Supporting_Information_1

Manuscript: Effects of virgin micro- and nano-plastics on fish: Trends, meta-analysis and perspectives

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This Supporting_Information_1 consists of a list descripting the terms used in the spreadsheet Supporting_Information_2. This list ranges over the twelve pages of this document.

- **11β-hsd2**
  Name(s): 11 β-hydroxysteroid dehydrogenase type 2, Corticosteroid 11-β-dehydrogenase isozyme 2.
  Type: enzyme.
  Role: oxidizes the glucocorticoid cortisol to the inactive metabolite cortisone, thus preventing illicit activation of the mineralocorticoid receptor; protects cells from the growth-inhibiting and/or pro-apoptotic effects of cortisol, particularly during embryonic development.
  Indicator of: general metabolism.

- **α-Proteobacteria**
  Name(s): α-Proteobacteria.
  Type: bacteria class.
  Role: Gram -, belongs to the Proteobacteria Phylum; mainly related to carbohydrate metabolism, cholesterol metabolism and bile acid synthesis; high abundances of Proteobacteria have been associated with dysbiosis in hosts with metabolic or inflammatory disorders.
  Indicator of: Proteobacteria.

- **α1-tubulin**
  Name(s): 11 β-hydroxysteroid dehydrogenase type 2, Corticosteroid 11-β-dehydrogenase isozyme 2.
  Type: protein.
  Role: neuron-specific microtubule protein whose expression is induced in the developing and regenerating CNS.
  Indicator of: nervous system.

- **β-Proteobacteria**
  Name(s): β-Proteobacteria.
  Type: bacteria class.
  Role: Gram -, belongs to the Proteobacteria Phylum; high abundances of Proteobacteria have been associated with dysbiosis in hosts with metabolic or inflammatory disorders.
  Indicator of: Proteobacteria.

- **γ-Proteobacteria**
  Name(s): γ-Proteobacteria.
  Type: bacteria class.
  Role: Gram -, belongs to the Proteobacteria Phylum; a number of important pathogens belong to this class.
  Indicator of: Proteobacteria.

- **Acc1**
  Name(s): Acetyl-CoA carboxylase.
  Type: enzyme.
  Role: catalyzes the irreversible carboxylation of acetyl-CoA to produce malonyl-CoA; provides the malonyl-CoA substrate for the biosynthesis of fatty acids.
  Indicator of: lipid metabolism.

- **AChE**
  Name(s): Acetylcholinesterase.
  Type: enzyme.
  Role: AChE is found at mainly neuromuscular junctions and in chemical synapses of the cholinergic type, where its activity serves to terminate synaptic transmission.
  Indicator of: nervous system.

- **Aco**
  Name(s): Acyl-CoA oxidase.
  Type: enzyme.

Role: belongs to the family of oxidoreductases; participates in 3 metabolic pathways: fatty acid metabolism, polyunsaturated fatty acid biosynthesis, and ppar signaling pathway; employs one cofactor, FAD.
Indicator of: lipid metabolism.

- **Actinobacteria**
  Name(s): Actinobacteria.
  Type: bacteria phylum.
  Role: Gram +, pivotal in the maintenance of gut homeostasis; one the four major phyla of the gut microbiota; role in gastrointestinal and systemic diseases.
  Indicator of: Actinobacteria.

- **AhRα**
  Name(s): Aryl hydrocarbon receptor α.
  Type: transcription factor.
  Role: sensor of xenobiotic chemicals and regulator of enzymes such as cytochrome P450s that metabolize these chemicals; important for immunological responses and inhibiting inflammation.
  Indicator of: detoxification (PLA_2) and immune response.

- **AhRβ**
  Name(s): Aryl hydrocarbon receptor β.
  Type: transcription factor.
  Role: sensor of xenobiotic chemicals and regulator of enzymes such as cytochrome P450s that metabolize these chemicals; important for immunological responses and inhibiting inflammation.
  Indicator of: detoxification (PLA_2) and immune response.

