MSC Functional Characterization by ChemStress® technology for Media Design & Quality Control

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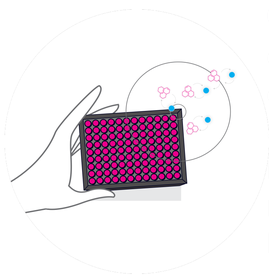
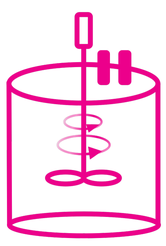
ChemStress® Assay Principle

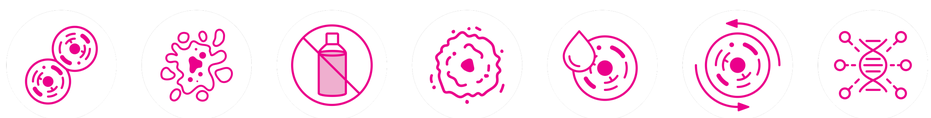
Cell culture media in the Cell Therapy (CT) space is considerably underdeveloped with scarce availability of defined formulations and lack of rapid and precise analytical solutions for Mesenchymal Stem Cell (MSCs) manufacturing.



ChemStress® technology is an information-rich, analytical assay that uses a panel of 21 small chemical molecules to analyze the functional quality of cells in specific culture media environments or following manipulation. Initially developed for use in Biologics manufacturing, ChemStress® is now under validation for use in the CT space.



Bioreactor Stressors



In these study, we describe how the ChemStress® assay can be used to profile MSCs expanded in different media formulations.

ChemStress® Workflow & Applications

The ChemStress® assay comes in 96 well plate format, precoated with lyophilised small chemical molecules.

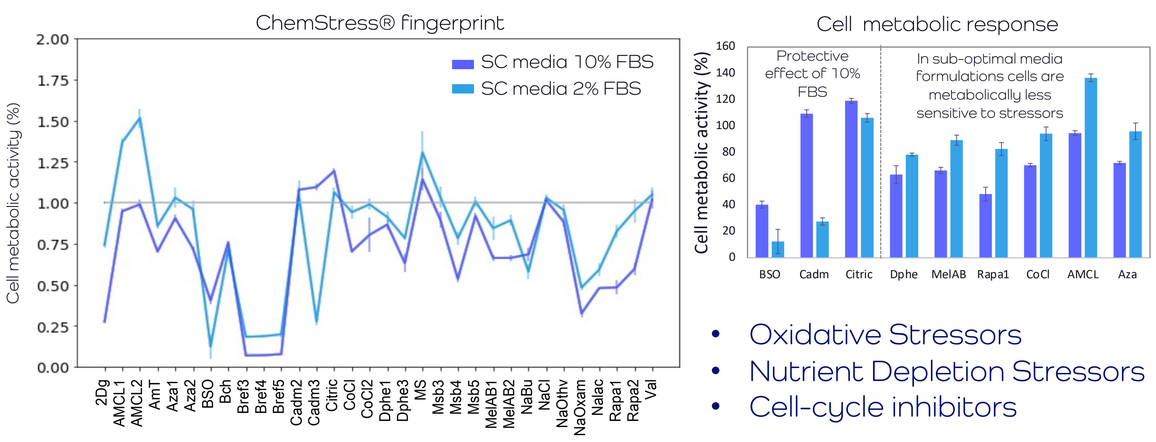
1. Seeded cells into the ChemStress® plate
2. When cells adhere, reconstitute the chemicals and transfer to the cells
3. Incubated at 37°C & 5% CO2 for 72 hours
4. Measure biological readouts (e.g., growth/ metabolic activity) with a standard fluorescent plate reader
5. Extract rich functional information using advanced data analysis

CELL-PHENOTYPIC PROFILING TECHNOLOGY
Revealing functional similarities & differences among **MEDIA & CELLS**.

Media Design & Quality Control Applications

MSCs were expanded in serum containing (SC) media at 10% or 2% of FBS and in serum free (SF) (M1, M2) formulations. ChemStress® technology was used to assess variability in the metabolic response of MSCs in different media formulations, and cell aging by using a Resazurin-based metabolic activity assay.

