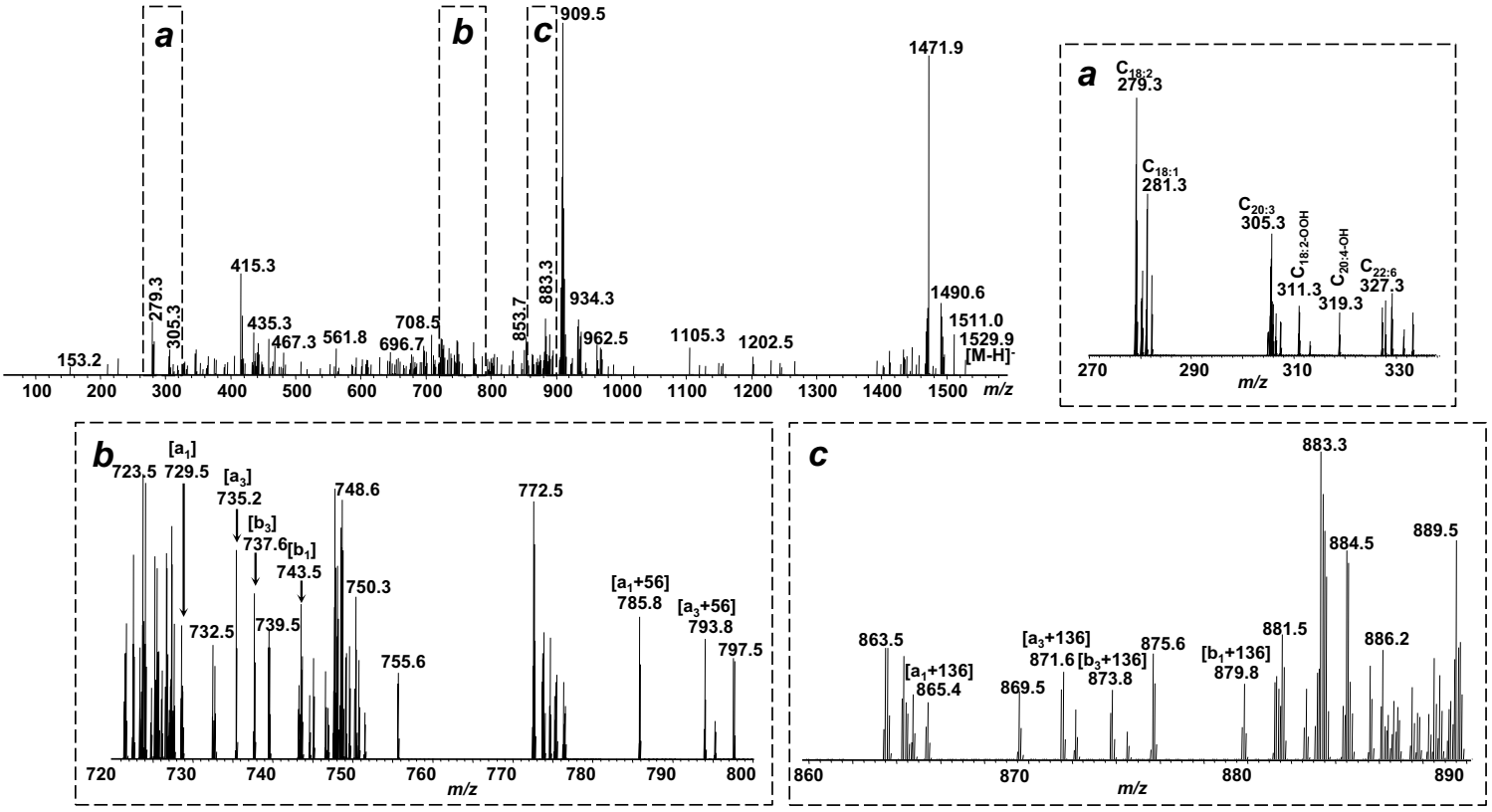

Figure S1. MS/MS fragmentation of CL species with *m/z* 1529.9 from irradiated lung.