- **Apo**
  Name(s): Apolipoprotein.
  Type: protein.
  Role: Apolipoproteins are proteins that bind lipids to form lipoproteins. They transport lipids in blood, cerebrospinal fluid and lymph.
  Indicator of: lipid metabolism.

- **AR**
  Name(s): Androgen receptor.
  Type: transcription factor.
  Role: are involved in the many physiological actions of androgens.
  Indicator of: sex hormones and endocrinology.

- **Bacteroidetes**
  Name(s): Bacteroidetes.
  Type: bacteria phylum.
  Role: Gram -, ferment polysaccharides and otherwise indigestible carbohydrates; produce short-chain fatty acids (SCFAs) that have many beneficial effects in the gut; speed up metabolism; block inflammation; high Firmicutes/Bacteroides ratio is associated with obesity and diseases; mainly related to carbohydrate metabolism, cholesterol metabolism and bile acid
  synthesis.
  Indicator of: Bacteroidetes.

- **BFCOD**
  Name(s): 7-benzyloxy-4-trifluoromethyl-coumarin O-dibenzyloxylase.
  Type: enzyme.
  Role: involved in CYP1A metabolism.

Indicator of: detoxification.

- **CAT**
  Name(s): Catalase.
  Type: enzyme.
  Role: catalyzes the decomposition of hydrogen peroxide to water and oxygen; protects the cell from oxidative damage by reactive oxygen species (ROS).
  Indicator of: oxidative stress.

- **ChgH**
  Name(s): Choriogenin.
  Type: protein.
  Role: group of proteins that are precursors to the formation of the chorion of an egg.
  Indicator of: reproductive investment and success.

- **Cholesterol**
  Name(s): Cholesterol.
  Type: lipid.
  Role: equals HDL + LDL.
  Indicator of: lipid metabolism.

- **CHRNA2**
  Name(s): Neuronal acetylcholine receptor subunit alpha-2, nAChRα2.
  Type: protein.
  Role: subunit of certain nicotinic acetylcholine receptors; influence hippocampus-dependent learning and memory and CA1 synaptic plasticity.
  Indicator of: nervous_system.

- **coxIV**
  Name(s): COXIV, cox4, COX4, cytochrome c oxidase subunit 4.
  Type: enzyme.
  Role: couples the transfer of electrons from cytochrome c to molecular oxygen and contributes to a proton electrochemical gradient across the inner mitochondrial membrane, acting as the terminal enzyme of the mitochondrial respiratory chain.
  Indicator of: oxidative stress.

- **Cpt1**
  Name(s): Carnitine palmitoyltransferase I.
  Type: enzyme.
  Role: responsible for the formation of acyl carnitines by catalyzing the transfer of the acyl group of a long-chain fatty acyl-CoA from coenzyme A to l-carnitine; its role in fatty acid metabolism makes CPT1 important in many metabolic disorders such as diabetes.
  Indicator of: lipid metabolism.

- **Crude lipid**
  Name(s): Crude lipid.
  Type: lipid.
  Role: total amount of lipid.
  Indicator of: lipid metabolism.

- ***CYP1A*/CYP1A**
  Name(s): Cytochrome P450, family 1, subfamily A.

Type: gene/enzyme.
Role: has an important function in the biotransformation of many xenobiotics, including polynuclear aromatic hydrocarbons, and planar organochlorine compounds. The metabolism can lead to detoxification or activation to reactive intermediates.
Indicator of: detoxification.

- **CYP450**
  Name(s): Cytochrome P450.
  Type: enzyme family.
  Role: regulation of P450 genes by environmental stresses including water pollution; most common example: *CYP1A*.
  Indicator of: detoxification.

