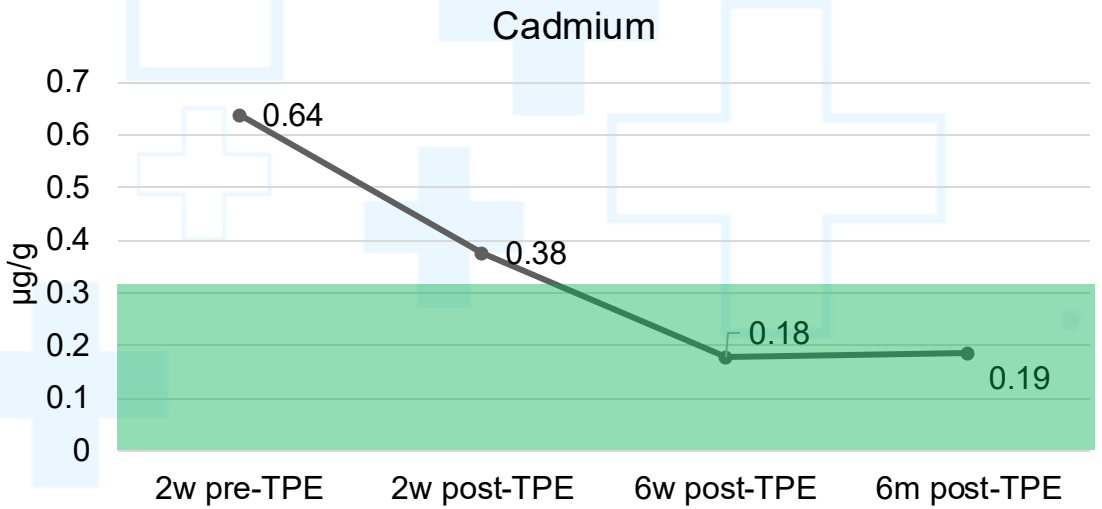


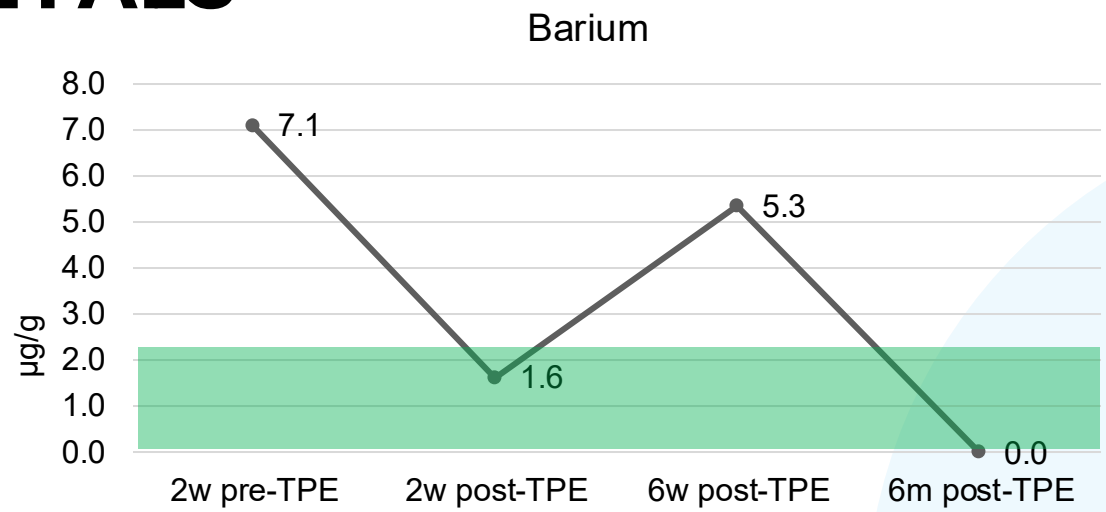


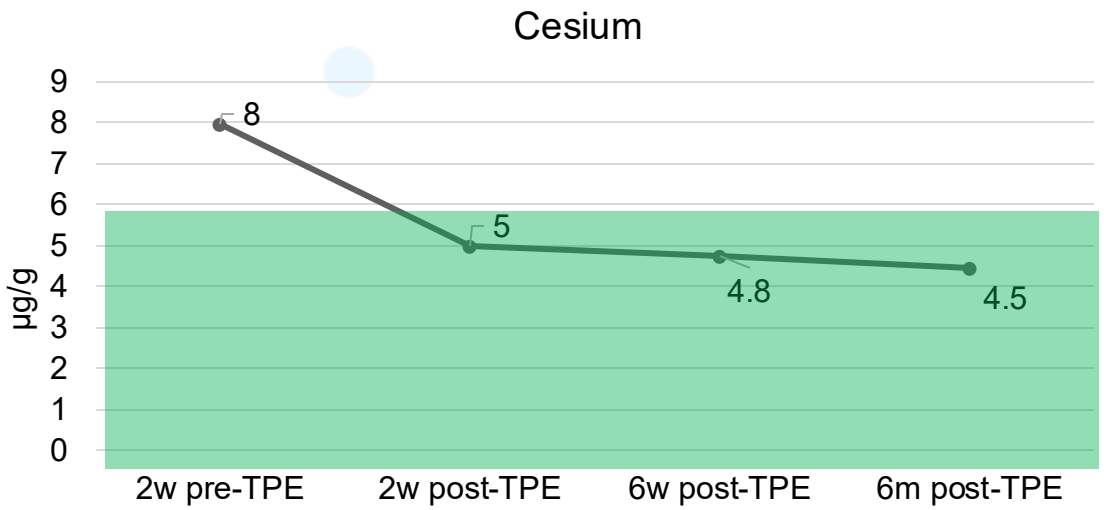
HEAVY METALS	Healthy Range		Units
	Min	Max	
Aluminum	0	17.8	µg/g
Nickel	0	6.37	µg/g
Arsenic	0	11.9	µg/g
Cadmium	0	0.29	µg/g
Cesium	0	6.37	µg/g
Barium	0	2.33	µg/g
Mercury	0	0.57	µg/g
Lead	0	0.52	µg/g
Aluminum	0	17.8	µg/g

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

HEAVY METALS



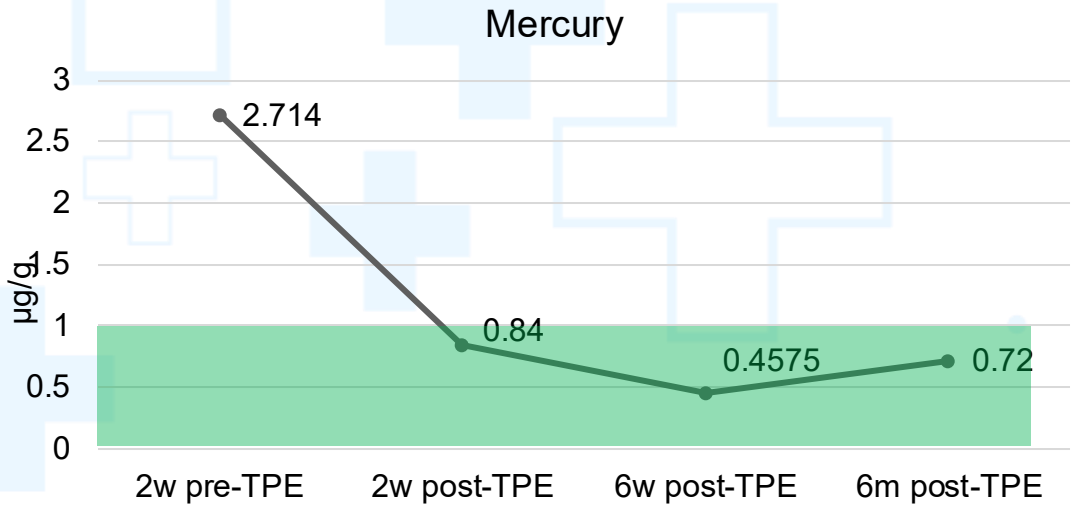


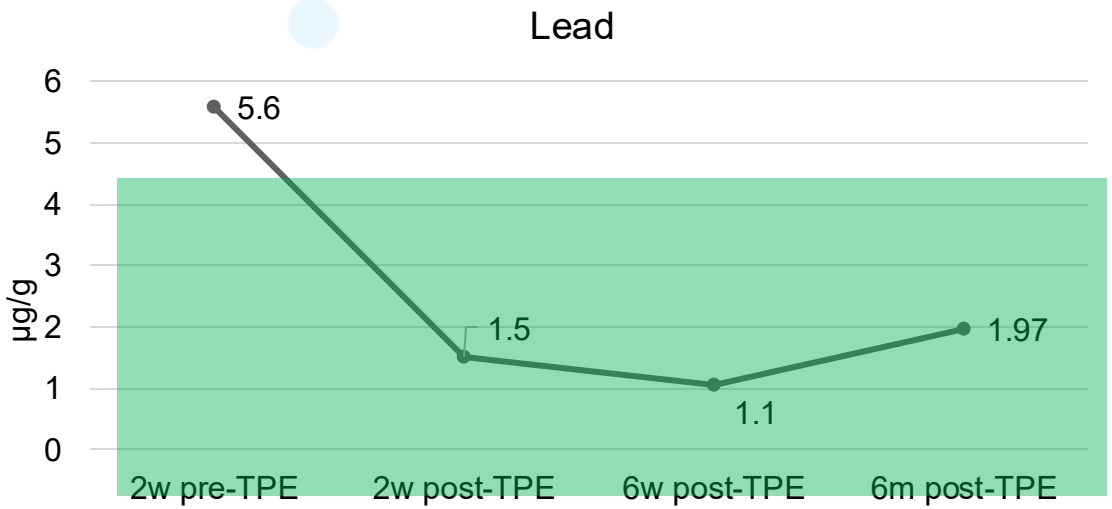


HEAVY METALS	Healthy Range		Units
	Min	Max	
Aluminum	0	17.8	µg/g
Nickel	0	6.37	µg/g
Arsenic	0	11.9	µg/g
Cadmium	0	0.29	µg/g
Cesium	0	6.37	µg/g
Barium	0	2.33	µg/g
Mercury	0	0.57	µg/g
Lead	0	0.52	µg/g
Aluminum	0	17.8	µg/g

