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"Repeated mild traumatic brain injury increases blood-brain barrier permeability in adolescent female Wistar rats at 24 hours post injury"

Adolescence is a critical period for brain development and is associated with increased susceptibility to traumatic brain injuries (TBIs), particularly among young athletes. While most TBIs are mild, the damage from repeated mild TBI (rmTBI) can accumulate to the levels comparable to a more severe injury. Previous studies have shown that a single mTBI transiently disrupts the blood-brain barrier (BBB), with peak extravasation occurring at 24 hours post-injury. The current study sought to identify whether our model of rmTBI would delay or extend this effect. Adolescent female Wistar rats were subjected to either 4 rmTBIs or the sham condition (matched isoflurane anesthesia) spaced 96 hours apart. At 1 to 4 days following the final TBI, animals were deeply anesthetized and given an i.v. injection of Evans Blue Dye (EBD), which binds to endogenous serum albumin, a large protein excluded from the brain by the healthy BBB. An hour after this injection, the animals are flushed with saline and the brains extracted for analysis. We found that EBD extravasation was significantly increased at 24h but had returned to sham levels by 48h post-injury. Future studies will incorporate males to identify whether there is a sex difference as well as investigating the potential compounding effects of alcohol exposure on BBB function.