Two overlapping signals corresponding to molecular species of oxidized CL (CL-$C_{18:1}$/$C_{18:2\text{-}OOH}$/$C_{18:1}$/$C_{22:6}$, and CL-$C_{18:2}$/$C_{20:4\text{-}OH}$/$C_{20:4\text{-}OH}$/$C_{18:1}$) along with several non-oxidized CL were detected in MS/MS spectrum of CL molecular ion with m/z 1529.9. CL-$C_{18:1}$/$C_{18:2\text{-}OOH}$/$C_{18:2}$/$C_{22:6}$: Ions $[a_1]^-$ and $[b_1]^-$ with *m/z* 729.5 and *m/z* 743.5, respectively corresponding to $C_{18:1}$/$C_{18:2\text{-}OOH}$-PA and $C_{18:1}$/$C_{22:6}$-PA were formed during fragmentation of the molecular ion with *m/z* 1529.9. Additionally characteristic daughter ions $[a_1+56]^-$ (m/z 785.8), $[a_1+136]^-$ (m/z 865.6), and $[b_1+136]^-$ (*m/z* 879.8) were detected on MS/MS spectrum as well. CL-$C_{18:2}$/$C_{20:4\text{-}OH}$/$C_{20:4\text{-}OH}$/$C_{18:1}$: $[a_3]^-$ and $[b_3]^-$ ions with *m/z* 735.4 and *m/z* 737.6 corresponding to $C_{18:2}$/$C_{20:4\text{-}OOH}$-PA and $C_{20:4\text{-}OH}$/$C_{18:1}$-PA as well as additional ions with m/z 793.8 ($[a_3+56]^-$), *m/z* 871.6 ($[a_3+136]^-$) and *m/z* 873.5 ($[b_3+136]^-$) were formed after fragmentation of molecular ion with m/z 1529.9. In addition, molecular ions of $C_{18:1}$ (*m/z* 281.3), $C_{18:2}$ (*m/z* 279.3), $C_{18:2\text{-}OOH}$ (*m/z* 311.3), $C_{20:4\text{-}OH}$ (*m/z* 319.3), and $C_{22:6}$ (*m/z* 327.3) were present in MS/MS spectrum. Parts of MS^2 spectrum of the molecular ion with *m/z* 1529.8 are shown in the ranges of *m/z* 270 – 340 (**a**) in the range of *m/z* 720 – 800 (**b**) and in the range of *m/z* 860 – 890 (**c**).

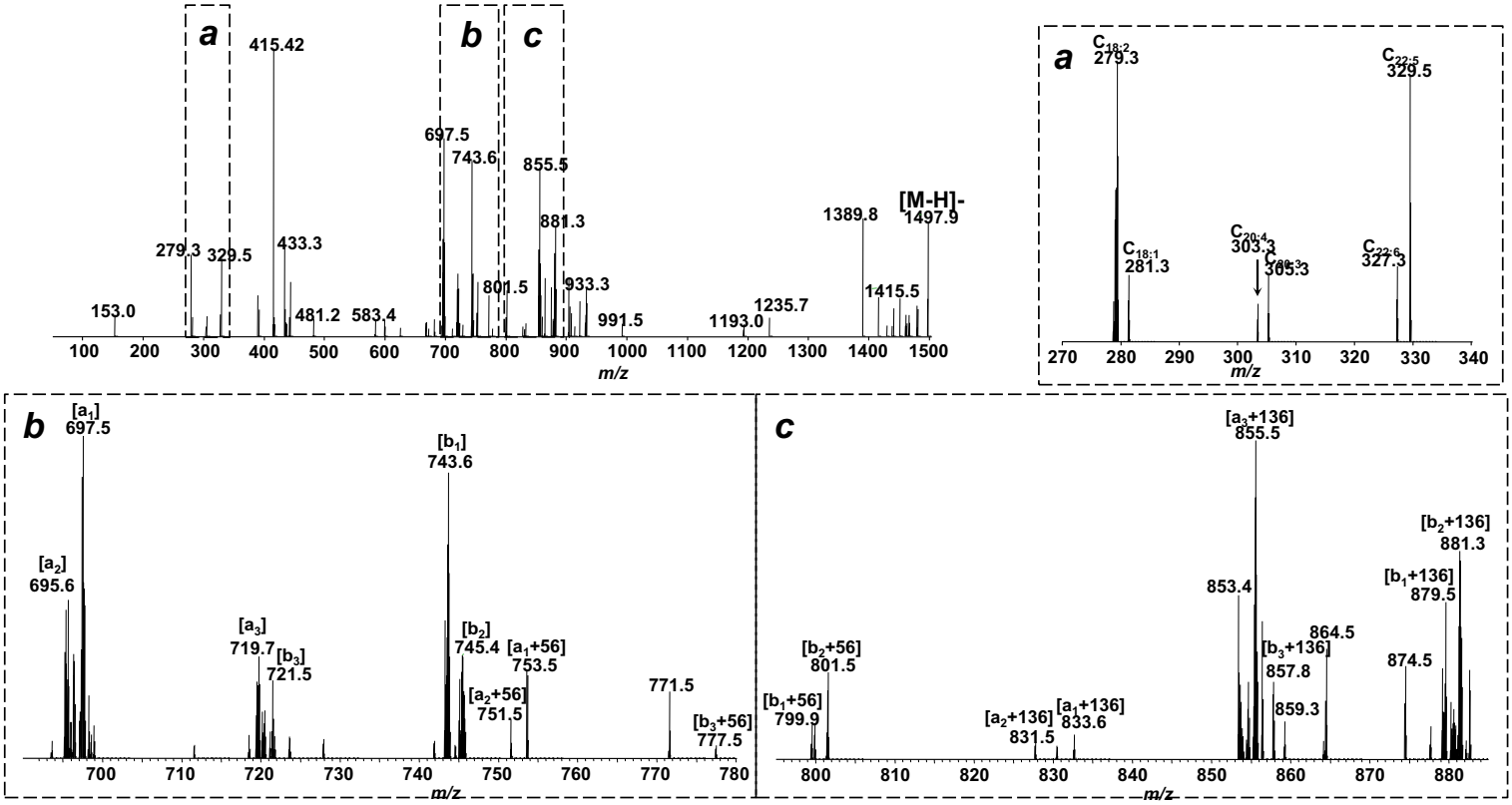

Figure S2**.** MS/MS fragmentation of CL species with *m/z* 1497.9 from control lung.