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

HEAVY METALS

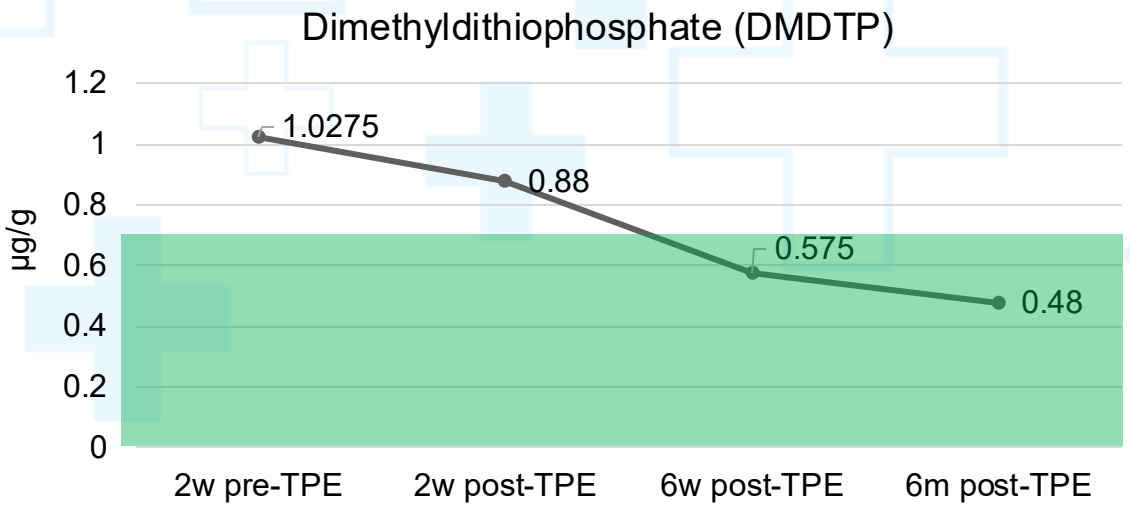


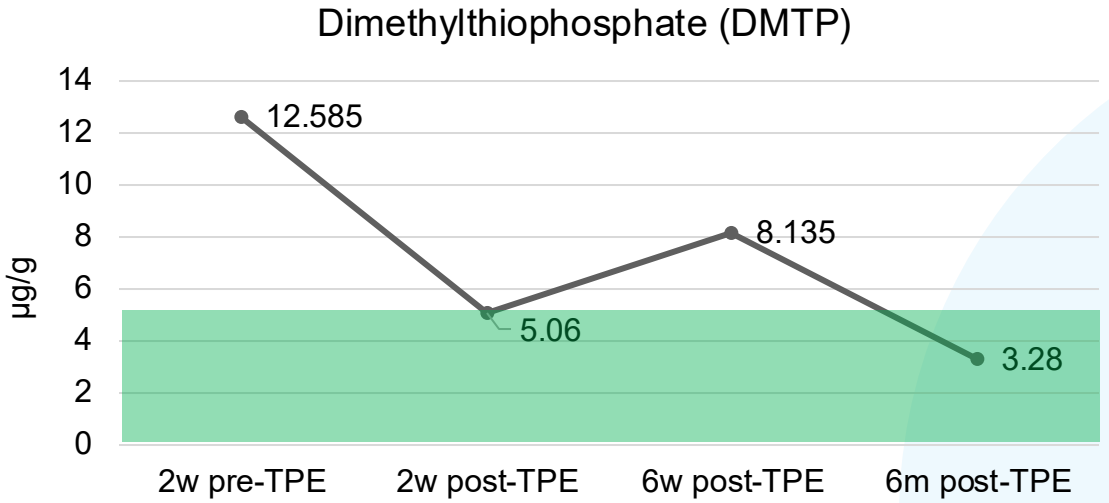


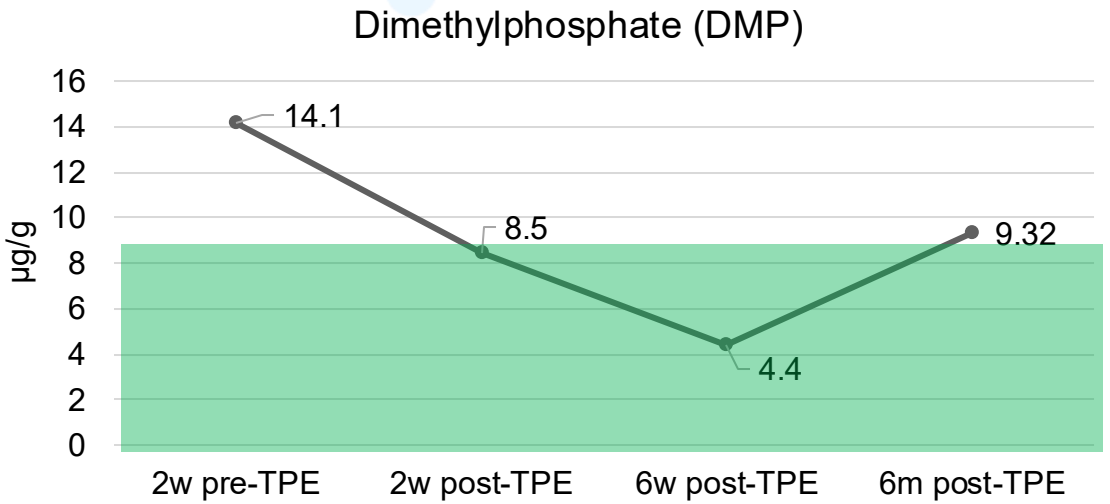
HEAVY METALS	Healthy Range		Units
	Min	Max	
Aluminum	0	17.8	µg/g
Nickel	0	6.37	µg/g
Arsenic	0	11.9	µg/g
Cadmium	0	0.29	µg/g
Cesium	0	6.37	µg/g
Barium	0	2.33	µg/g
Mercury	0	1.03	µg/g
Lead	0	0.52	µg/g
Aluminum	0	17.8	µg/g

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

PESTICIDES







PESTICIDES	Healthy Range		Units
	Min	Max	
Dimethyldithiophosphate (DMDTP)	0	0.67	µg/g
Dimethyl phosphate (DMP)	0	9.1	µg/g
Dimethylthiophosphate (DMTP)	0	5.91	µg/g

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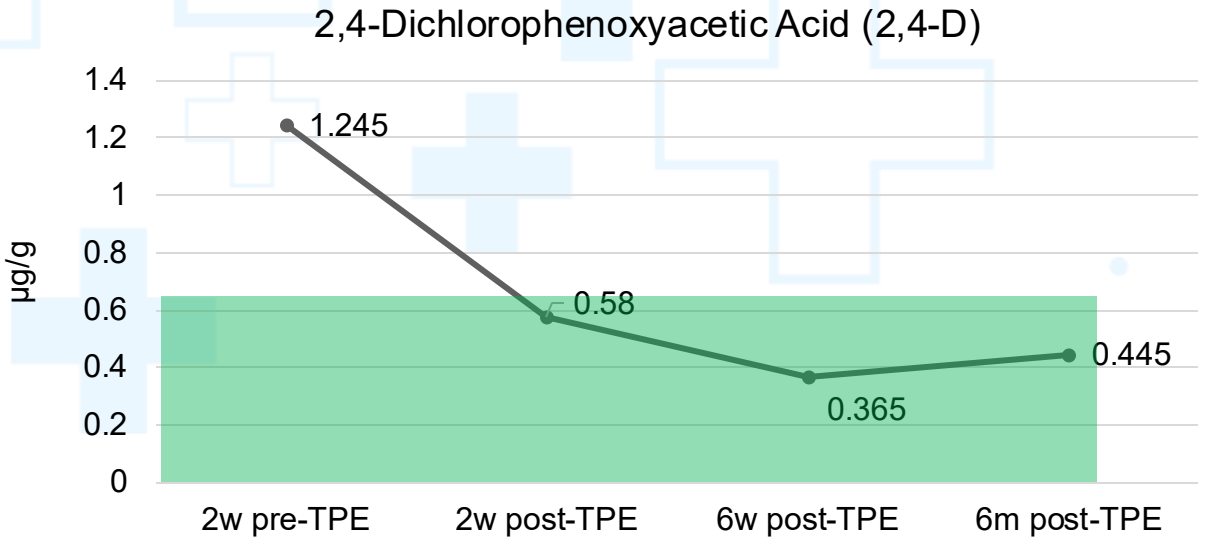
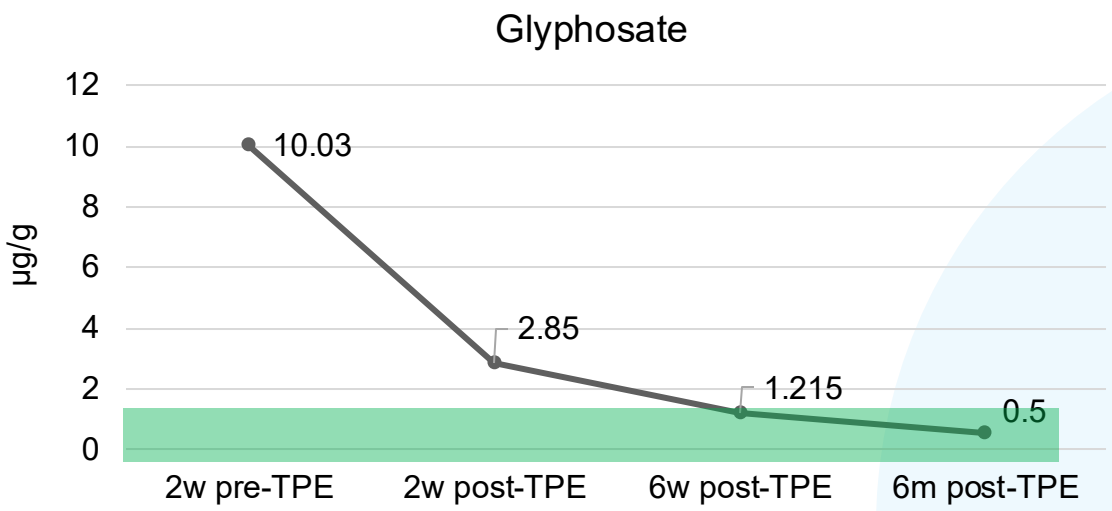
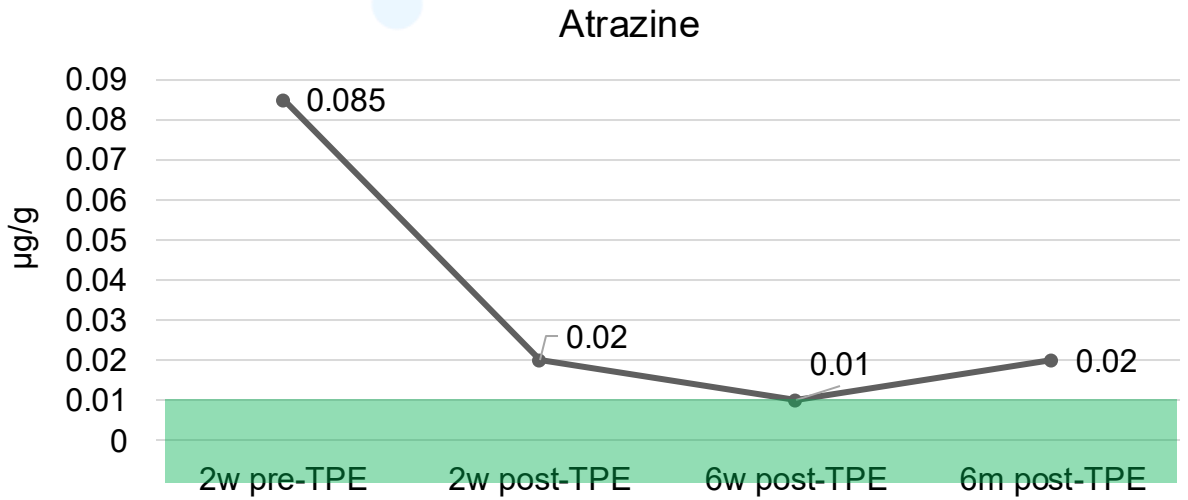
HERBICIDES







HERBICIDES	Healthy Range		Units
	Min	Max	
2,4-Dichlorophenoxyacetic Acid (2,4-D)	0	0.5	µg/g
Atrazine	0	0.02	µg/g
Glyphosate	0	1.65	µg/g

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

TOXINS

TPE Only

VS.