- **DGAT**
  Name(s): Diglyceride acyltransferase.
  Type: enzyme.
  Role: catalyzes the formation of triglycerides from diacylglycerol and Acyl-CoA; the reaction catalyzed by DGAT is considered the terminal and only committed step in triglyceride synthesis and to be essential for intestinal absorption and adipose tissue formation.
  Indicator of: lipid metabolism.

- **Dopamine**
  Name(s): Dopamine, DA.
  Type: neurotransmitter.
  Role: hormone and a neurotransmitter, and plays several important roles in the brain and body.
  Indicator of: nervous system (PLA_11) and general metabolism.

- **ERα**
  Name(s): Estrogen receptor α.
  Type: transcription factor.
  Role: ER and estrogen play very important roles in the development of the reproductive system in animals. Liver is the main organ for ER expression and for vitellogenin synthesis in fish. ER is responsible for vitellogenin synthesis.
  Indicator of: sex hormones and endocrinology.

- **ERβ**
  Name(s): Estrogen receptor β, **ESR2**.
  Type: transcription factor.
  Role: ER and estrogen play very important roles in the development of the reproductive system in animals. Liver is the main organ for ER expression and for vitellogenin synthesis in fish. ER is responsible for vitellogenin synthesis.
  Indicator of: sex hormones and endocrinology.

- **EROD**
  Name(s): 7-ethoxyresorufin O-deethylase.
  Type: enzyme.
  Role: widely used catalytic probe for determining the induction response of CYP1A in fish.
  Indicator of: detoxification.

- **FABP6**
  Name(s): Fatty acid binding protein 6, ileal, gastropin.
  Type: enzyme.
  Role: encodes the ileal fatty acid binding protein; binds bile acids; roles include fatty acid uptake, transport, and metabolism.

Indicator of: lipid metabolism.

- **FAS**
  Name(s): Fatty acid synthase.
  Type: enzyme.
  Role: catalyzes fatty acid synthesis.
  Indicator of: lipid metabolism.

- **Firmicutes**
  Name(s): Firmicutes.
  Type: bacteria phylum.
  Role: Gram +, crave sugars; generate inflammation; slow down body metabolism; increase can provoke weight gain; high Firmicutes/Bacteroides ratio is associated with obesity and diseases.
  Indicator of: Firmicutes.

- **FOXL2**
  Name(s): Forkhead box protein L2.
  Type: transcription factor.
  Role: plays a role in ovarian development and function; marker for ovarian differentiation; required for granulosa cell differentiation; prevent the formation of testes by suppressing expression of SOX9; regulates granulosa cell differentiation; supports the growth of the pre-ovulatory follicles during adult life.
  Indicator of: sex hormones and endocrinology.

- **FTZ-F1**
  Name(s): Fushi tarazu factor 1.
  Type: transcription factor.
  Role: transcriptional factors regulating the transcription of brain aromatase gene; reduced ftz-f1 mRNA levels could cause a hormonal imbalance and affect the reproductive success in fish; steroidogenesis; protect embryos against maternal estrogens; involved in cholesterol transfer and metabolism.
  Indicator of: sex hormones and endocrinology (PLA_25), reproductive success and investment and general metabolism.

- **GCL_{cu}**
  Name(s): Glutamate-cysteine ligase (or gamma-glutamylcysteine synthetase) catalytic subunit.
  Type: enzyme.
  Role: Glutamate-cysteine ligase carries out the first reaction of glutathione synthesis.
  Indicator of: oxidative stress.

- **GCL_{mu}**
  Name(s): Glutamate-cysteine ligase (or gamma-glutamylcysteine synthetase) modifying subunit.
  Type: enzyme.
  Role: Glutamate-cysteine ligase carries out the first reaction of glutathione synthesis.
  Indicator of: oxidative stress.

- **GFAP**
  Name(s): Glial fibrillary acidic protein.
  Type: protein.
  Role: involved in the structure and function of the cell's cytoskeleton; to help to maintain astrocyte mechanical strength; expressed by numerous cell types of the central nervous system.
  Indicator of: nervous sytem.

