“The Effects of Pulse-Focused Ultrasound on the Injured Kidney”

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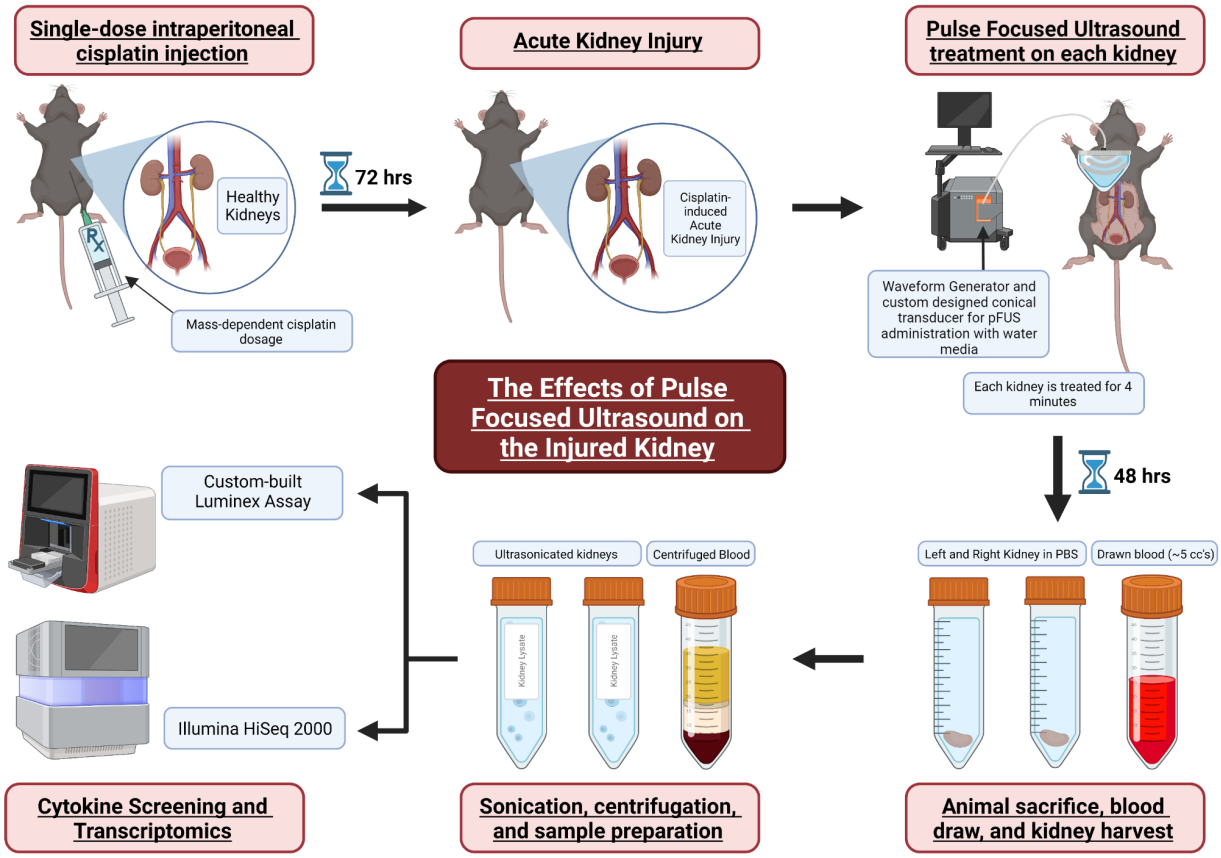
Introduction and Objective:

There is currently no treatment available for the reversal of Acute Kidney Injury (AKI), yet AKI is often a precursor or exacerbator for the onset of chronic diseases such as Chronic Kidney Disease (CKD) or Diabetes. Current standard approach treatments for AKI are mostly homeostatically supportive by maintaining blood volume or balancing electrolyte concentrations. Supportive treatments like dialysis are largely palliative, rather than curative. As a result, there is a significant disparity in patient outcomes involving AKI. Pulse Focused Ultrasound (pFUS) offers a novel, noninvasive solution to this disparity.