TPE Protocol

6 weeks post-procedure	TPE ONLY	TPE Protocol
Phenols		
Bisphenol A (BPA)	-4.02%	-60.91%
Triclosan	-22.84%	-36.14%
4-Nonylphenol	-18.13%	-92.16%
Phthalates		
mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP)	-81.27%	-99.12%
mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)	-63.59%	-85.57%
Volatile Organic Compounds		
2-Hydroxyisobutyric Acid (2HIB)	-15.48%	-61.50%
Phenylglyoxylic Acid (PGO)	-41.94%	-80.88%
Mycotoxins		
Aflatoxin B2	-48.94%	-64.93%
Ochratoxin A	-56.65%	-70.66%
Zearalenone	-33.29%	-77.32%

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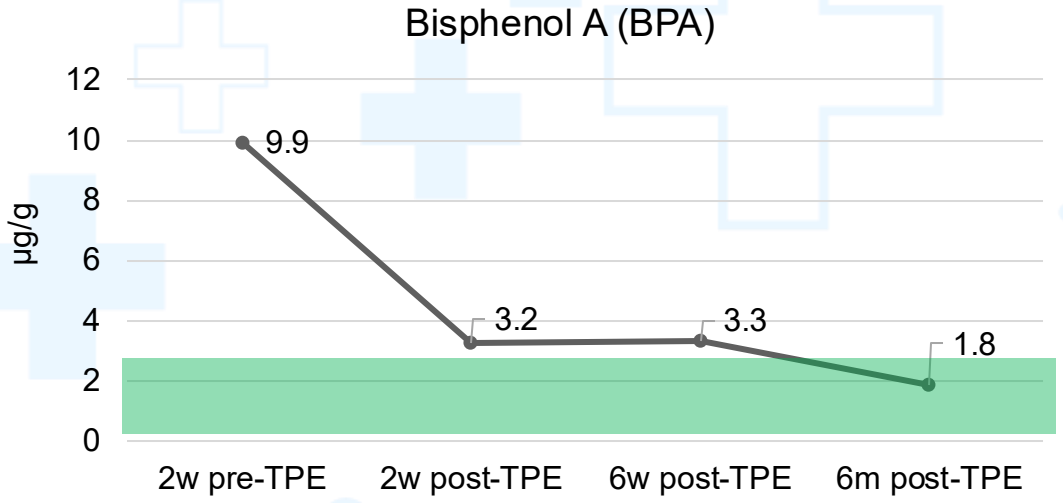
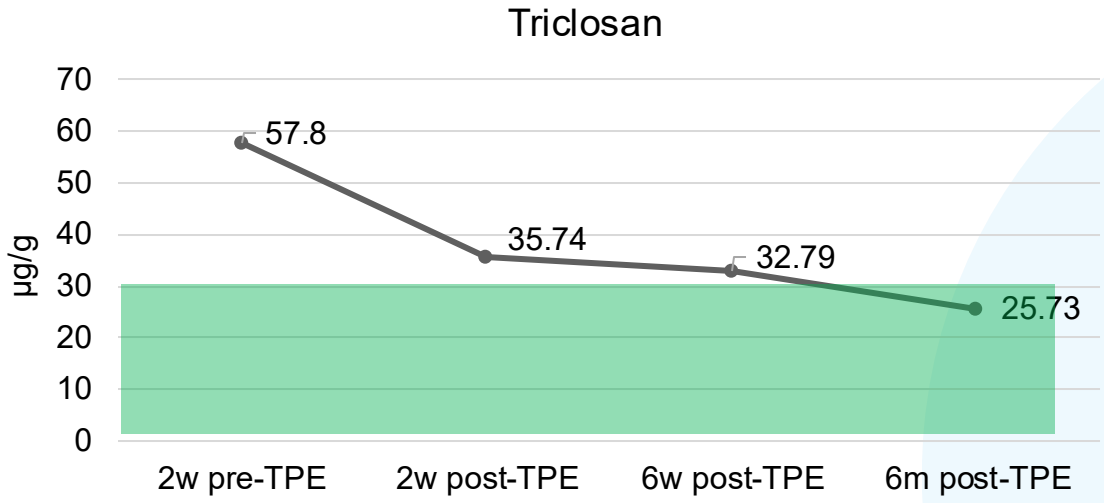
PHENOLS





PHENOLS	Healthy Range		Units
	Min	Max	
Bisphenol A (BPA)	0	2.12	µg/g
Triclosan	0	29.9	µg/g

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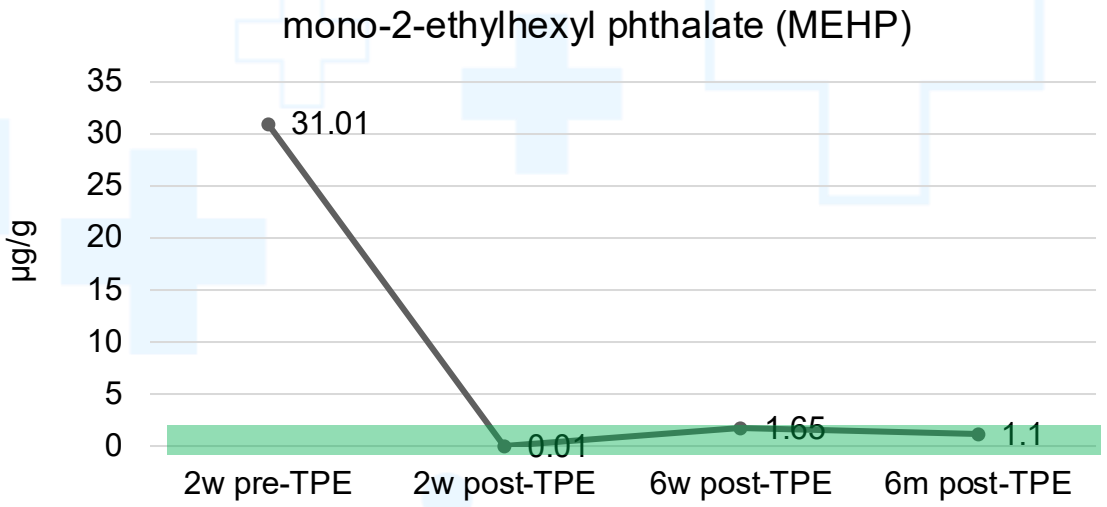
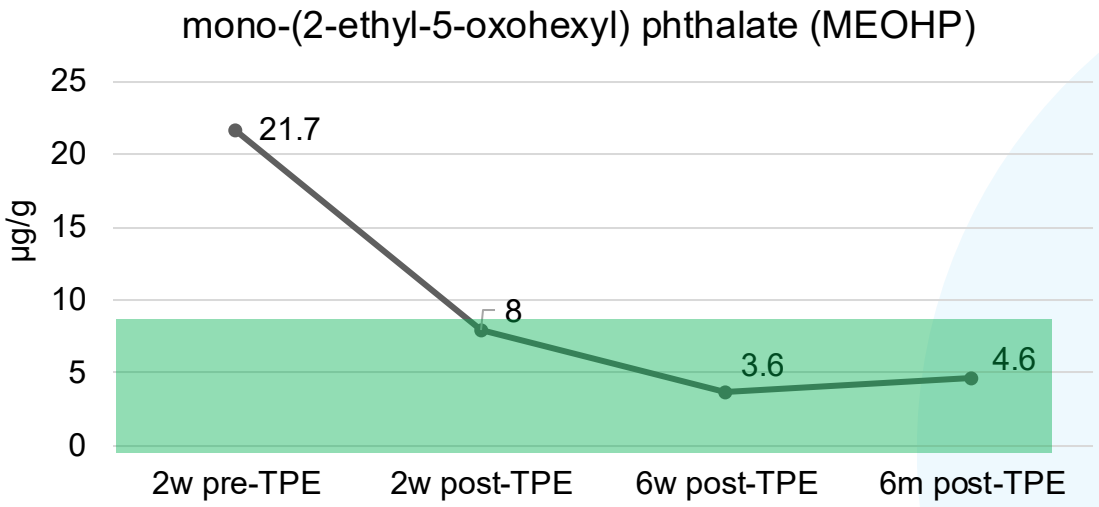
PHTHLATES





PHTHALATES	Healthy Range		Units
	Min	Max	
mono-2-ethylhexyl phthalate (MEHP)	0	2.73	µg/g
mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)	0	8.99	µg/g

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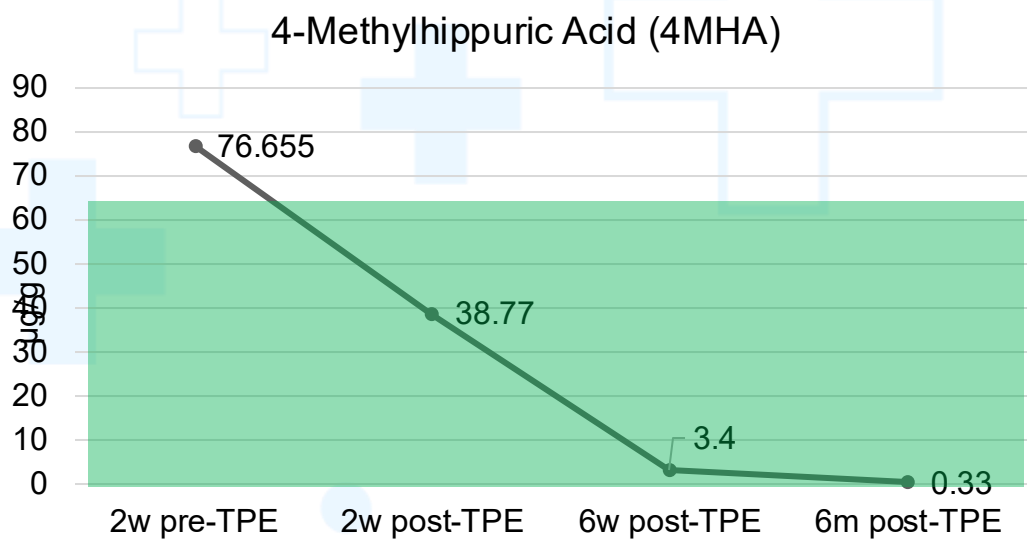
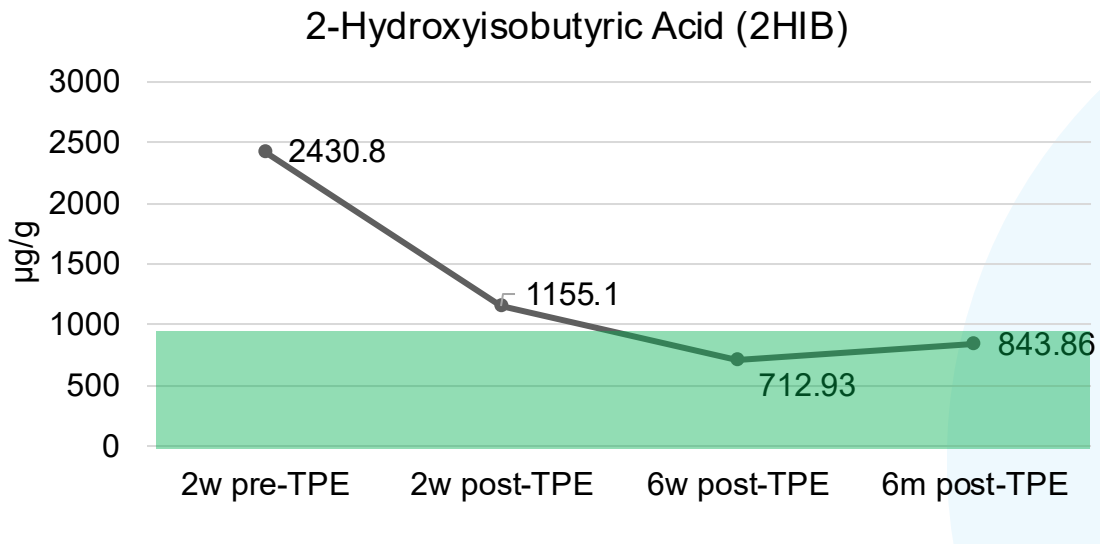
VOLATILE ORGANIC COMPOUNDS

