CLAIMS

1. A quantitative method for measuring cellular responses to one or more differential stimuli or analytes using optic and fluid force-based measurements, wherein the method comprises:

receiving a selection of initial samples comprising biological cells or sub-cellular components or fractions treated with varying known amounts of stimuli or analyte,

measuring optic and fluid force-based parameters on the samples,

determining a response metric (RM) to describe the cellular response based on the one or more optic and fluid force-based parameters, and

using the RM to measure the cellular response of at least one unknown cellular sample.

2. The method of claim 1, further comprising determining a target value range of the RM based on differential cellular response to the varying levels of analyte or stimuli.

3. The method of claim 2, further comprising analyzing cellular samples treated with varying unknown amounts of stimuli or analyte until an accurate measurement of the cellular response is determined, based upon having an RM that falls within the target value range.

4. The method of claim 1, wherein the sub-cellular fraction is nuclei, mitochondria, or other sub-cellular component or fraction.

5. The method of claim 2 further comprising:

comparing the response metric of an initial unknown cellular sample to the target value range

selecting a second unknown sample based on the RM of the first unknown cellular sample,

comparing the response metric of the second unknown cellular sample to the target value range

selecting subsequent unknown samples in a similar manner until an unknown cellular sample falling within the target value range is identified.

6. The method of claim 1, wherein the biological cell comprises plant cells (algal cells or others), prokaryotic cells (bacteria), eukaryotic cells, yeast, fungus, mold cells, red blood cells, neurons, egg cell (ovum), spermatozoa, white blood cells, basophils, neutrophils, eosinophils, monocytes, lymphocytes, macrophages, platelets, vesicles, exosomes, stromal cells, multicellular constructs such as spheroids, mesenchymal cells, and induced pluripotent stem cells (iPSC).

7. The method claim 1, wherein the analyte comprises a virus or wherein the analyte comprises a bacterium.

8. The method of claim 1, wherein the analyte is a virus and a neutralizing serum containing antibodies (neutralization assay) or wherein the analyte is a bacterium and a neutralizing serum containing antibodies or wherein the analyte is a toxin and antibodies in sera capable or not capable of neutralizing the toxin or wherein the analyte is a virus and an antiviral compound or material.

9. The method of claim 1, wherein the cells are present in a monolayer, suspension or embedded in a matrix or wherein the cells are suspended by alginate, gelatin, or other similar semi-solid suspension or wherein the cells are sampled from an ongoing process and analyzed directly with no further incubation.

10. The method of claim 1, further comprising calibration objects.

11. The method of claim 10, wherein the calibration objects comprise beads, particles, biologics, lipids, vesicles, live cells, or fixed cells.

12. The method of claim 11, wherein beads or particles, comprise organic materials, polymers, metals, alloys, glass, sapphire, or diamond.

13. The method of claim 10, wherein the calibration objects are in spherical or non-spherical shapes sized from nanometers to millimeters or wherein the calibration objects are mixed with one or more samples and analyzed at the same time or wherein

the calibration objects can be differentiated from cell samples based on brightfield image analysis of the cells, fluorescence measurements, or one or more optical force-based measurements.

14. A method for calculating absolute titer/infectivity comprising:

analyzing by optic and fluid force-based measurements a plurality of samples having cells and a known range of dilutions of a viral stock to determine an infection metric; identifying the sample demonstrating a maximum infection metric;

setting the maximum infection metric as 100% infected;

calculating an amount of virus added to each dilution (infectious units/mL) based on the number of cells at a time of infection, the percentage of uninfected cells, a mathematical distribution describing infection, and a volume of viral stock added at the dilution; and

using only the dilutions that fall within specified range, predicting an overall titer of an unknown sample.