Four overlapping molecular species of CL (CL-$C_{18:1}/C_{18:2}/C_{18:2}/C_{22:6}$, CL-$C_{18:2}/C_{18:2}/C_{18:2}/C_{22:5}$, CL-$C_{18:2}/C_{20:4}/C_{20:3}/C_{18:2}$, and CL-$C_{18:2}/C_{20:4}/C_{20:4}/C_{18:1}$) were detected in MS/MS spectrum of CL molecular ion with m/z 1497.9. CL-$C_{18:1}/C_{18:2}/C_{18:2}/C_{22:6}$: Ions $[a_1]^-$ and $[b_1]^-$ with *m/z* 697.7 and *m/z* 743.5, respectively corresponding to $C_{18:1}/C_{18:2}$-PA and $C_{18:2}/C_{22:6}$-PA were formed during fragmentation of the molecular ion with *m/z* 1497.9. Additionally characteristic daughter ions $[a_1+56]^-$ (*m/z* 753.7), $[a_1+136]^-$ (*m/z* 833.6), $[b_1+56]^-$ (*m/z* 799.9), and $[b_1+136]^-$ (*m/z* 879.6) were detected on MS/MS spectrum as well. CL-$C_{18:2}/C_{18:2}/C_{18:2}/C_{22:5}$: Fragmentation analysis revealed the presence of $[a_2]^-$ and $[b_2]^-$ ions with *m/z* 695.5 and *m/z* 745.8 mainly corresponding to $C_{18:2}/C_{18:2}$-PA and $C_{182}/C_{22:5}$-PA. Daughter ions with *m/z* 751.7 ($[a_2+56]^-$); *m/z* 831.5 ($[a_2+136]^-$); *m/z* 801.6 ($[a_2+56]^-$ and 881.3 ($[b_2+136]^-$) were additionally detected on MS/MS spectrum. CL-$C_{18:2}/C_{20:4}/C_{20:3}/C_{18:2}$, and CL-$C_{18:2}/C_{20:4}/C_{20:4}/C_{18:1}$: $[a_3]^-$ and $[b_3]^-$ ions with *m/z* 719.3 and 721.6 corresponding to $C_{18:2}/C_{20:4}$-PA and $C_{20:3}/C_{18:2}$-PA or $C_{20:4}/C_{18:1}$-PA as well as addition ions with *m/z* 855.5 ($[a_3+136]^-$), *m/z* 777.5 ($[b_3+56]^-$) and *m/z* 857.5 ($[b_3+136]^-$) were formed after fragmentation of molecular ion with m/z 1497.9 Molecular