**Supplementary Figure Legends**

**Figure S1**. Schematic showing the key regulatory steps of ferroptosis. Ferroptosis can be induced (red text; via inhibition of GSH synthesis or GPX4 activity) and inhibited (blue text; via inhibition of PE-OOH production) in the *in vitro* setting using various compounds and small molecule inhibitors.

**Figure S2. No motor deficits were observed in open field testing by day 5 after controlled cortical impact (CCI).** No difference was observed in (**A**)distance travelled or (**B**) mean speed between sham and CCI-injured animals using open field testing. (Data are Mean ± SD, N=12-13/group).

**Figure S3. Inhibition of pharmacologically-induced ferroptosis in HT22 neurons**. Ferroptosis was induced using (**A**) glutamate (5 mM; inhibitor of cystine/glutamate antiporter which results in depletion of intracellular cysteine – the rate-limiting substrate of GSH synthesis), (**B**) erastin (5 μM; inhibitor of cystine/glutamate antiporter which results in depletion of intracellular cysteine – the rate-limiting substrate of GSH synthesis), or (**C**) BSO (50 μM; inhibitor of rate-limiting enzyme in GSH synthesis) resulting in a significant increase in cell death (lactate dehydrogenase release). Administration of DFO (10 μM; iron chelator) or Fer-1 (0.2-1 μM; lipid radical-trapping antioxidant) resulted in a significant reduction in pharmacologically-induced cell death. (Data are Mean ± SD, N=3-4/group, \**p*<0.05 vs control, #*p*<0.05 vs vehicle). Abbreviations: L-buthionine sulfoximine (BSO), deferoxamine (DFO), ferrostatin-1 (Fer-1).

**Figure S4. Phosphatidylethanolamine (PE) contains more arachidonic acid (AA) and adrenic acid (AdA) than other phospholipid classes in murine cortex.** (**A**) Spectra of phosphatidic acid (PA), phosphatidylcholine (PC), phosphatidylethanolamine (PE), phosphatidylglycerol (PG), phosphatidylinositol (PI), and phosphatidylserine (PS) in mouse cortex. (**B**) Stacked bar graph showing the abundance of major phospholipid classes in mouse cortex. Species within each phospholipid class were grouped by the number of double bonds, revealing the greatest amount of species containing 4, 5, or 6 double bonds (phospholipids likely containing AA and AdA) in the PE class. (N=5).

**Figure S5. Lipidomics analysis of murine cortex.** (**A**) MS2 fragmentation of highly abundant phosphatidylethanolamine (PE) species confirmed the predominance of arachidonic acid/adrenic acid (AA/AdA)-containing PE in cortex, with characteristic fragments shown in red.

**Figure S6. Identity of the significantly changing oxidized phosphatidylethanolamine (PE) species in cortex at 4 h after controlled cortical impact (CCI) with baicalein or vehicle treatment.** Volcano plots demonstrating the significantly increased (red) or decreased (blue) oxidized PE species in the cortex of (**A**)CCI+vehicle vs naive, (**B**) CCI+baicalein vs naive, (**C**) CCI+baicalein vs CCI+vehicle mice at 4 h after injury. (**D**) Table listing the significantly altered oxidized PE species of the corresponding volcano plots (red text highlights previously identified ferroptotic signals). (N=4-5/group, *p*<0.05).

**Figure S7. Characterization of pro-ferroptotic oxidized phosphatidylethanolamine (PE) species.** MS2 fragmentation of previously identified ferroptotic death signals that significantly changed in the cortex after controlled cortical impact (CCI) (purple denotes non-oxygenated free fatty acid (FFA) fragments, blue denotes oxygenated FFA fragments, and red denotes signature fragments of position-specific oxidation). (Data are Mean ± SD, N=4-5/group, \**p*<0.05 vs naive, #*p*<0.05 vs vehicle).

**Figure S8. Baicalein administration does not affect cardiolipin (CL) oxidation in the cortex at 4 h after controlled cortical impact (CCI).** Heat map showing fold change in non-oxidized CL and oxidized CL (with the addition of 1 or 2 oxygens) at 4 h post-CCI with respect to naive. Regardless of treatment (vehicle or baicalein), CCI resulted in a decrease in non-oxidized CL and an increase in oxidized CL compared to naive animals. Reduction in non-oxidized CL and accumulation in oxidized CL was most prominent in highly unsaturated species. (N=5-6/group).

**Figure S9. Effect of baicalein administration on probe trial performance after controlled cortical impact (CCI).** Following visible platform testing on day 15 post-injury, a 60 s probe trial was performed to evaluate time spent in the southwest quadrant when the platform was removed. Post-hoc analysis of one-way ANOVA showed that CCI-injured groups spent significantly less time in the target quadrant than shams, but no effect of therapy was observed. (Data are Mean ± SD, N=9-10/group, \**p*<0.01 vs sham).