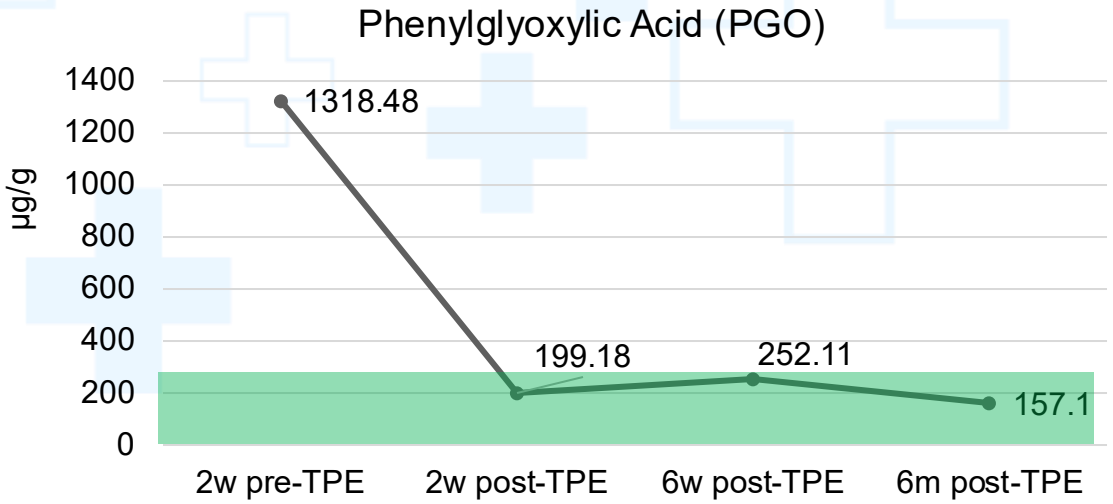


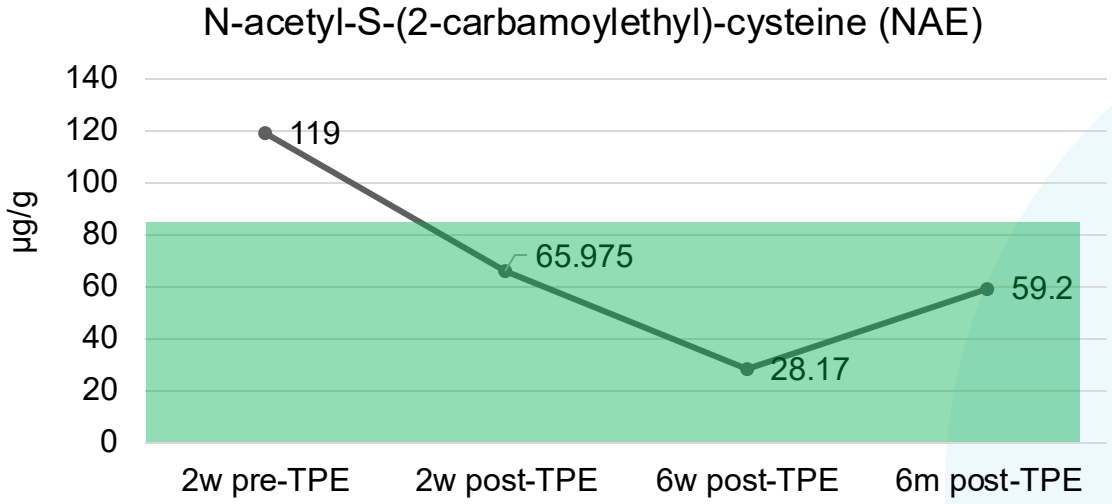


VOLATILE ORGANIC COMPOUNDS	Healthy Range		Units
	Min	Max	
4-Methylhippuric Acid (4MHA)	0	65.6	µg/g
2-Hydroxyisobutyric Acid (2HIB)	0	895	µg/g
Phenylglyoxylic Acid (PGO)	0	285	µg/g
N-acetyl-S-(2-carbamoylethyl)-cysteine (NAE)	0	82	µg/g

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

VOLATILE ORGANIC COMPOUNDS





VOLATILE ORGANIC COMPOUNDS	Healthy Range		Units
	Min	Max	
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N-acetyl-S-(2-carbamoylethyl)-cysteine (NAE)	0	82	µg/g

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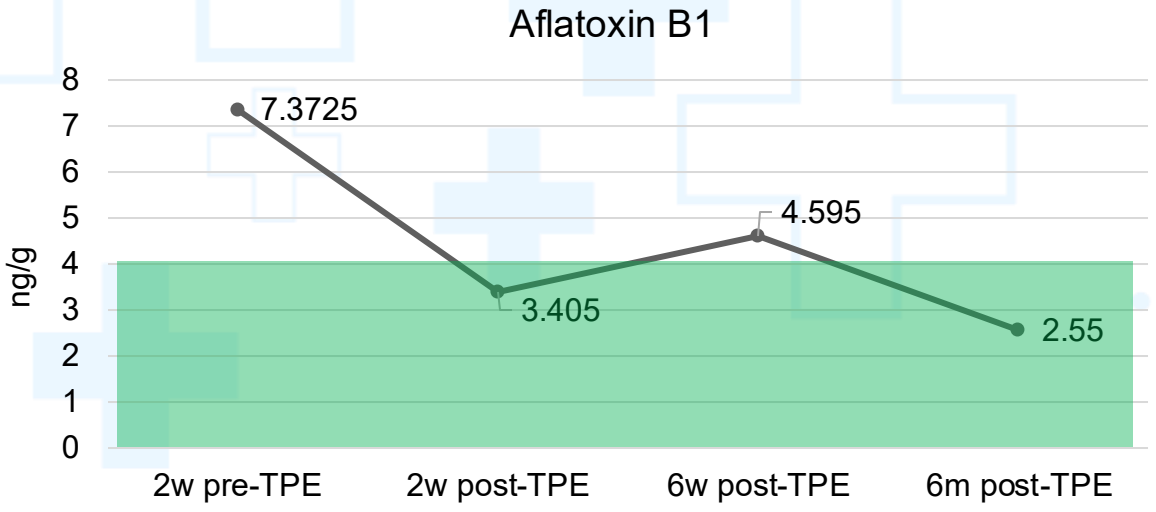
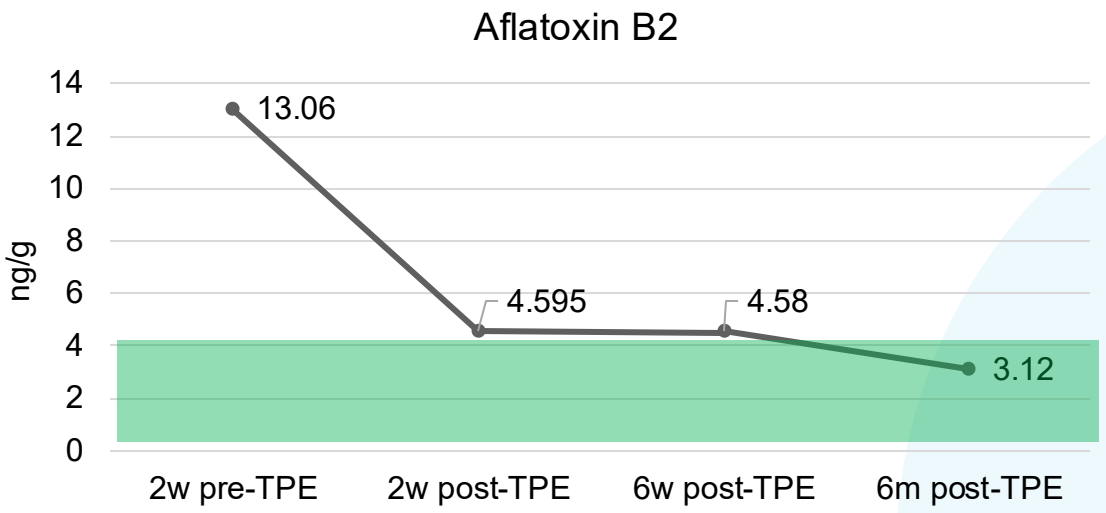
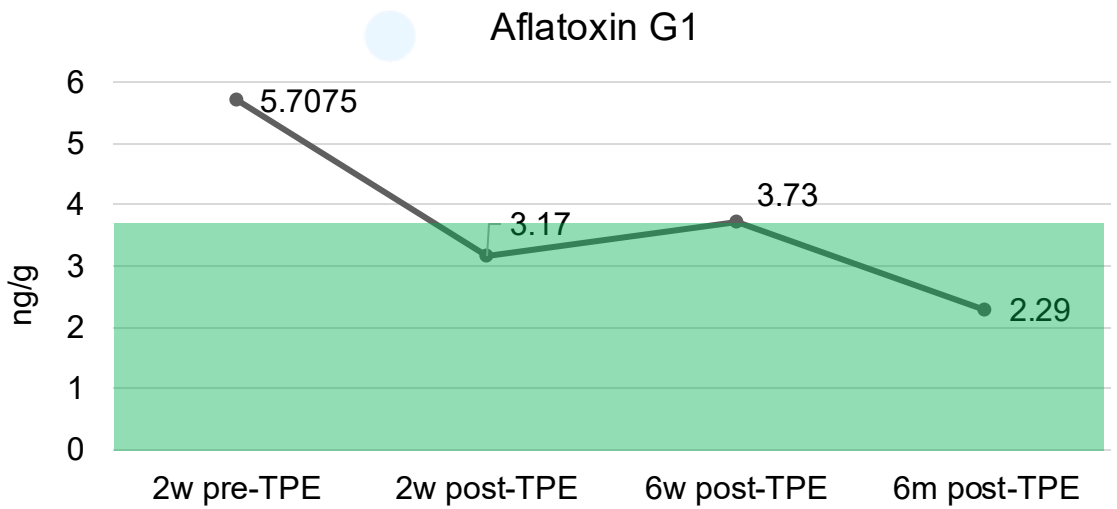
MYCOTOXINS







MYCOTOXINS	Healthy Range		Units
	Min	Max	
Aflatoxin B1	0	3.9	ng/g
Aflatoxin B2	0	4.58	ng/g
Aflatoxin G1	0	3.68	ng/g
Citrinin	0	7.05	ng/g
Diacetoxyscirpenol	0	2.4	ng/g
Fumonisins B3	0	6.08	ng/g
Ochratoxin A	0	3.83	ng/g
Roridin E	0	0.75	ng/g
Zearalenone	0	0.38	ng/g