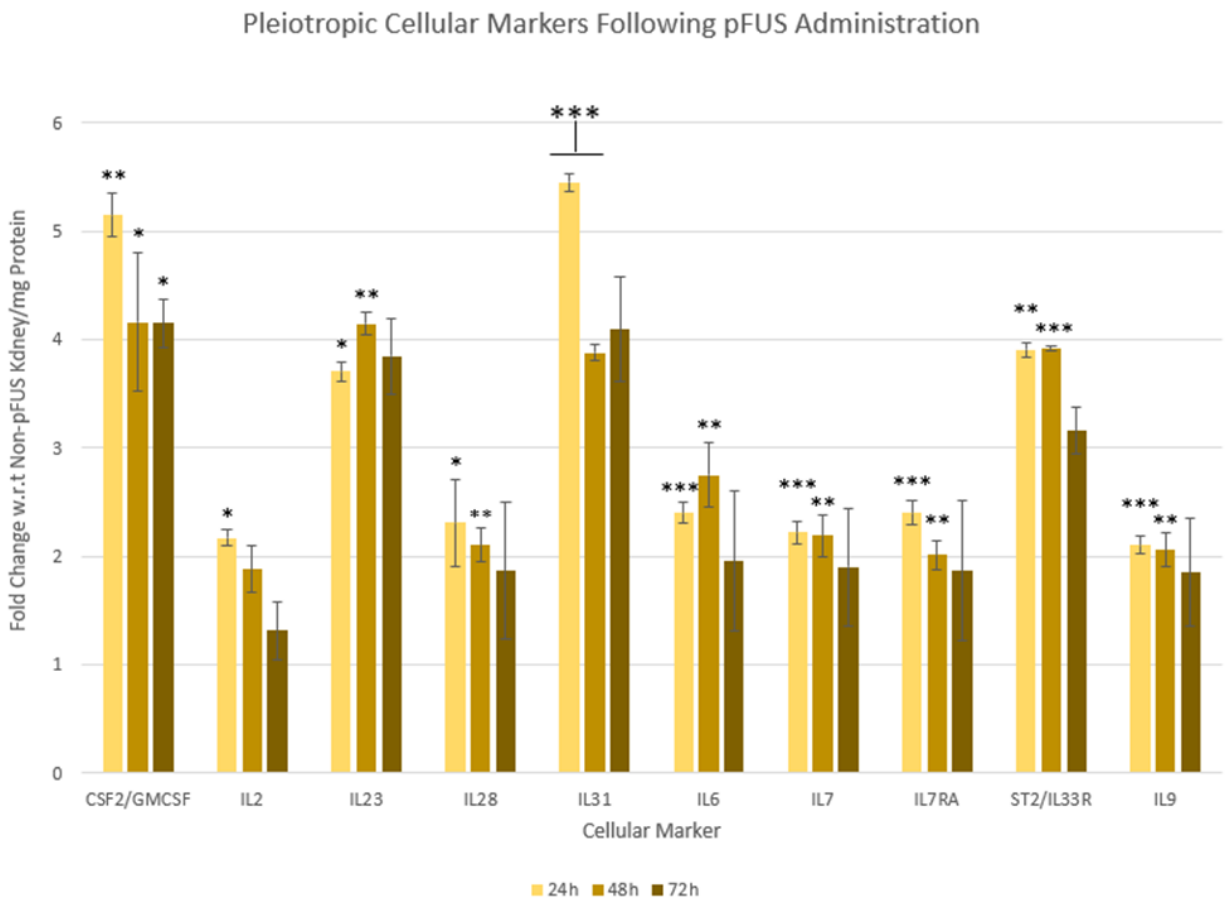
Methods:



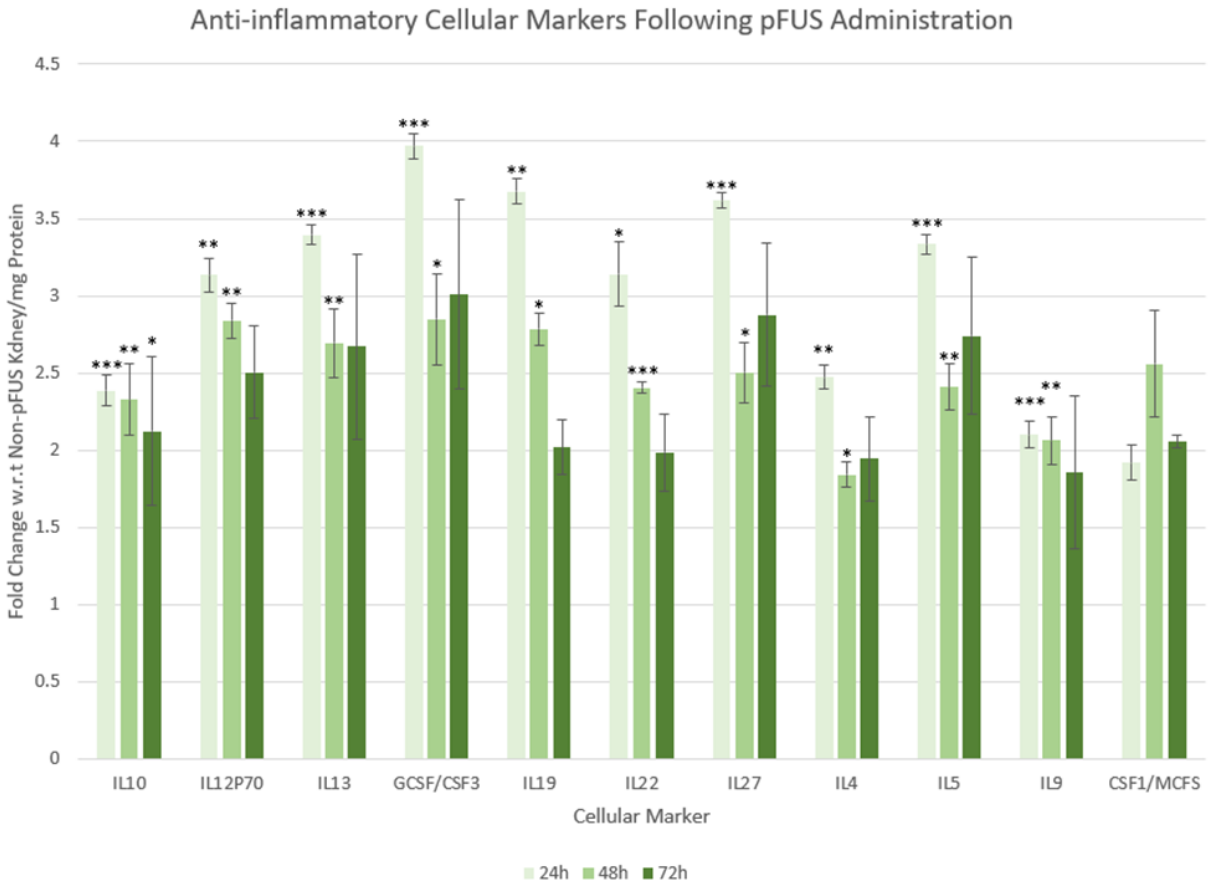
Here we measure pFUS' therapeutic capacity upon acute induction of AKI through the intraperitoneal injection of the chemotherapeutic drug cisplatin and subsequent pFUS administration.

