Treatments for Neurotrauma

Nose-to-brain Delivery of Therapeutic Agents Against Blast-induced Traumatic Brain Injury

Several neuroprotective compounds showing efficacy against neuronal injury in in vitro or ex vivo studies are limited for clinical applications due to their inability to cross the blood brain barrier (BBB) (*Patel and Patel 2017*). Non-invasive intranasal nose-to-brain delivery bypasses the BBB to rapidly deliver drugs to the central nervous system along the olfactory and trigeminal neural pathways. Drugs applied in this manner have been detected in the brain and cerebrospinal fluid within 5-10 minutes of application (*Krishnan et al. 2016*). Charged molecules, neuroactive peptides and small proteins which cannot permeate the BBB can be rapidly delivered to the brain in minutes through the nasal route. The non-invasive intranasal administration doesn't require sterile conditions and hence can be self-administered in non-sterile environments such as battlefield conditions. Since intranasally administered drugs avoid hepatic first-pass effect and subsequent dilution, it will be very cost effective. Researchers at the Walter Reed Army Institute of Research (WRAIR; Silver Spring, Maryland), using validated pre-clinical models of single and repeated blast-induced TBI utilizing an advanced blast simulator, demonstrated intranasal brain delivery of polar macromolecules (otherwise excluded by the BBB) in preliminary studies and are evaluating the efficacy of these molecules as countermeasures to blast-induced neurotrauma following this novel route of administration.

In conclusion, these preclinical findings identify a non-invasive immediate means to pharmacologically counter blast-induced traumatic brain injury in austere non-sterile far-forward settings.

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