- **GGT**

Name(s): Gamma-glutamyltransferase, γ-glutamyltransferase, gamma-GT.
Type: enzyme.
Role: plays a key role in the gamma-glutamyl cycle, a pathway for the synthesis and degradation of glutathione as well as drug and xenobiotic detoxification; can also exert a pro-oxidant role, with regulatory effects at various levels in cellular signal transduction and cellular pathophysiology; preserve intracellular homeostasis of oxidative stress.
Indicator of: oxidative stress (PLA_23) and detoxification.

- **GK**
  Name(s): Glucokinase, GCK.
  Type: enzyme.
  Role: involved in the glycolysis pathway.
  Indicator of: carbohydrate metabolism.

- **GLU**
  Name(s): Glucose.
  Type: molecule.
  Role: Glucose, for metabolism.
  Indicator of: carbohydrate metabolism.

- **GnRH**
  Name(s): Gonadotropin-releasing hormone.
  Type: hormone.
  Role: responsible for the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the anterior pituitary; constitutes the initial step in the hypothalamic–pituitary–gonadal axis; activity is critical for successful reproductive function.
  Indicator of: sex hormones and endocrinology.

- **GP**
  Name(s): Glutathione peroxidase, **GPx**.
  Type: enzyme.
  Role: protects the organism from oxidative damage; reduces lipid hydroperoxides to their corresponding alcohols and reduces free hydrogen peroxide to water.
  Indicator of: oxidative stress.

- **GR**
  Name(s): Glutathione reductase, **GSR**.
  Type: enzyme.
  Role: catalyzes the reduction of GSSG to GSH, which is a critical molecule in resisting oxidative stress and maintaining the reducing environment of the cell.
  Indicator of: oxidative stress.

- **GS**
  Name(s): Glutathione synthetase.
  Type: enzyme.
  Role: catalyzes the condensation of gamma-glutamylcysteine and glycine, to form glutathione. Glutathione synthetase is also a potent antioxidant.
  Indicator of: oxidative stress.

- **GSH**
  Name(s): Glutathione.
  Type: molecule.
  Role: one of the major antioxidant compounds in body fluids; reduced version of glutathione.

Indicator of: oxidative stress.

- **GSH/GSSG**
  Name(s): Glutathione/ Glutathione disulfide ratio.
  Type: ratio; marker.
  Role: powerful index of oxidative stress and disease risk (high = no stress; low = stress).
  Indicator of: oxidative stress.

- **GSSG**
  Name(s): Glutathione disulfide.
  Type: molecule.
  Role: generated by antioxidant enzymes, such as GP; marker of oxidative stress; oxidized version of glutathione.
  Indicator of: oxidative stress.

- **GST**
  Name(s): Glutathione S-transferase, **gst1**.
  Type: enzyme.
  Role: catalyzes the conjugation of the reduced form of glutathione (GSH) to xenobiotic substrates for the purpose of detoxification.
  Indicator of: detoxification.

- **HDL**
  Name(s): High density lipoprotein
  Type: enzyme.
  Role: responsible for the transport of cholesterol to the liver (where it could be eliminated); permits to avoid the accumulation of cholesterol in blood vessels.
  Indicator of: lipid metabolism.

- **HK1**
  Name(s): Hexokinase 1.
  Type: enzyme.
  Role: involved in the glycolysis pathway.
  Indicator of: carbohydrate metabolism.

- **IDH**
  Name(s): Isocitrate dehydrogenase, ID.
  Type: enzyme.
  Role: catalyzes the oxidative decarboxylation of isocitrate, producing alpha-ketoglutarate (α-ketoglutarate) and CO2; aerobic pathway of energy production.
  Indicator of: carbohydrate metabolism.