ions with m/z 415.5 and *m/z* 417.5 were formed during fragmentation of the molecular ion with *m/z* 1497.9 as well and corresponding to ions $[a]^-$ and $[b]^-$ without one fatty acid residue. In addition, molecular ions of $C_{18:1}$ (*m/z* 281.3), $C_{18:2}$ (*m/z* 279.3), $C_{22:5}$ (*m/z* 329.3), $C_{20:4}$ (*m/z* 303.3), $C_{20:3}$ (*m/z* 305.3) and $C_{22:6}$ (*m/z* 327.3) were presented in MS^2 spectrum as well.Parts of MS/MS spectrum of molecular ion with *m/z* 1497.9 shown in the range of *m/z* 270 – 340 (**a*)*** in the range of *m/z* 690 – 780 (**b**) and in the range of *m/z* 790-890 (**c**).

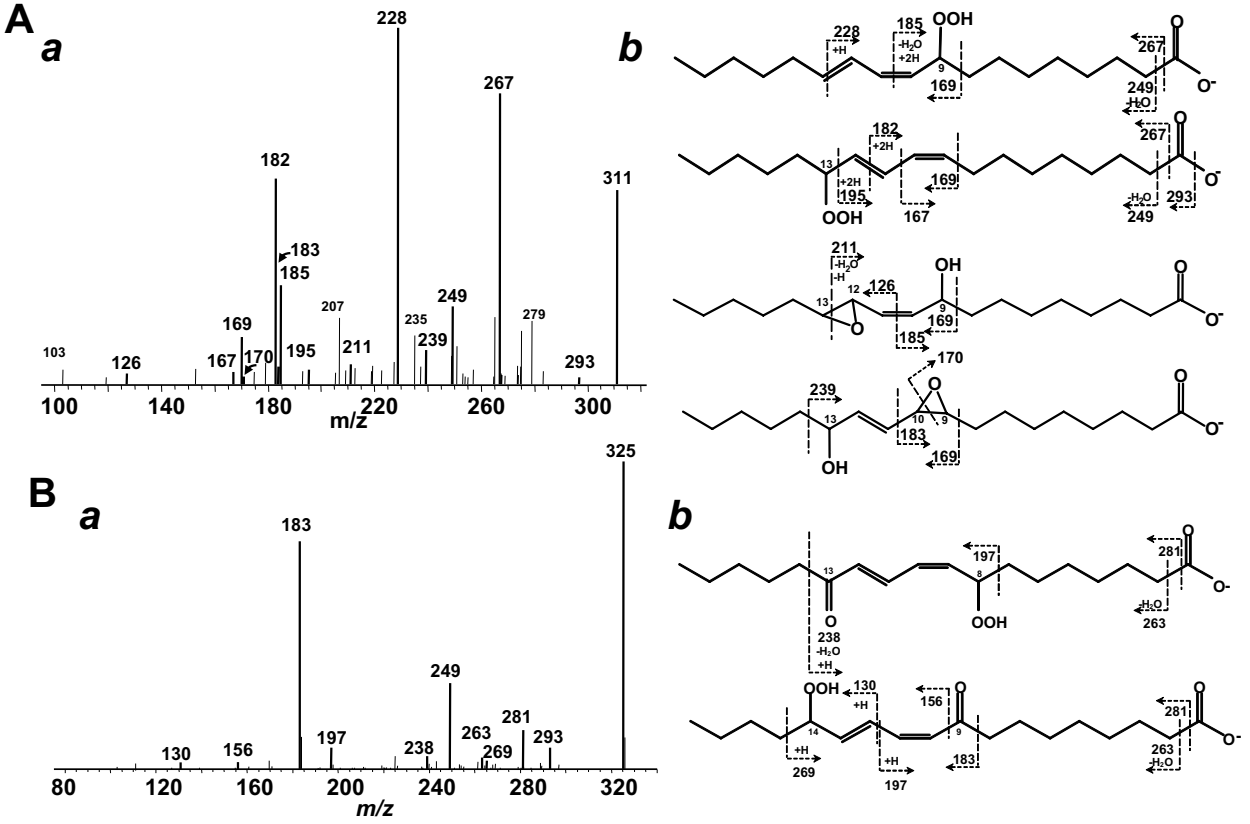

Figure S3. Identification of oxygenated fatty acids in CL obtained from the lung of mice exposed to TBI.
A –Typical MS/MS spectrum of oxygenated $C_{18:2}$ with *m/z* 311 (**a**) after CL hydrolysis by phospholipase A_2. Fragmentation pattern of molecular ion with m/z 311 (**b**). **B –**Typical MS/MS spectrum of oxygenated $C_{18:2}$ with *m/z* 325 (a) after CL hydrolysis by phospholipase A_2. Fragmentation pattern of molecular ion with m/z 325 (**b).**

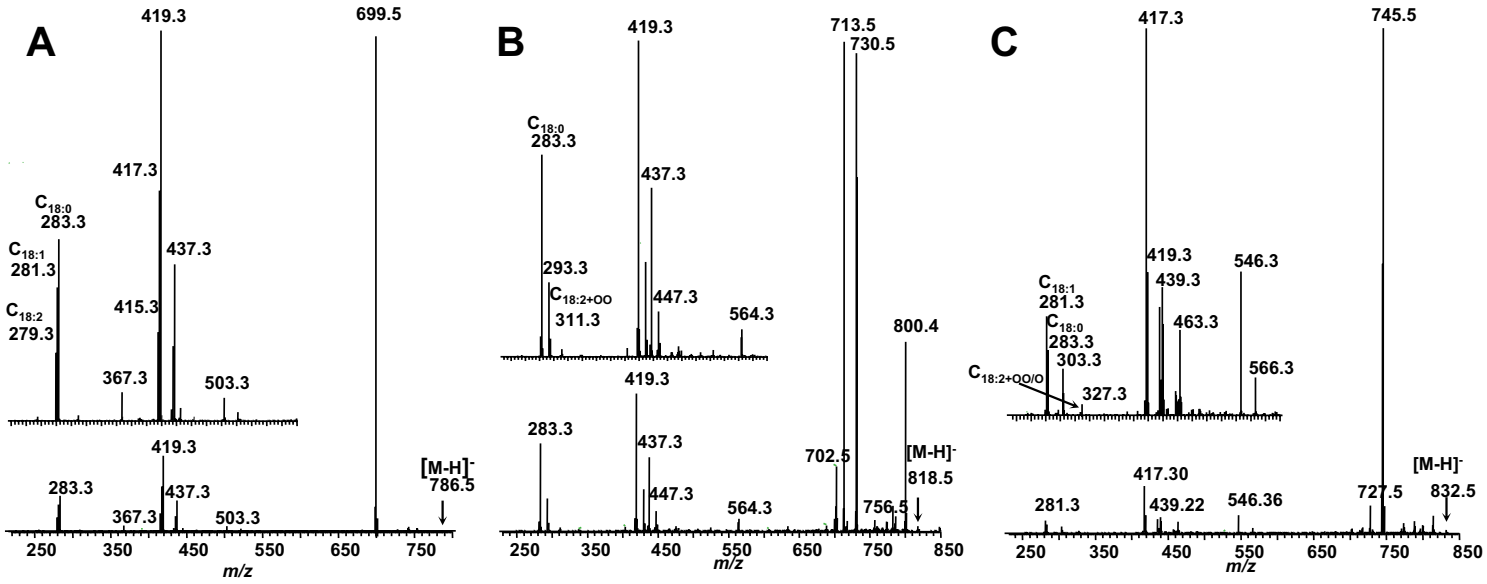

Figure S4. Identification of oxidized PS molecular species from the lung of mice exposed to TBI.
A – Negative ion ESI-MS/MS spectra of PS species with *m/z* 786.5 from control lung. **B –** MS/MS fragmentation of oxidized PS molecular species with *m/z* 818.5 from the lung of mice exposed to TBI at the dose of 10Gy. **C –** MS/MS fragmentation of oxidized PS molecular species with *m/z* 832.5 from the