

**Supplementary Fig. 1. Silencing COX-2 reversed the proferroptotic effects induced by TLR2 overexpression in SH-SY5Y cells.** SH-SY5Y cells were transfected with an overexpression negative control plasmid (oe-NC) or a TLR2 overexpression plasmid (oe-TLR2) or co-transfected with oe-TLR2 and either a negative control shRNA (sh-NC) or a COX-2-targeting shRNA (sh-COX-2). The protein expression levels of ACSL4 and GPX4 were detected by Western blot. Data The data are expressed as the means ± SDs. n = 3. \*\**p <* 0.01, \*\*\**p <* 0.001.

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**Supplementary Fig. 2. Argon inhalation did not significantly alter the expression of ferroptosis-related proteins in the spinal cords of mice**. C57BL/6J mice were exposed to either a control atmosphere (79% N₂ and 21% O₂) or an argon atmosphere (75% Argon, 21% O₂ and 4% N₂) for 1 hour daily for 20 days. Following the treatment period, spinal cord tissues were collected. (A) The paw withdrawal threshold (PWT) and paw withdrawal latency (PWL) of the mice were measured at specified time points to evaluate pain behaviors. (B) The levels of oxidative stress markers (MDA, GSH, and iron) in the spinal cord tissue were quantified using specific biochemical kits. (C) The protein expression levels of ACSL4, GPX4, FTL and SLC7A11 were detected by Western blot. Data. The data are expressed as the means ± SDs. n = 5.

Supplementary Table 1. Primer sequences

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| Gene | Forward (5′-3′) | Reverse (5′-3′) |
| *TLR2* | 5′-ACTTCTCCCATTTCCGTCTT-3′ | 5′-GGACTTTATCGCAGCTCTCA-3′ |
| *COX-2* | 5′-CGGTGAAACTCTGGCTAGACAG-3′ | 5′-GCAAACCGTAGATGCTCAGGGA-3′ |
| *GAPDH* | 5′-GGATTTGGTCGTATTGGGCG-3′ | 5′-TCCCGTTCTCAGCCATGTAG-3′ |