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Cellular characterization of compression induced-damage in live biological samples CHIARA BO, JENS BALZER, MARK HAHNEL, SARA M. RANKIN, KATHERINE A. BROWN, WILLIAM G. PROUD — Understanding the dysfunctions that high-intensity compression waves induce in human tissues is critical to impact on acute-phase treatments and requires the development of experimental models of traumatic damage in biological samples. In this study we have developed an experimental system to directly assess the impact of dynamic loading conditions on cellular function at the molecular level. Here we present a confinement chamber designed to subject live cell cultures in liquid environment to compression waves in the range of tens of MPa using a split Hopkinson pressure bars system. Recording the loading history and collecting the samples post-impact without external contamination allow the definition of parameters such as pressure and duration of the stimulus that can be related to the cellular damage. The compression experiments are conducted on Mesenchymal Stem Cells from BALB/c mice and the damage analysis are compared to two control groups. Changes in Stem cell viability, phenotype and function are assessed flow cytometry and with in vitro bioassays at two different time points. Identifying the cellular and molecular mechanisms underlying the damage caused by dynamic loading in live biological samples could enable the development of new treatments for traumatic injuries.

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