- **LDH**
  Name(s): Lactate dehydrogenase, LD.
  Type: enzyme.
  Role: catalyzes the conversion of lactate to pyruvate and back; anaerobic pathway of energy production.
  Indicator of: carbohydrate metabolism.

- **LPO**
  Name(s): **LOP**, Lipid oxidation products, Lipid peroxidation.
  Type: lipids.
  Role: marker of oxidative damage to lipids.
  Indicator of: oxidative stress.

- **MANF**
  Name(s): Mesencephalic astrocyte-derived neurotrophic factor.
  Type: lipids.
  Role: dopaminergic neuron differentiation; neuron projection development; platelet degranulation; regulation of response to endoplasmic reticulum stress; cerebral/neuronal growth factor.
  Indicator of: nervous system.

- **MBP**
  Name(s): Myelin basic protein.
  Type: lipids.
  Role: important in the process of myelination of nerves in the nervous system.
  Indicator of: nervous system.

- **MDA**
  Name(s): **LOP**, Lipid oxidation products, Lipid peroxidation.
  Type: lipids.
  Role: results from lipid peroxidation of polyunsaturated fatty acids; is a marker for oxidative stress.
  Indicator of: oxidative stress.

- **MTA**
  Name(s): Malondialdehyde.
  Type: organic molecule.
  Role: has the capacity to bind both physiological (such as zinc, copper, selenium) and xenobiotic (such as cadmium, mercury, silver, arsenic) heavy metals through the thiol group of its cysteine residues.
  Indicator of: detoxification.

- **MTB**
  Name(s): Metallothionein B.
  Type: protein.
  Role: has the capacity to bind both physiological (such as zinc, copper, selenium) and xenobiotic (such as cadmium, mercury, silver, arsenic) heavy metals through the thiol group of its cysteine residues.
  Indicator of: detoxification.

- **Muscle/Liver cholesterol distribution**
  Name(s): Muscle/Liver cholesterol distribution.
  Type: lipid distribution.
  Role: changes in distribution indicate disturbance of the lipid metabolism.
  Indicator of: lipid metabolism.

- **NGN1**
  Name(s): Neurogenin 1.
  Type: transcription factor.
  Role: involved in specifying neuronal differentiation; essential for neurogenesis in the developing dorsal root ganglia and development of the sensory lineage.
  Indicator of: nervous system.

- **Nrf2**
  Name(s): **NFE2L2**, Nuclear factor (erythroid-derived 2)-like 2.
  Type: transcription factor.
  Role: regulates the expression of antioxidant proteins that protect against oxidative damage triggered by injury and inflammation.

Indicator of: oxidative stress.

- **PEPCKc**
  Name(s): Phosphoenolpyruvate carboxykinase, PEPCK.
  Type: enzyme.
  Role: involved in the glycolysis pathway.
  Indicator of: carbohydrate metabolism.

- **PK**
  Name(s): Pyruvate kinase.
  Type: enzyme.
  Role: involved in the glycolysis pathway.
  Indicator of: carbohydrate metabolism.

- **Ppar-α**
  Name(s): Peroxisome proliferator-activated receptor alpha.
  Type: transcription factor.
  Role: major regulator of lipid metabolism in the liver.
  Indicator of: lipid metabolism.

- **Ppar-γ**
  Name(s): Peroxisome proliferator-activated receptor gamma.
  Type: transcription factor.
  Role: regulates fatty acid storage and glucose metabolism; genes activated by PPARG stimulate lipid uptake and adipogenesis by fat cells.
  Indicator of: lipid metabolism (PLA_45) and carbohydrate metabolism.

- **prdx1**
  Name(s): **PRDX1**, Peroxiredoxin-1, pdx1.
  Type: enzyme.
  Role: reduce hydrogen peroxide and alkyl hydroperoxides; antioxidant protective role in cells; enzyme that combat oxidative stress; act to produce inflammatory cytokines.
  Indicator of: oxidative stress (PLA_17, PLA_39) and immunity.