lung of mice exposed to TBI at the dose of 10Gy. Part of MS/MS spectra in the range of *m/z* 200 – 600 for the respective molecular ions is shown as an inserts. The loss of serine group of PS with m/z 786.5, *m/z* 818.5 and *m/z* 832.5 yielded the fragments with *m/z* 699.5, *m/z* 731.5 and *m/z* 745.6, respectively. Product ions with *m/z* 419.3 originated from fragments with *m/z* 699.5, *m/z* 731.5 and *m/z* 745.6 after loss of $C_{18:2}$, mono-hydroperoxy-$C_{18:2}$or mono-hydroxy/mono-epoxy-$C_{18:2}$ and mono-hydroperoxy/mono-oxo-$C_{18:2}$, respectively. Molecular ions with *m/z* 283.3, *m/z* 281.3 and *m/z* 279.3 corresponding to $C_{18:0}$ $C_{18:1}$ and $C_{18:2}$ acids, respectively were also formed during fragmentation of parent ion with *m/z* 786.7. Fragmentation of oxidized molecular species of PS with m/z 818.5 and 832.5 revealed formation of additional ions with *m/z* 311.3 and *m/z* 325 corresponding to mono-hydroperoxy-$C_{18:2}$or mono-hydroxy/mono-epoxy-$C_{18:2}$ and mono-hydroperoxy/mono-oxo-$C_{18:2}$, respectively. Daughter ions with m/z 281.3 and *m/z* 327.3 were present in spectrum of molecular ions with *m/z* 832.5 and correspond to non-oxidized PS $C_{18:1}$/$C_{22:6}$. Thus, the molecular ion at *m/z* 786.5 corresponds to molecular species of PS $C_{18:0}$/$C_{18:2}$ whereas the molecular ions with *m/z* 818.5 and *m/z* 832.5 correspond to molecular species of oxidized PS $C_{18:0}$/mono-hydroperoxy-$C_{18:2}$ or $C_{18:0}$/mono-hydroxy/monio-epoxy-$C_{18:2}$ and $C_{18:0}$/mono-hydroperoxy/mono-oxo-$C_{18:2}$.