

Metabolism and Translational Science Core

The Metabolism and Translational Science Core is capable of performing all of the analyses listed below as well as many others that fall within each category (e.g., most ELISAs and multiplex immunoassay panels, additional physical/cognitive performance measures).

In addition, the Core provides

- 1) guidance on the selection of analyses best suited for an investigator's project
- 2) consultation on the development of standard operating procedures for the collection, processing and storage of biological samples as well as on IACUC/IRB protocols.
- 3) budget estimates for both currently funded projects as well as grant proposals.

Main Measures

| Analysis technique | Assay / Analytes | Specialized Equipment |
|---|--|---|
| ELISA | Sample type: plasma, serum, tissue | <ul style="list-style-type: none"> • Bio-Tek Synergy HTX multi-detection microplate reader (fluorescence, absorbance and luminescence measurements) with Gen5 Data Analysis Software • BioTek Instruments ELx405™ HT Microplate Washer - for 96-well plates |
| Oxidation | MPO, oxLDL, Protein carbonyls, ferritin | |
| Inflammation | TNFα, IL-6, IL-8, V-CAM, Selectins, CRP | |
| Apoptosis | Cell death ELISA | |
| Multiplex Immunoassay | Sample type: plasma, serum, tissue | <ul style="list-style-type: none"> • Millipore MILLIPLEX® Analyzer 3.1 xPONENT System with MILLIPLEX® Analyst 5.1 software (Luminex 200) • BioTek Instruments ELx405™ HT Microplate Washer - for 96-well plates |
| Cardiovascular Disease, Metabolic Disorders, Inflammation | Adiponectin, MPO, Soluble E-Selectin, Soluble ICAM-1, Soluble VCAM-1, Total PAI-1, IFN-gamma, IL-10, IL-12, IL-12,IL-13, IL-1beta, IL-5, IL-6, IL-8, TNF-alpha | |
| qRT-PCR | Sample type: cells, tissue, whole worms | <ul style="list-style-type: none"> • Bio-Rad Laboratories CFX96 Touch™ Real-Time PCR Detection System • Bio-Rad Laboratories C1000 Touch™ Thermal Cycler with Dual 48/48 Fast Reaction Module |
| Inflammation | TNFα, IL-6, NF-κB | |
| Autophagy/Proteolysis | LAMP-2, Atg5, 7, 12, Beclin-1, MurF 1, Atrogin 1, Foxo-3 | |
| Aging-related transcription factors | FOXO/DAF-16, FOXA/PHA-4, NRF2/SKN-1, nuclear hormone receptors, etc | |
| Mitochondria | mtDNA copy number, mtDNA mutation/deletion/damage | |
| Immunoblot | Sample type: tissue, cells, mitochondria | |

| | | |
|---|--|---|
| Oxidative stress | Nitrotyrosine, 4-HNE | <ul style="list-style-type: none"> • ProteinSimple Jess System for capillary immunoassays (chemi, IR, NIR detection for multiplexing) • Bio-Rad Criterion™ gel electrophoresis • Bio-Rad Trans-Blot® SD semi-dry transfer cell • Bio-Rad Trans-Blot® Turbo™ Transfer System • Bio-Rad Gel Doc XRS+ high-resolution gel/blot imaging system |
| Mitochondria | Fusions & Fission (Opa1, Fis1, Mfn1, Drp1), Biogenesis transcription/Translation (PGC1α, TFAM, Nrf1) | |
| Inflammation | TNFα Receptor I, NF-κB | |
| Apoptosis | Caspases 3 & 9, PARP, Endo G, & AIF | |
| Autophagy/Proteolysis | LC3, Beclin-1, Atg proteins, p62, PINK-1, Parkin, MuRF-1, Atrogin-1, Foxo-3 | |
| Activity assay/Spectrophotometry | Sample type: cells, tissue | <ul style="list-style-type: none"> • Bio-Tek Synergy HTX multidetection microplate reader (fluorescence, absorbance and luminescence measurements) |
| Oxidative stress / Mitochondria | ROS production (H ₂ O ₂), Aconitase, Citrate synthase, Cytochrome c oxidase | |
| Apoptosis | Caspase 3 & 9 | |
| Respirometry | Sample type: isolated mitochondria, cells, tissue, whole worms | <ul style="list-style-type: none"> • OROBOROS Oxygraph-2k for high-resolution mitochondrial respiratory function assessment • Agilent/Seahorse XFe96 Flux Analyzer for high-throughput in a 96-well plate format <ul style="list-style-type: none"> ○ BioTek Cytation 1 cell imaging multi-mode reader (cell count) |
| Mitochondria | High resolution (O2k) or high-throughput (XFe96) mitochondrial respiratory function measurements: oxygen consumption rate and extracellular acidification rate (XFe96) of live cells, tissue biopsy material, isolated mitochondria or whole worms | |

Other Measures/Equipment Available

| Analysis technique | Measure | Specialized Equipment |
|---|--|--|
| COGNITION/ATTENTION/EXECUTIVE FUNCTION | | |
| Water Maze | Morris Swim Task | <ul style="list-style-type: none"> • Noldus Ethovision automated tracking system • Pools (mice/rats) |
| Object Location/Context/Recognition | Cue discrimination, spatial discrimination | |
| Chemotaxis | Olfactory sensation and olfactory learning | <ul style="list-style-type: none"> • Stereoscopes (C. elegans) • Chemotaxis plates (C. elegans) • Incubators (C. elegans) |
| MOTOR/SOMATOSENSORY | | |

| | | |
|----------------------------|--|--|
| Locomotor Activity | Voluntary Activity | <ul style="list-style-type: none"> • Noldus Ethovision automated tracking system • Customized Wormlab C. elegans locomotion tracker (MBF Bioscience) (also applicable to larval Drosophila) |
| Running Wheel | Voluntary Exercise Activity | <ul style="list-style-type: none"> • Nalgene Activity Wheels (rat). Each wheel is equipped with a magnetic switch and a counter with liquid crystal display (LCD) that records the number of wheel revolutions. |
| Treadmill | Exercise/exercise tolerance testing. | <ul style="list-style-type: none"> • Five-lane Rodent Treadmill (Panlab/Harvard Apparatus) |
| Grip Strength | Forelimb grip strength (mean force in grams will be divided by body weight). Average measurements from three successful trials will be taken as the final outcome. | <ul style="list-style-type: none"> • Automated Grip Strength Meter (Columbus Instruments, Columbus Ohio): computerized electronic pull strain gauge that is fitted directly to the grasping ring. |
| Body Composition | | |
| Nuclear Magnetic Resonance | NMR analyzer delivers body composition measurements of fat, lean, free water, and total water masses in live animals weighing up to 700 grams. | <ul style="list-style-type: none"> • EchoMRI™-700 |

| | | |
|-----------------|---|---|
| Auditory | | |
| ABR | Auditory Brainstem Response (ABR) is an electrical signal generated from the brainstem in response to sound: measures the brainstem's response to sound. | <ul style="list-style-type: none"> • Intelligent Hearing System with Smart-EP v10 software • Tucker Davis Technologies Evoked Potentials and EEG system • Sound Isolation Booth (GretchKen Industries, Inc.) |
| DPOAE | DPOAE (distortion product otoacoustic emission) are generated in the cochlea in response to two simultaneous tones of a given frequency and sound pressure level presented in the ear canal: indicative of outer hair cells function, providing information as to the source of hearing loss and is a general method to test hearing levels in animals. | |