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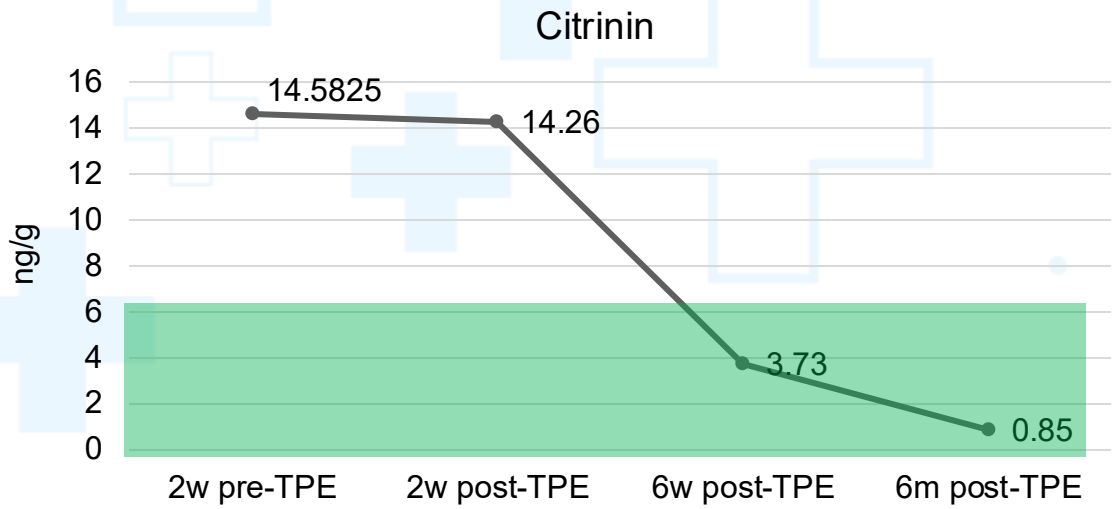
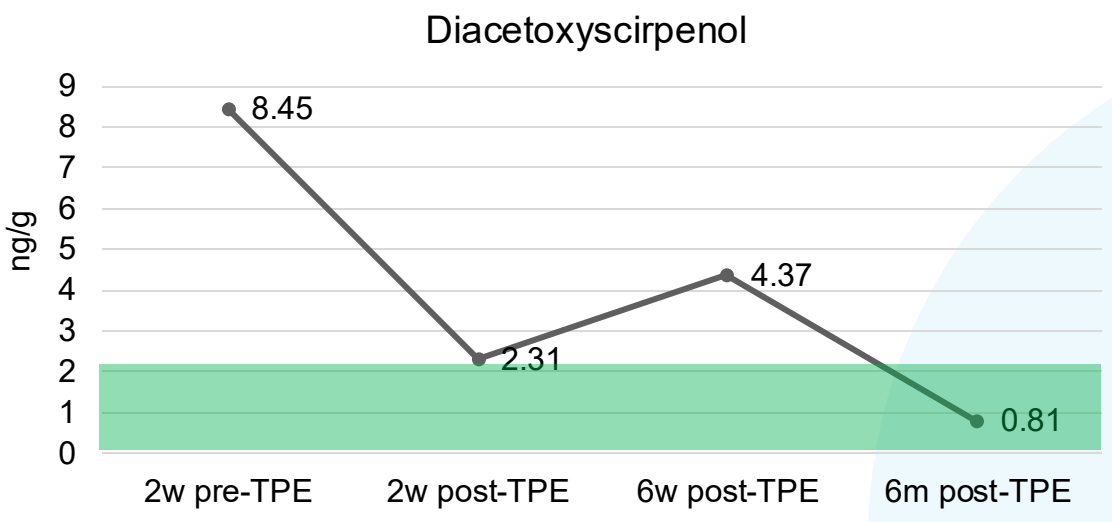
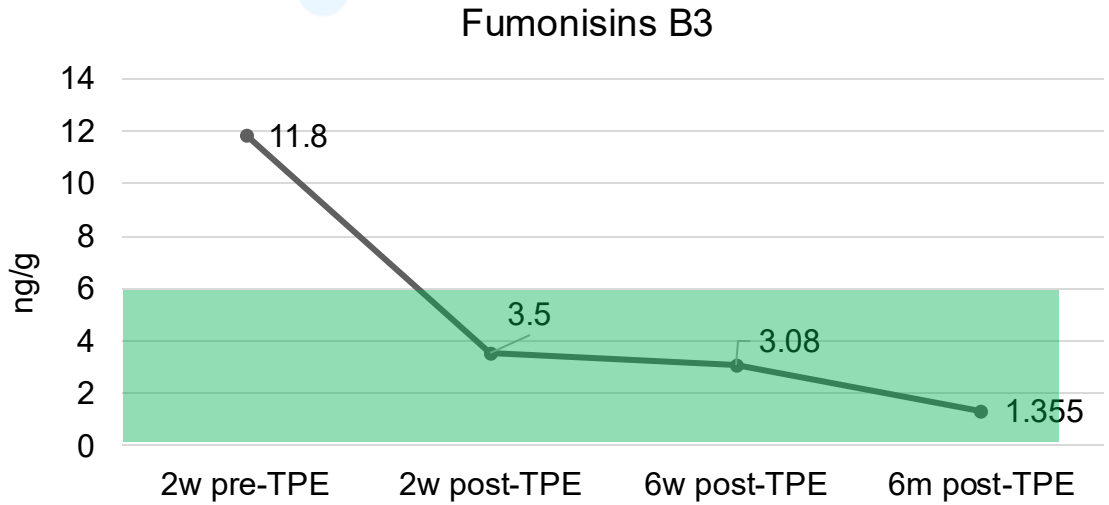
MYCOTOXINS



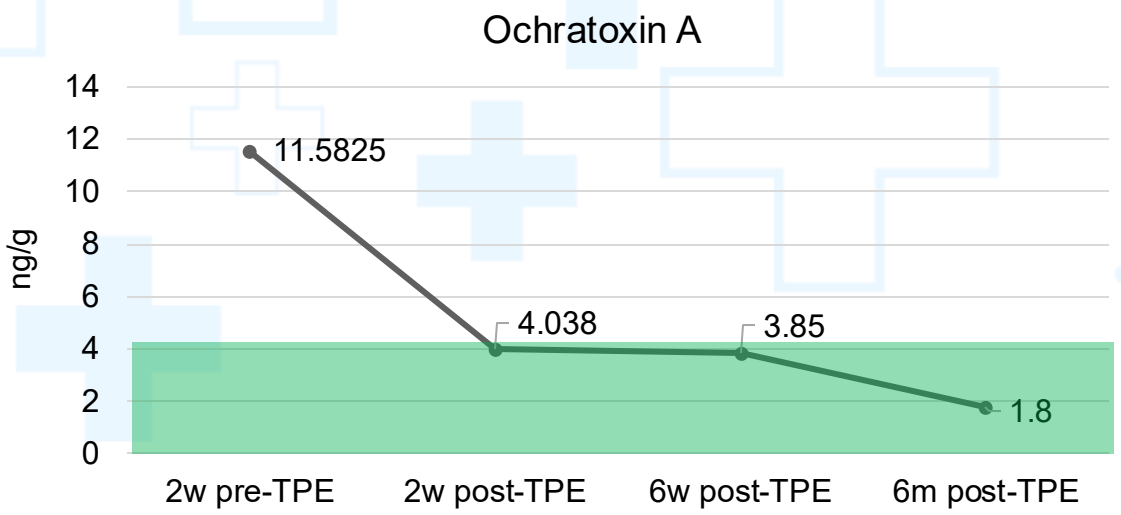


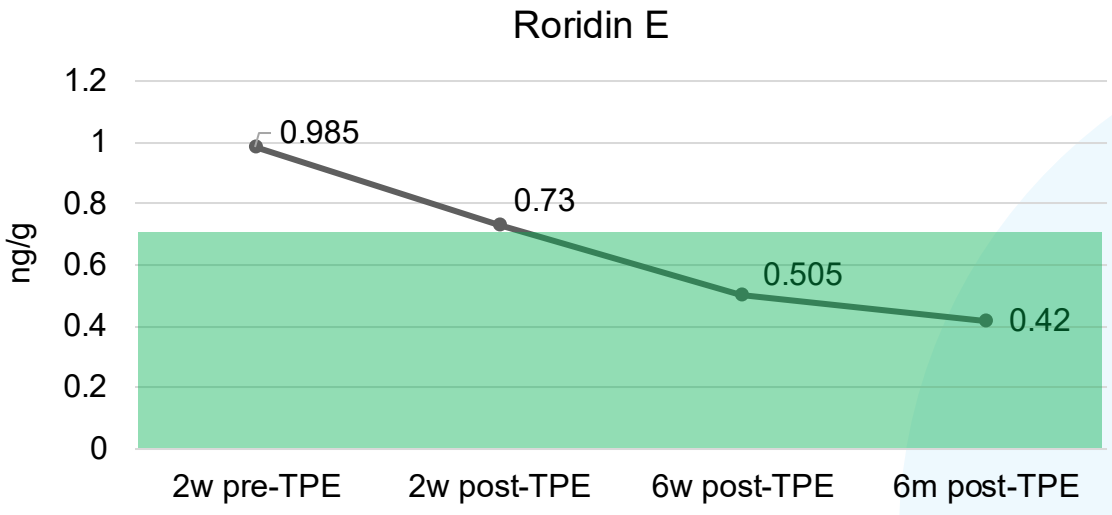


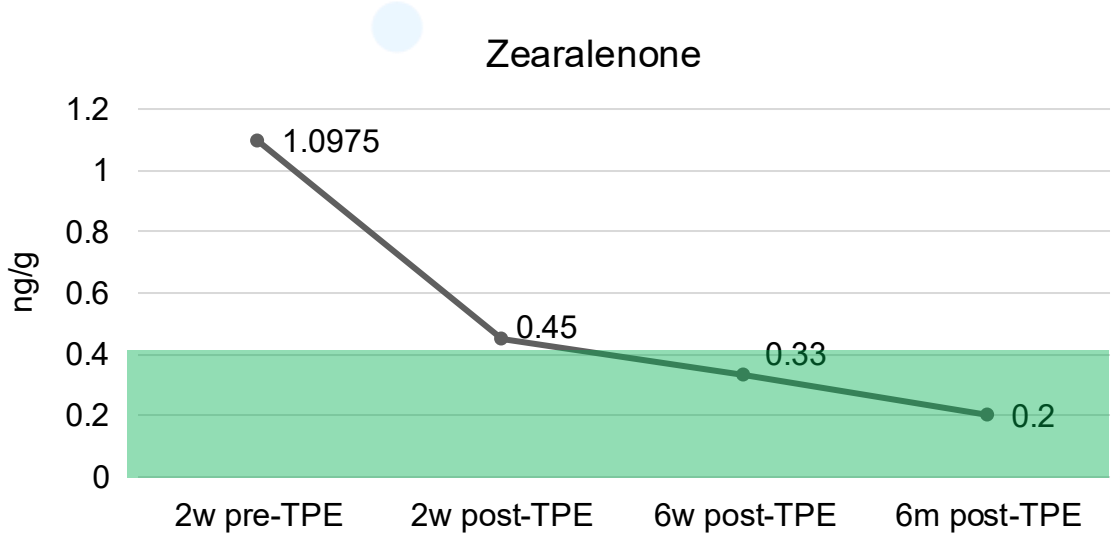
MYCOTOXINS	Healthy Range		Units
	Min	Max	
Aflatoxin B1	0	3.9	ng/g
Aflatoxin B2	0	4.58	ng/g
Aflatoxin G1	0	3.68	ng/g
Citrinin	0	7.05	ng/g
Diacetoxyscirpenol	0	2.4	ng/g
Fumonisins B3	0	6.08	ng/g
Ochratoxin A	0	3.83	ng/g
Roridin E	0	0.75	ng/g
Zearalenone	0	0.38	ng/g

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Protocol of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

MYCOTOXINS







MYCOTOXINS	Healthy Range		Units
	Min	Max	
Aflatoxin B1	0	3.9	ng/g
Aflatoxin B2	0	4.58	ng/g
Aflatoxin G1	0	3.68	ng/g
Citrinin	0	7.05	ng/g
Diacetoxyscirpenol	0	2.4	ng/g
Fumonisins B3	0	6.08	ng/g
Ochratoxin A	0	3.83	ng/g
Roridin E	0	0.75	ng/g
Zearalenone	0	0.38	ng/g

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TOXINS

TPE Only

VS.