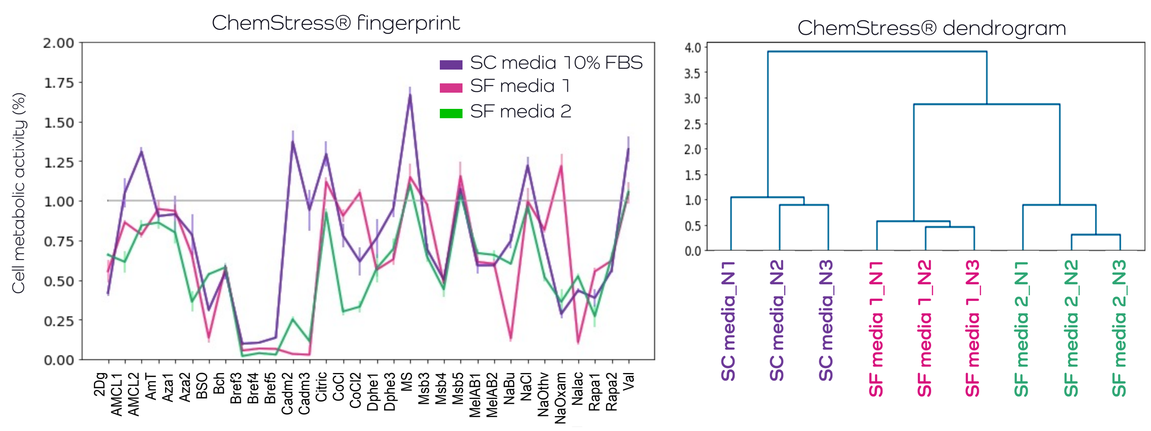
ChemStress® FBS Concentration Analysis



- Oxidative Stressors
- Nutrient Depletion Stressors
- Cell-cycle inhibitors

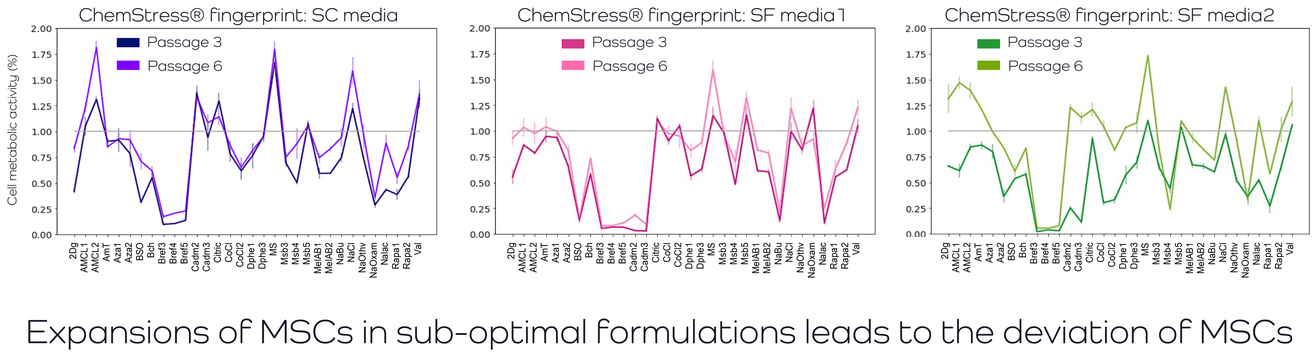
Cells expanded in serum containing (SC) vs low serum containing (LSC) media formulations demonstrated significantly different fingerprints

ChemStress® Media Formulation Analysis

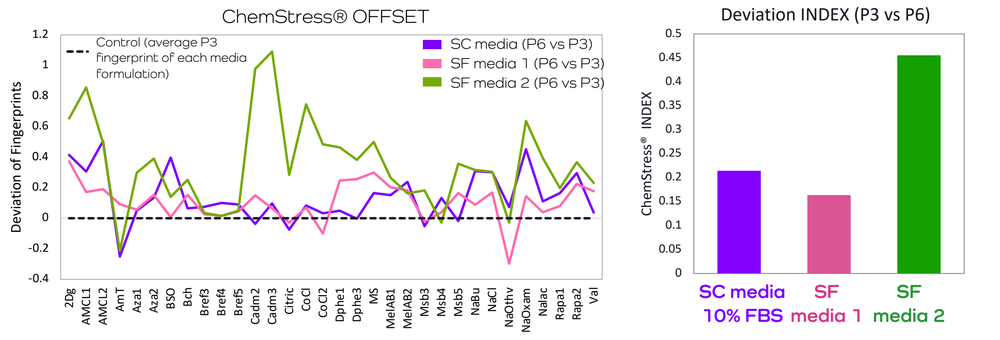


ChemStress® reveals functional differences between cells grown in serum containing (SC) and serum free (M1, M2) formulations

ChemStress® Cell Passage Analysis



Expansions of MSCs in sub-optimal formulations leads to the deviation of MSCs metabolic profile over passages. Specific media formulations can impact the ability of MSCs to resist biomanufacturing relevant stresses over passages



Major differences were observed in cell metabolic response to stressors when MSCs were expanded in SF media 2

Conclusions

- ChemStress® technology analyzes metabolic cell profiling of stem cells in a small scale and low-volume model
- ChemStress® technology analyses functional performance, QC and design and optimization of media formulations
- ChemStress® technology is applicable to donor profiling and process control screening

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