

## Overview

TruBrain is a neuroscience company that develops functional beverages designed by neuroscientists for improved focus, memory, and mental clarity. Our products distinguish themselves by using the right ingredients at optimal dosages and are testing with wearable brain wave technology. The purpose of this document is to introduce you the ingredients we've selected in truBrain and the benefits the research has shown that these ingredients provide.

## Meet our Lead Neuroscientist: Dr. Andrew Hill

Dr. Hill received his PhD in Cognitive Neuroscience from UCLA in 2012, studying how attention operates in the brain. He is currently lecturing for the Undergraduate Education Initiatives program at UCLA, teaching a course on sequence gerontology, and the neuroscience of healthy brain aging. Dr. Hill has published chapters on measuring and modulating human attention, and continues to research self regulation. Prior to UCLA, Dr. Hill obtained extensive experience working with both psychiatric and developmental populations as well as gaining experience in high technology areas. He received his B.S. in Psychology/Neuroscience from UMass Amherst. See Andrew's book chapters Measuring & Modulating Hemispheric Attention and EEG Correlates of Hemispheric Word Recognition.

Below we have listed different areas of brain health and the ingredients in the truBrain blend that have been shown to affect them.

### Increase in oxygen consumption in the brain

-Piracetam can increase brain oxygen consumption mostly during periods of insufficient neuronal oxidation, therefore resulting in increased glucose oxidation.<sup>123</sup>

-ALCAR can enhance glucose levels in the brain.<sup>4</sup> It can also stabilize and prolong activities of anti-oxidant enzymes and can reduced oxidative damage and neuronal loss from alcohol. ALCAR has also been associated with neuroprotectivity by attenuating the increase in harmful oxidation and decline in ATP that occurs when neurons are close to beta-amyloid pigmentation, a compound correlated with Alzheimer's Disease and aging.<sup>567</sup>

-DHA can increase cerebral oxygenation.<sup>8</sup>

### Neuroprotection and reduction in rate of cognitive decline

-Oxiracetam can reduce cognitive decline in individuals suffering from neurodegenerative conditions and organic cognitive decline.<sup>910</sup> Studies also report improved verbal fluency and improved psychosocial function in these individuals.<sup>1112</sup> Oxiracetam appears to have potent anti-amnesiac effects against cholinergic and NMDA antagonists.<sup>131415</sup>

-Piracetam can reduce cognitive decline in individuals suffering from neurodegenerative conditions and organic cognitive decline.<sup>1617</sup> Piracetam can increase membrane permeability and fluidity and can normalize mitochondrial function in response excessive oxidative stress; Piracetam can also inhibit blood clotting.<sup>18192021</sup>

-CDP-choline can preserve membrane plasticity and ATP synthase activity and can reduce apoptosis.<sup>222324</sup> It can also has neuroprotective effects when applied to dopaminergic neurons threatened by neurodegenerative conditions.<sup>252627</sup>

-L-theanine can reduce corticosterone levels and can attenuate stress-induced memory impairment.<sup>282930</sup>

-ALCAR can reduce the rate of cognitive decline in individuals suffering from neurodegenerative conditions and organic cognitive decline and can elevate mood and alleviate depression-like symptoms in the elderly.<sup>3132333435363738</sup>

-L-Tyrosine can attenuate memory impairment associated with acute stressors.<sup>3940</sup> As a pre-cursor for catecholamines, L-Tyrosine can contribute to the increase in anti-oxidants that enhance neuroprotectivity.<sup>41</sup>

-DHA can normalize a stress response to acute stressors and can attenuate noradrenaline levels associated with stressors.<sup>4243444546</sup> High levels of DHA are associated with a lower risk of developing dementia and related neurodegenerative diseases.<sup>47484950</sup>

-Magnesium can reduce depressive symptoms in response to environmental stressors.<sup>51525354</sup>

## Cognition (learning & memory) enhancement

-Oxiracetam appears to increase long-term potentiation (LTP) in hippocampal cells by positively modulating AMPA receptors, enhancing glutaminergic signaling.<sup>5556575859606162</sup>

Protein Kinase C (PKC) appears to be stimulated in hippocampal neurons with oxiracetam.<sup>636465</sup> Oxiracetam can potentiate ACh release from activated neurons in the hippocampus but does not influence resting ACh concentrations.<sup>6667</sup>

-Piracetam can positively modulate AMPA-glutamate and NMDA receptors and can also attenuate excessive neuronal firing.<sup>686970</sup> Increased ACh receptor expression has also been observed.<sup>71</sup>

-CDP-choline can increase acetylcholine synthesis, a neurotransmitter associated with learning and memory.<sup>7273</sup> Piracetam and Oxiracetam deplete ACh resources in the hippocampus, and CDP-choline supplements more ACh. CDP-choline can also enhance memory and cognition and in conjunction with Piracetam can have a synergistic effect towards increased memory formation and recall.<sup>74757677</sup>

-ALCAR can contribute to acetylcholine synthesis.<sup>78</sup>

-DHA can improve working memory and verbal fluency.<sup>79808182</sup>

-Magnesium can enhance working memory and recall. It can increase NMDA transmission potential while not affecting the resting membrane potential and can contribute to enhanced synaptic plasticity.<sup>8384858687</sup>

## Attention

-CDP-choline can enhance attentional focus.<sup>88</sup>

-L-theanine can enhance  $\alpha$ -waves in the brain, which are associated with relaxation, selective attention, and arousal/mental alertness.

-ALCAR appears to significantly reduce symptoms of ADHD.<sup>89</sup>

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