TPE Protocol

6 weeks post-procedure	TPE ONLY	TPE Protocol
PFAS		
GenX/HPFO-DA	-4.02%	-28.58%
Perfluoro-1-heptane sulfonic acid (PFHpS)	-14.48%	-25.86%
Perfluorododecanoic acid (PFDoA)	-6.09%	-43.10%
Perfluoropentanoic acid (PFPeA)	-13.86%	-25.00%
Perfluorooctane sulfonic acid (PFOS)	-37.52%	-34.82%
Perfluoropentanoic acid (PFPeA)	-22.91%	-35.97%
Microplastics		
Total Microplastics	-15.48%	-41.49%

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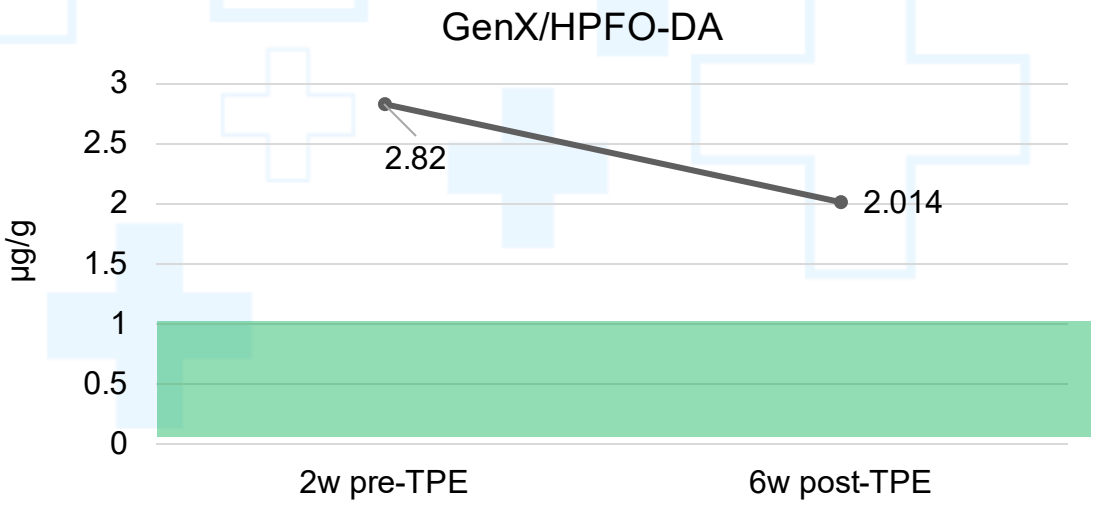
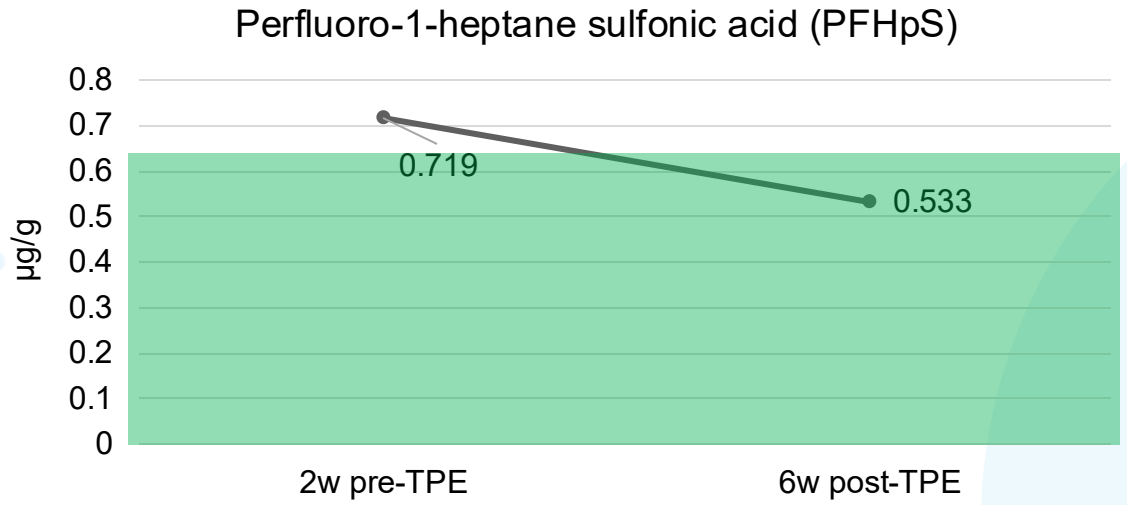
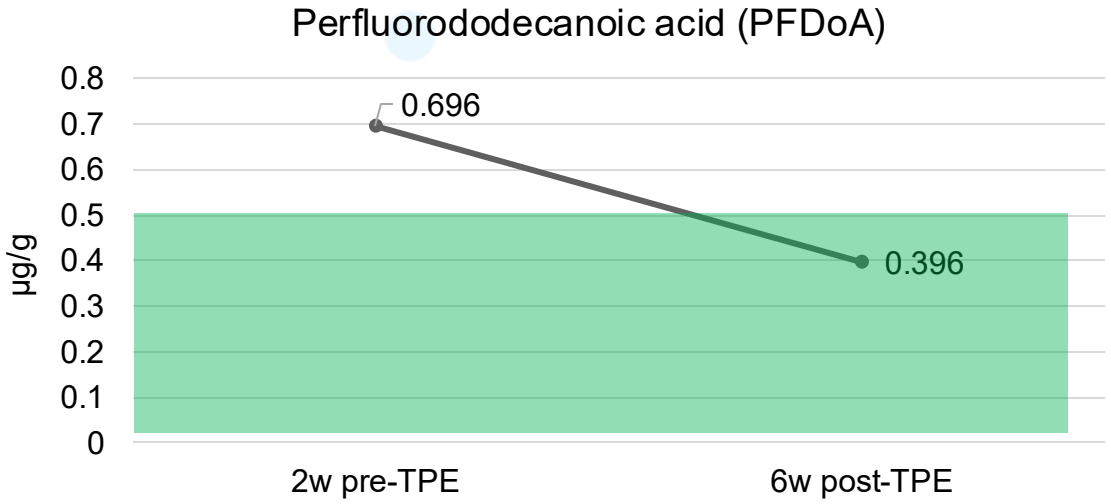
PFAS



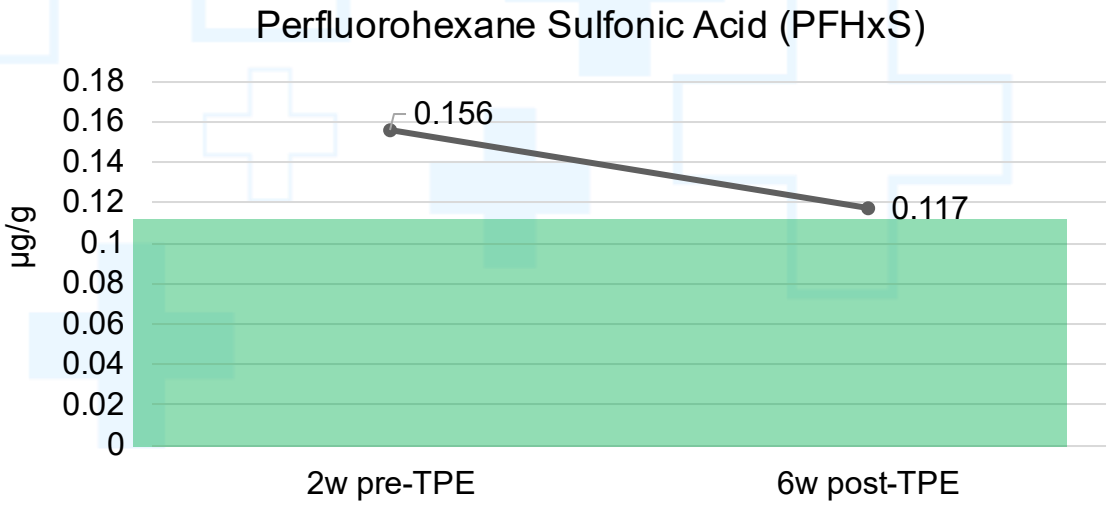


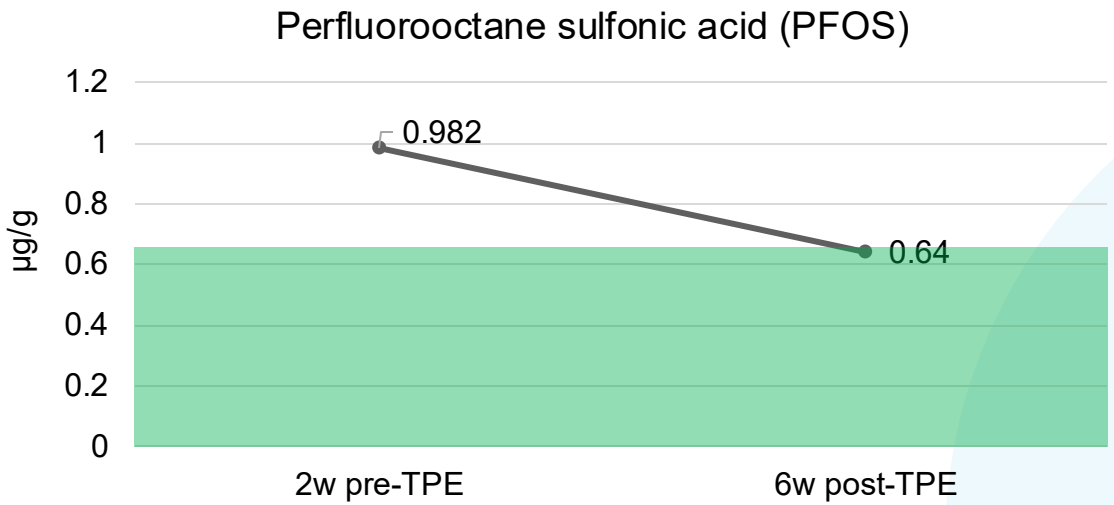


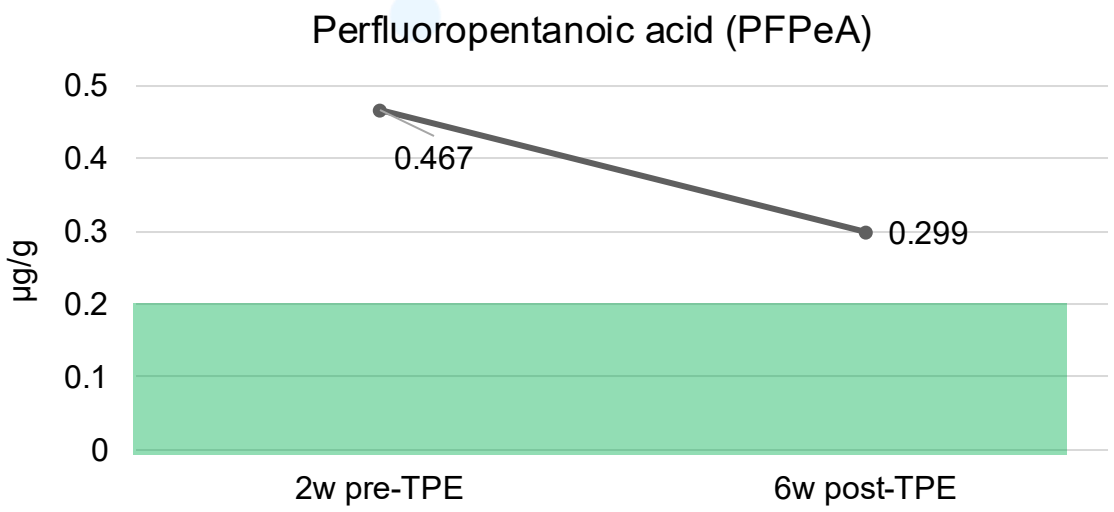
PFAS	Healthy Range		Units
	Min	Max	
GenX/HPFO-DA	0	1.04	µg/g
Perfluoro-1-heptane sulfonic acid (PFHpS)	0	0.628	µg/g
Perfluorododecanoic acid (PFDoA)	0	0.54	µg/g
Perfluorohexane Sulfonic Acid (PFHxS)	0	0.113	µg/g
Perfluorooctane sulfonic acid (PFOS)	0	0.658	µg/g
Perfluoropentanoic acid (PFPeA)	0	0.193	µg/g

The following data is based upon the clinical observational data of 25 patients. Twenty patients receiving the full TPE Proto col of serial TPE plus supplementation, and five patients receiving only serial TPE without supplementation. This data is under review, and pending publication at this time.

