The Potential of Intranasal Light Therapy for brain stimulation

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The mother: intravenous irradiation

Parameters are based on Blood irradiation
Why the nose

Vascular concentration
Design opportunities

- Non-invasive blood irradiation
- Small and convenient
- Low cost
- Idiot proof
You can also run a truck over it!
It stimulates systemic homeostasis

...and the body attempts to heal any disequilibrium (represented by diseases and ailments).
When something profound works ....
Present parameters

**LED model:**
633 nM, CW
8 mW, 25 min
12 J/cm²

**Laser model:**
655 mW, CW
4.8 mW, 25 min
7.2 J/cm²
Re-emphasis from blood irradiation to brain stimulation
Deep brain stimulation for Parkinson’s – Example of effective alternative method

It’s about stimulation
History of neurological evidence

With present Intranasal Low Level Laser Therapy parameters

- Facial pain, 1998
- Intractable headache, 1998
- Cerebral thrombosis, 1999
- Parkinson’s disease, 1999
- Alzheimer’s disease, 1999
- Mild cognitive impairment, 2000
- Insomnia, 2001
- Post-stroke conditions, 2003
- Migraine, 2003
- Traumatic brain injury, 2003
- Schizophrenia, 2000
- Vascular dementia, 2005
- Cerebral palsy, 2007

Can we still improve?
Impr"ovement in brain blood flow

Before

After

Net increase

Stroke patient. 650 nm, 4 mW, 30 min/day, 7.2 J/cm²/day, 10 days

Source: Single photon emission computed photometry by Prof Xiao XC, 2005
Brain Cell Healing

In vitro post-oxidative stress. 670nm, 3 mW, 20 sec/day, 5 days

Intranasal: Path of low resistance to mid-brain

Transcranial

Limbic system

Picture source: OpimMeadow. Flickr
Thin ethmoid bone plate is thin
Opportunity for new parameters
Optical penetration depth

Source: Barolet D. Light-emitting Diodes (LED) in Dermatology. 2008

630nm

660nm

810nm
Effect of 10 hz pulsed mode


Neurological Severity Score

Area under curve
Deeper tissue travel may help with proximity to:

- Substantia nigra for Parkinson’s
- Subventricular zone for neurogenesis
- Hypothalamus for homeostasis

10 Hz helps:

- Greater neural response
- Seratonin for depression
- Alpha state 8-12 Hz entrainment for an “ordered state”
- Hippocampal theta state 5-10 Hz: resonates with hippocampus for behavioral inhibition, attention, spatial memory

Large beam footprint for:

- Systemic response
- Vascular dementia and Alzheimer’s
The “brain-effective” model

810 nm
10 mW
Pulsed: 10 Hz
50% duty cycle
25 min
7.5 J/cm² post-duty cycle
Initial reports

Enhanced neural response:
• Improved cognitive performance
• Enhanced post-stroke conditions
• Parkinson’s disease condition enhanced
• More efficient release of growth hormone as needed

But more clinical investigations needed