- **prdx2**
  Name(s): **PRDX2**, Peroxiredoxin-2.
  Type: enzyme.
  Role: reduce hydrogen peroxide and alkyl hydroperoxides; antioxidant protective role in cells; enzyme that combat oxidative stress; act to produce inflammatory cytokines.
  Indicator of: oxidative stress (PLA_17) and immunity.

- **prdx3**
  Name(s): **PRDX3**, Peroxiredoxin-3, Thioredoxin-dependent peroxide reductase (mitochondrial).
  Type: mitochondrial enzyme.
  Role: reduce hydrogen peroxide and alkyl hydroperoxides; antioxidant protective role in cells; enzyme that combat oxidative stress.
  Indicator of: oxidative stress.

- **prdx5**
  Name(s): **PRDX5**, Peroxiredoxin-5 (mitochondrial).
  Type: mitochondrial enzyme.
  Role: cytoprotective antioxidant enzyme that inhibits endogenous or exogenous peroxide accumulation.

Indicator of: oxidative stress.

- **ROS**
  Name(s): Reactive oxygen species.
  Type: molecules.
  Role: during times of stress, ROS levels can increase dramatically, resulting in significant damage to cell structures, this is known as oxidative stress.
  Indicator of: oxidative stress.

- **SOD_{Mn}**
  Name(s): Superoxide dismutase with manganese cofactor.
  Type: enzyme.
  Role: superoxide dismutase catalyzes the dismutation (or partitioning) of the superoxide (O_2^-) radical into either ordinary molecular oxygen (O_2) or hydrogen peroxide (H_2O_2). Thus, SOD is an important antioxidant defense in nearly all living cells exposed to oxygen.
  Indicator of: oxidative stress.

- **SOD_{Zn_Cu}**
  Name(s): Superoxide dismutase with zinc or copper cofactor, **SOD3**, **sod3**.
  Type: enzyme.
  Role: superoxide dismutase catalyzes the dismutation (or partitioning) of the superoxide (O2−) radical into either ordinary molecular oxygen (O2) or hydrogen peroxide (H2O2). Thus, SOD is an important antioxidant defense in nearly all living cells exposed to oxygen.
  Indicator of: oxidative stress.

- **SREBP1α**
  Name(s): sterol regulatory element-binding protein 1α, SREBF1.
  Type: protein.
  Role: regulates genes related to lipid and cholesterol production and its activity is regulated by sterol levels in the cell.
  Indicator of: lipid metabolism.

- **Synapsin**
  Name(s): Synapsin.
  Type: protein.
  Role: regulation of neurotransmitter release at synapses.
  Indicator of: nervous system.

- **tGSH**
  Name(s): total Glutathione.
  Type: calculation; marker.
  Role: sum of GSH + GSSG.
  Indicator of: oxidative stress.

- **Thermogenin**
  Name(s): **ucp1**, UCP1.
  Type: protein.
  Role: UCPs are transmembrane proteins that decrease the proton gradient generated in oxidative phosphorylation; thought to be involved in regulating reactive oxygen species (ROS).
  Indicator of: oxidative stress.

- **Triglyceride:cholesterol ratio**

Name(s): Triglyceride:cholesterol ratio.
Type: calculation.
Role: a high value indicates an atherogenic lipid profile.
Indicator of: lipid metabolism.

- **VTG**
  Name(s): Vitellogenin, **VG**.
  Type: protein.
  Role: serves as a major precursor of egg yolk proteins stored as essential nutrients for future embryogenesis.
  Indicator of: reproductive investment and success.

- **zfblue**
  Name(s): Blue opsin, Blue-sensitive opsin, OPN1SW.
  Type: protein.
  Role: involved in visual phototransduction.
  Indicator of: vision.

- **zfrho**
  Name(s): Rhodopsin.
  Type: protein.
  Role: involved in visual phototransduction.
  Indicator of: vision.