PFAS







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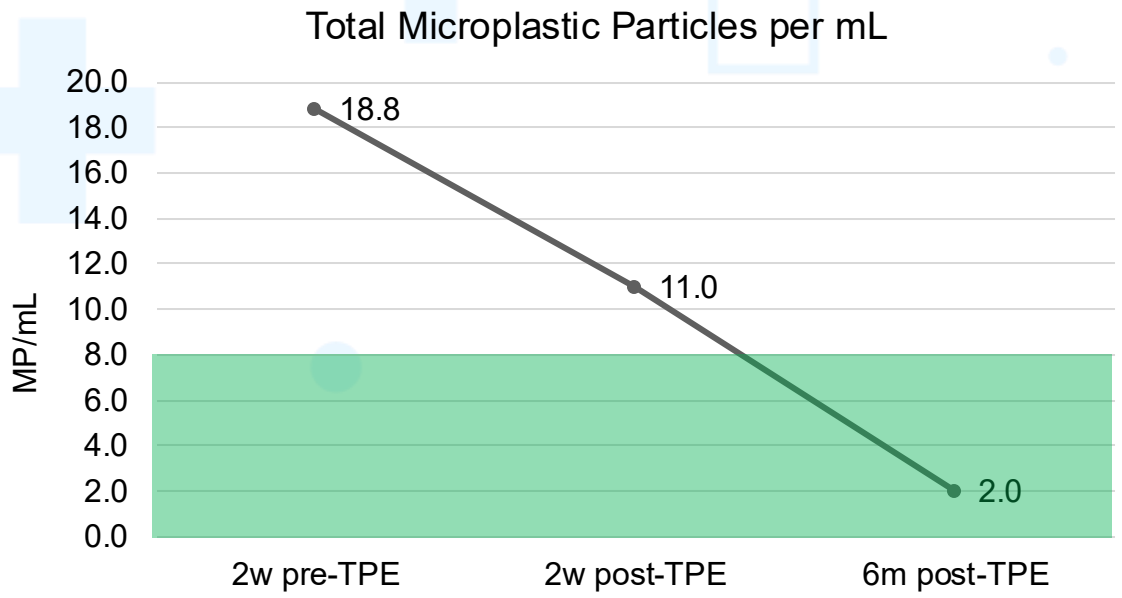
MICROPLASTICS



	Healthy Range		Units
	Min	Max	
Microplastic Particles	0	8	MP/mL

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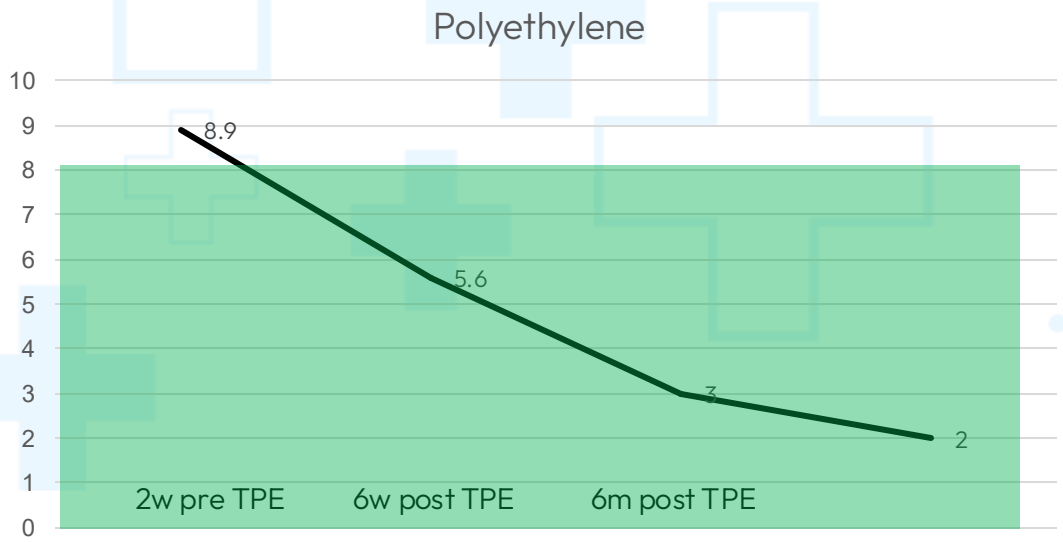
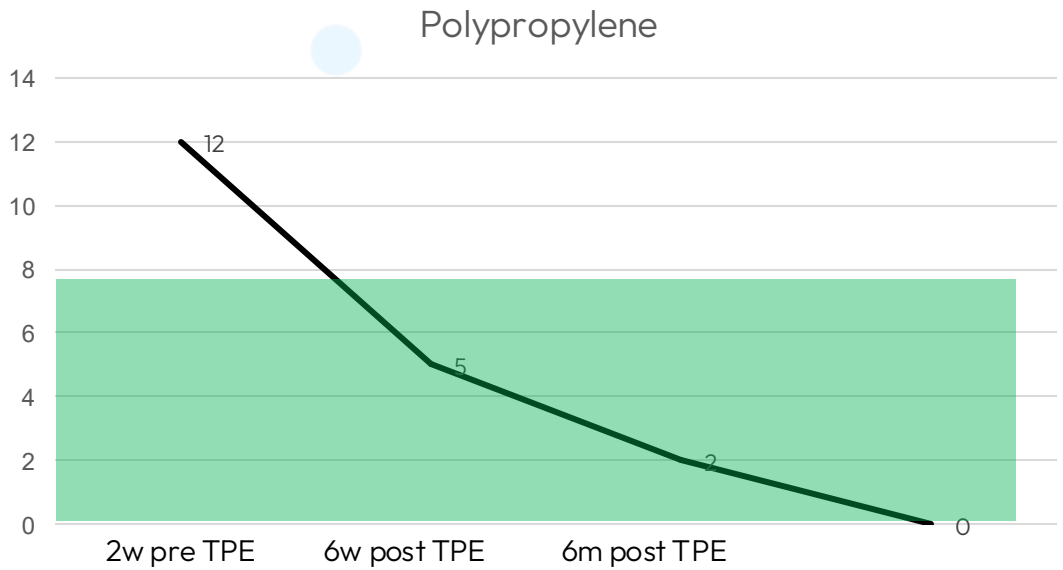
MICROPLASTICS





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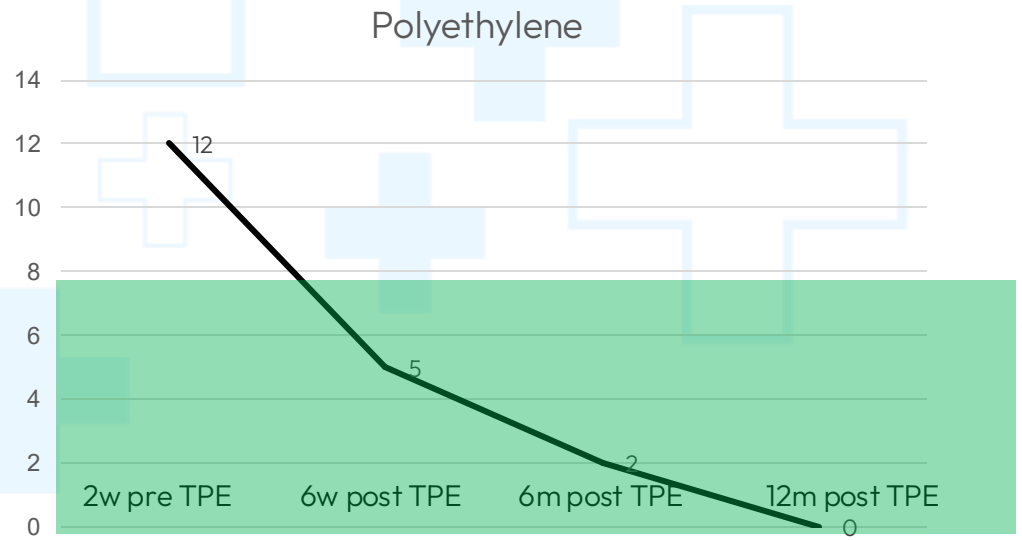

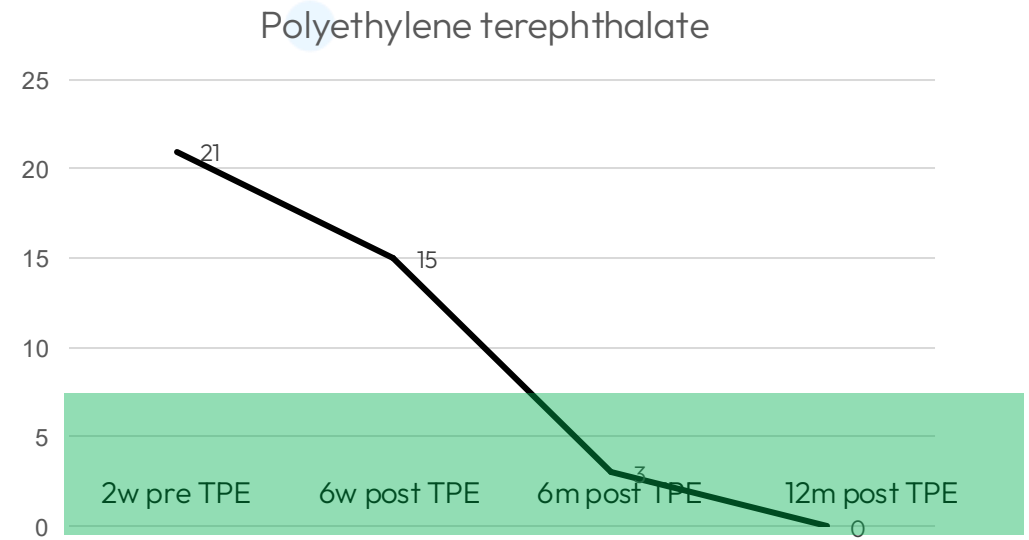

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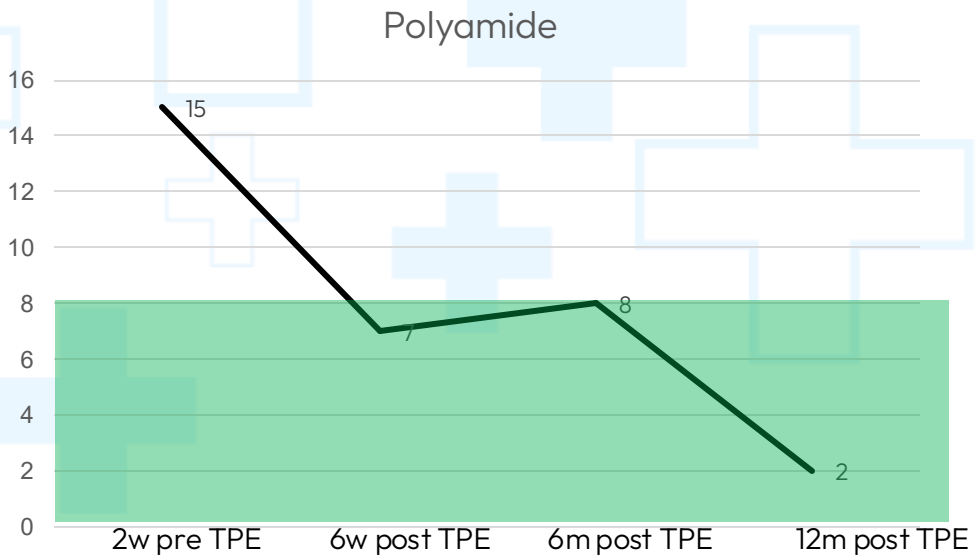