Results:

A



B


Anti-inflammatory Cellular Markers Following pFUS Administration
Fold Change w.r.t Non-pFUS Kdney/mg Protein
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
IL10
IL12P70
IL13
GCSF/CSF3
IL19
IL22
IL27
IL4
IL5
IL9
CSF1/MCFS
Cellular Marker
24h
48h
72h

C

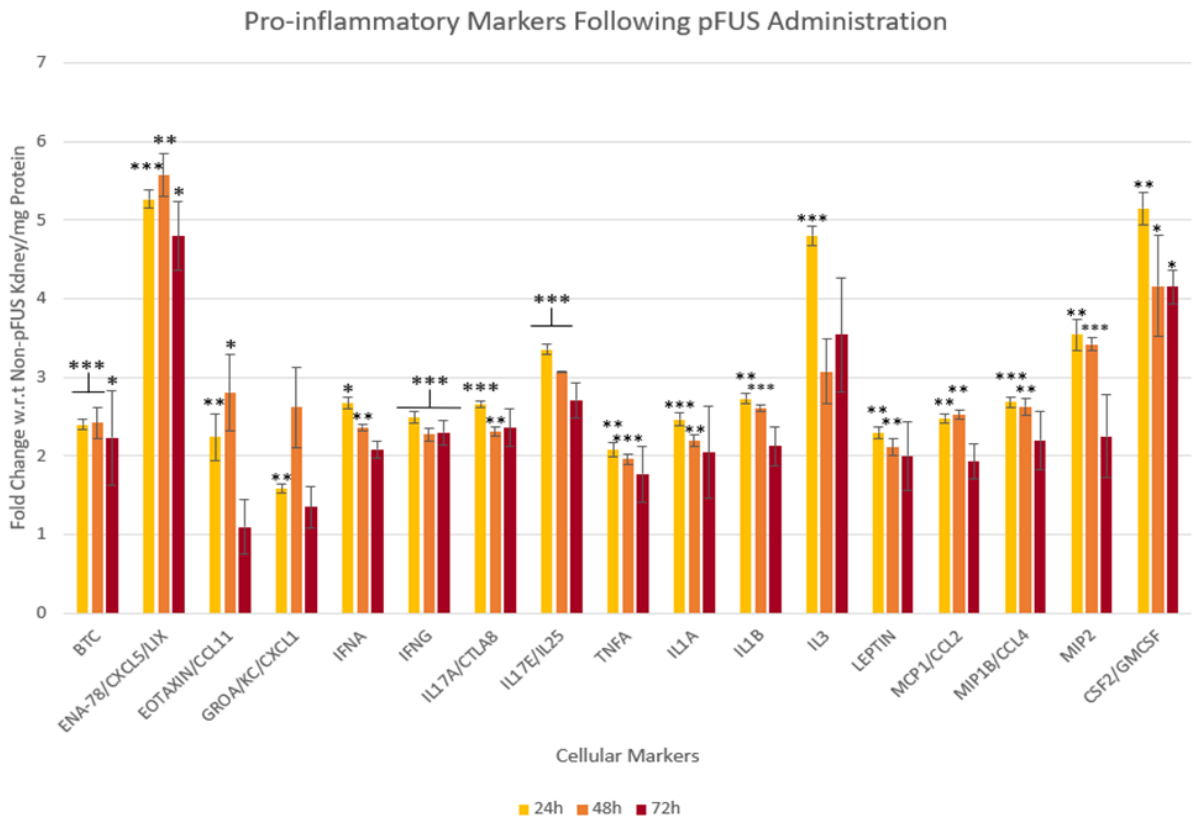


Fig. 1: Pleiotropic, Anti, and Pro-inflammatory Cellular Markers Following pFUS Administration. *, p<0.05 vs. Healthy, Black6 mice. N=2 separate experiments, enclosures, and unpaired data. **, p<0.005 vs. Healthy, Black6 mice, same parameters. ***, p<0.0005 vs. Healthy, Black6 mice, same parameters.

Conclusion

Our pFUS treatment has been shown to induce a multifold increase in cytokines and cellular homing factors. This suggests a therapeutic effect and a transient local increase in chemoattractants (i.e. cytokines) for the pFUS subjected organ, likely correlating to a heightened immune response and repair of the injured kidney that would not otherwise occur. Our data support a therapeutic effect in mice and suggest a similar effect could underlie administration in patients with AKI.