

## Intranasal Platelet Rich Plasma (PRP)

### Overview

Blood carries a healing agent that can assist in treating many injuries. By drawing blood and spinning it down in a centrifuge, we are able to harvest the platelet rich plasma (PRP). With this, a concoction can be made up and re-injected into the injured area to help strengthen and heal joints, ligaments or tissue.

PRP is an autologous concentration of human platelets to supraphysiologic levels. Platelets are irregularly shaped, nonnucleated cytoplasmic bodies derived from fragmentation of megakaryocyte precursors. PRP is a specialized form of blood plasma that is rich in growth factors, cytokines, and stem cell precursors.

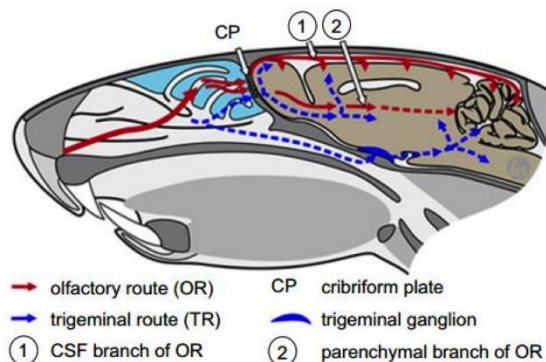
### Benefits

- Regrowth of brain collagen (proteins that provide strength and structure)
- Activation and targeting of stem cells (cellular regeneration and differentiation)
- Increased angiogenesis (the development of new blood vessels)
- Decreased inflammation (increasing brain functionality)
- Reduction of amyloid proteins (which result in memory loss)

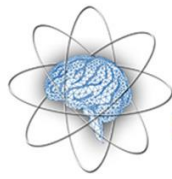
### Application for TBI

As part of our patented TBI Therapy Protocol, intranasal (IN) PRP infusions can be administered in coordination with another regenerative therapy to help accelerate regrowth and rehabilitation in the brain.

The following diagram is key for understanding how substances can get into the brain—in the CSF or parenchyma. One question commonly asked is, how *long* does it take for substances to get into the brain via this intranasal delivery? The consistent answer provided by the researchers and the studies is 10-15 minutes for the substances to be detected in the CSF after intranasal administration.



We do not know exactly what IN plasma does in the brain, but we have a pretty good idea. We know



that IN adult stem cells have been used to treat ischemic brain damage by reducing gray and white matter loss.<sup>1</sup> IN adult stem cells downregulate neuroinflammatory cytokines and rescue tyrosine hydroxylase (TH)-positive neurons in the substantia nigra in AD and PD patients.<sup>2</sup> We also know that there are neurosurgical researchers who have placed epidermal growth factors and fibroblast growth factors directly onto the dentate gyrus, via the ventricles, of the hippocampus after opening the skull surgically.

“Growth factor basic fibroblast growth factor (bFGF) or epidermal growth factor (EGF) infusion enhances injury-induced cell proliferation in the dentate gyrus (DG) and improves cognitive function in rats following fluid percussive injury.”<sup>3</sup>

“Other studies have found that infusion of S100 $\beta$  or VEGF can also enhance neurogenesis in the hippocampus and improve the functional recovery of animals following TBI (Kleindienst et al., 2005; Lee and Agoston, 2010; Thau-Zuchman et al., 2010).”<sup>4</sup>

Neurogenesis from plasma growth factors is certainly one benefit of PRP but it also has many other benefits and possible mechanisms of action. Autologous plasma contains growth factors and cytokines to aid the injured brain:

- VEGF, EGF increases angiogenesis
- PDGF, TGF- $\beta$  enhance collagen growth
- IGF-1 stimulates protein synthesis

Enhanced collagen IV in neurons of the brain has been shown to have a neuroprotective effect and reduce amyloid-beta proteins.<sup>5</sup>

Other studies with PRP and the brain have shown that plasma cytokines:

- Control inflammatory mediators cox1, cox2
- Guide stem cells to areas of injury

Human plasma lysate administered to rats (via the middle cerebral artery) after ischemic stroke was

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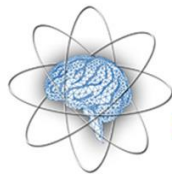
<sup>1</sup> Van Velthoven, C. T., Kavelaars, A., van Bel, F., & Heijnen, C. J. (2010). Nasal administration of stem cells: a promising novel route to treat neonatal ischemic brain damage. *Pediatric research*, 68, 419-422.

<sup>2</sup> Danielyan, L., Beer-Hammer, S., Stolzing, A., Schäfer, R., Siegel, G., Fabian, C., ... & Novakovic, A. (2014). Intranasal delivery of bone marrow-derived mesenchymal stem cells, macrophages, and microglia to the brain in mouse models of Alzheimer's and Parkinson's disease. *Cell transplantation*, 23(1), S123-S139.

<sup>3</sup> Sun, D. (2014). The potential of endogenous neurogenesis for brain repair and regeneration following traumatic brain injury. *Neural regeneration research*, 9(7), 688.

<sup>4</sup> Ibid.

<sup>5</sup> Gladstone Institutes. (2008, December 10). Collagen May Help Protect Brain Against Alzheimer's Disease. *ScienceDaily*. Retrieved March 2, 2016 from [www.sciencedaily.com/releases/2008/12/081210150713.htm](http://www.sciencedaily.com/releases/2008/12/081210150713.htm).



shown to reduce infarct volume.<sup>6</sup>

The exciting, synergistic aspect of plasma is the idea that PRP guides stem cells to areas of injury in the brain or elsewhere in the body. Stem cells get upregulated by certain nutritional foods, HBOT, exercise, and may also be administered. Healing the damaged, ischemic tissue of the brain involves PRP, stem cells, and HBOT in a very unique, coordinated manner. Improving uptake and usage of these factors in the brain is a key component to healing.

#### *Protocols*

Patients present for a 3-day program are recommended to receive at least 2 HBOT dives before doing IN PRP. If possible, with time and patient permitting, it is recommended that patients get a second IN PRP/insulin/glutathione/B12 (PRP cocktail) treatment (or IN stem cell treatment) after the first treatment. For moderate to severe TBI patients, it is recommended to get an IN PRP cocktail every 2-3 weeks while completing a 40 HBOT series. If patients are local and unable to afford such treatment, getting a IN PRP every 1-2 months, in combination with home HBOT, for a total of 3-4 treatments in 6 months is acceptable.

#### *Dangers/Side Effects*

Bloody noses and swallowing plasma or local anesthesia have been the biggest side-effects of IN PRP. If the patient swallows the PRP/insulin/nutrient cocktail, he or she may need some form of sweet substance to eat to prevent a drop in blood sugar. Sneezing is another danger of the treatment. Using good sterile technique will prevent infection.

#### *For More Information*

Visit [tbitherapy.com/prp-therapy-for-brain-injury](http://tbitherapy.com/prp-therapy-for-brain-injury)

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<sup>6</sup> Zhang, Y., Ying, G., Ren, C., Jizhang, Y., Brogan, D., Liu, Z., . . . Ji, X. (2015). Administration of human platelet-rich plasma reduces infarction volume and improves motor function in adult rats with focal ischemic stroke. *Brain Research*, 1594, 267-273.