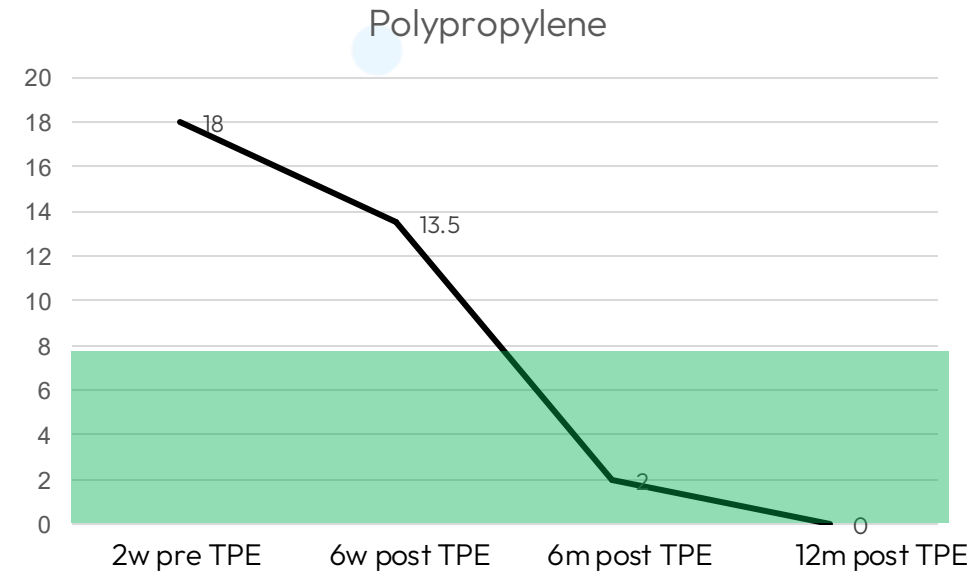

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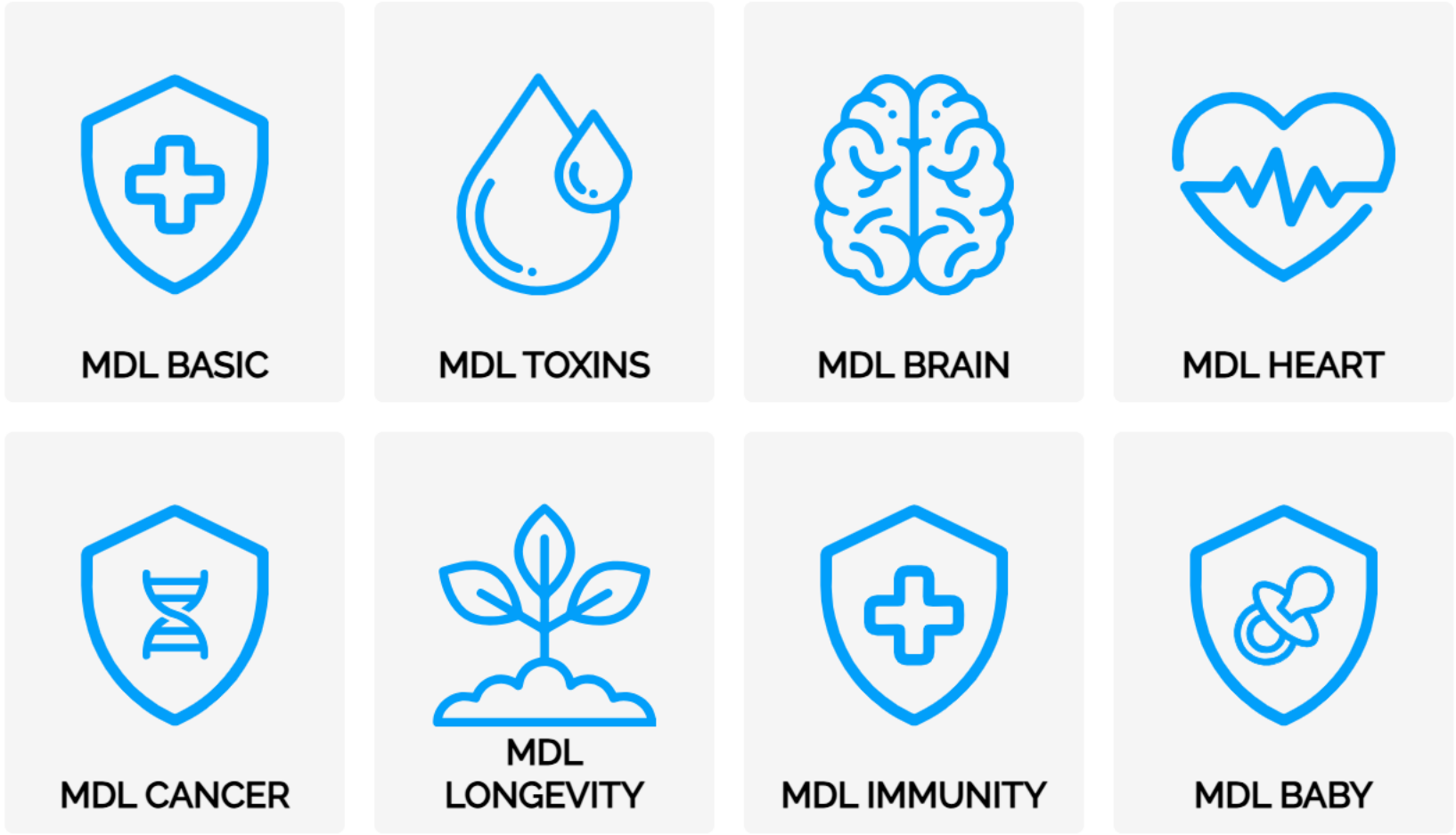
What's Next?

PLASMAXCHANGE PROTOCOLS



The TPE Protocol

- Reduces toxins significantly
- Improves the immune system
- Reduces oxidative stress
- Reduces inflammation
- Improves longevity markers
- Acts as a senolytic agent

Most changes appear stable and permanent

Notable studies and publications

1987, Cullen, M.R. The worker with multiple chemical sensitivities: An overview[201] - (Abstract)

1999, Multiple chemical sensitivity: a 1999 consensus[5] - (Full text)

2005, Multiple Chemical Sensitivity Syndrome (MCS) – suggestions for an extension of the US MCS-case definition[26] - (Abstract)

2014, Toxicant-Induced Loss of Tolerance: A Theory to Account for Multiple Chemical Sensitivity[99] (Full text)

2016, Association of Odor Thresholds and Responses in Cerebral Blood Flow of the Prefrontal Area during Olfactory Stimulation in Patients with Multiple Chemical Sensitivity[202] - (Full text)

2018, Multiple Chemical Sensitivity: Review of the State of the Art in Epidemiology, Diagnosis, and Future Perspectives[1] - (Full text)

2018, Perspectives on multisensory perception disruption in idiopathic environmental intolerance: a systematic review[6] - (Abstract)

2019, Italian Consensus on Multiple Chemical Sensitivity (MCS) -- Consensus Document and Guidelines on Multiple Chemical Sensitivity (MCS)[94] - (Full text - English)

Notable studies and publications

2019, International prevalence of chemical sensitivity, co-prevalences with asthma and autism, and effects from fragranced consumer products[65] - (Full text)

2019. Padmanabhan, A., Connelly-Smith, L., Aqui, N., Balogun, R. A., Klingel, R., Meyer, E., ... & Winters, J. L. Guidelines on the use of therapeutic apheresis in clinical practice.

2019. Zanatta E, Cozzi M, Marson P, Cozzi F. The role of plasma exchange in the management of autoimmune disorders. Br J Haematol. 2019 Jul;186(2):207-219. doi: 10.1111/bjh.15903. Epub 2019 Mar 28. PMID: 30924130.2021.

2020. Mehdipour, M., Mehdipour, T., Skinner, C., Wong, N., Lieb, M., Liu, C., ... & Conboy, I. M. (2020). Rejuvenation of three germ layers tissues by exchanging old blood plasma with saline-albumin. *Aging, 12*(10), 8790-8819. https://doi.org/10.18632/aging.103418

2021, Volatile organic compounds (VOCs) in exhaled breath as a marker of hypoxia in multiple chemical sensitivity[95] - (Full text)

2021, Mast cell activation may explain many cases of chemical intolerance[100] (Full text)

2021, Multiple Chemical Sensitivity[203] (Full text)

Notable studies and publications

2021. Momchilova, Albena. Plasmapheresis Affects Ophthalmological Parameters and Oxidative Stress in Patients with Multiple Sclerosis and Neuromyelitis Optica. Archives in Biomedical Engineering & Biotechnology. 5. 10.33552/ABEB.2021.05.000617.

2021. *Journal of Clinical Apheresis, 34*(3), 171-354. https://doi.org/10.1002/jca.21705
Solanki, A., Singh, A., Chauhan, A., Agarwal, D., Himanshu, D., & Chandra, T. Therapeutic plasma exchange an emerging treatment modality. *Asian journal of transfusion science*, *15*(1), 46–51.

2022. Kim, D., Kiprov, D.D., Luellen, C. *et al.* Old plasma dilution reduces human biological age: a clinical study. *GeroScience* **44**, 2701–2720 (2022). https://doi.org/10.1007/s11357-022-00645-w

2023. Terumo BCT. *Advances in apheresis technology: A look into the future of therapeutic plasma exchange* [White paper]. Terumo BCT.

2024. Khosa, N.A., Essa, S.M., Zarak, M.S., Zarkoon, A.U., Ibrahim, I.A., & Mumtaz, T. (2024). Plasma-exchange therapy in acute immune-mediated neuropathy: Effects on muscle strength and functional outcomes. *Romanian Journal of Neurology*.

2025. American Society for Apheresis. Procedure: Therapeutic Plasma Exchange (https://cdn.ymaws.com/www.apheresis.org/resources/resmgr/fact_sheets_file/therapeutic_plasma_exchange.pdf).


Thank You