Application of Panax ginseng extract, Ginkgo biloba extract, and far-infrared light in the treatment of depression and its mechanism

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Abstract

Depression has been defined as a type of neurosis, also known as psychoneurosis. Patients tend to lose interest in daily activities and generate intense anxiety. The most common treatment options for depression are drug therapy, repetitive transcranial magnetic stimulation (rTMS), and psychotherapy. However, those treatment methods are either not obvious or have side effects, coupled with the high medical bills. Therefore, we hope to treat depression with gentle treatments with fewer side effects, also known as "Naturopathic Medicine." Most of the research shows that the severity of depression is negatively correlated with regional cerebral blood flow (rCBF) and decreased expression of serotonin. Accordingly, we choose Panax ginseng extract (PGE), Ginkgo biloba extract (EGb 761), and far-infrared light to treat depression. EGb 761 is an extract of Ginkgo biloba, which can promote the secretion of neurotrophic factors, anti-oxidation, and anti-inflammation, increase cerebral blood flow and circulation, and may reduce over-release cortisol effects on stress; Ginsenosides in PGE are considered to have vasodilation, anti-inflammatory, and anticancer activity. In addition, it can promote blood circulation by increasing body temperature through internal metabolism, similar to the mechanism of far-infrared light that has been recognized as improving blood circulation. Furthermore, they all have relatively mild side effects and are reasonably priced. However, this potential naturepoahty's mechanism has not been thoroughly studied. This project used an animal model of sion to explore the effect of EGb761, PGE, and far-infrared therapy. Moreover, we compare their efficacy with fluoxetine, a mainstream drug for depression. We adopted eight-week-old C57BL/6JNarl mice with induction of depression by cortisol (20 mg/kg) for seventeen days and treated them with PGE, EGb 761, and far-red light for another four weeks. We used the behavior tests to evaluate the outcome of the naturopathy. We found that both infrared irradiation and comprehensive treatment groups significantly improved depression according to the results from the open field test and tail suspension test. Moreover, the sucrose preference test showed increased sucrose intake in all infrared irradiation-treated groups. However, the elevated plus maze has relatively no difference. In the blood test, we found that the depression group has more leukocytes and higher cortisol expression in plasma, which all the treatments could prevent. Nevertheless, the plasma serotonin shows no significant differences. Furthermore, in the brain HE and IHC -VEGF staining, the data showed that the infrared irradiation group has enlarged vessels in the brain, which could imply better circulation in these groups. Thus, this Naturopathic Medicine could improve the symptoms of depression. These potential alternative treatments may have adjuvant benefits in treating depression that may reduce the economic burden of patients and decrease social costs.

Methods

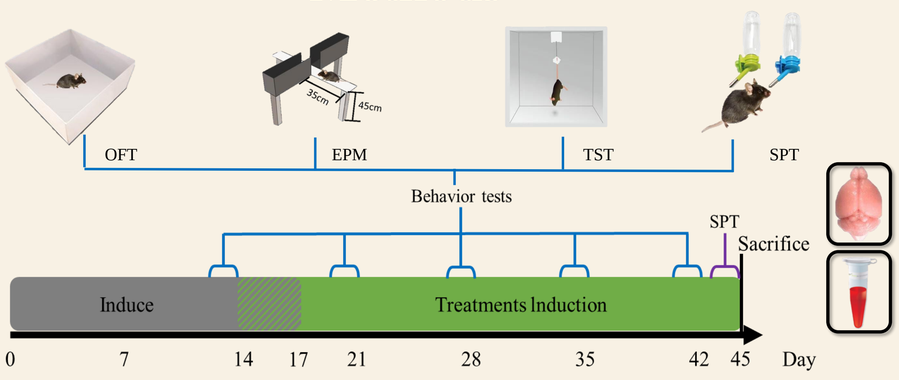

Figure 1. Time line

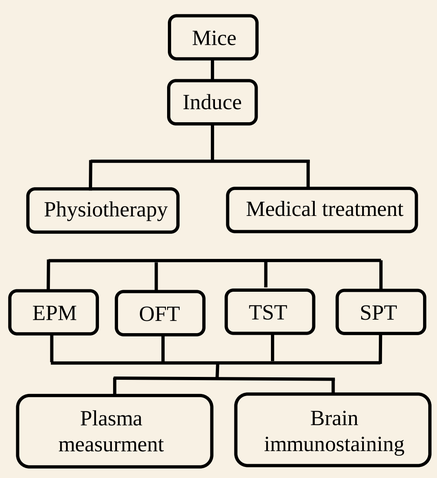

Figure 2. Experimental time Schedule

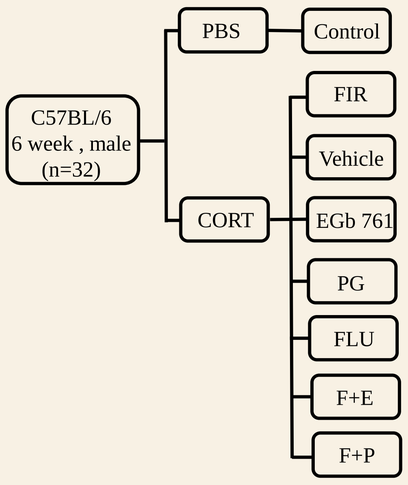

Figure 3. Groups

Figure 4. FIR instrument

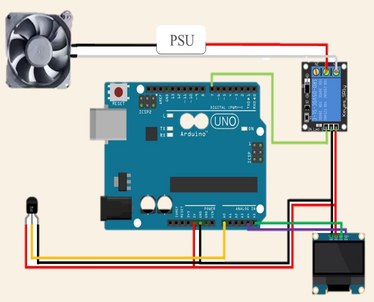

Figure 5. Circuit diagram

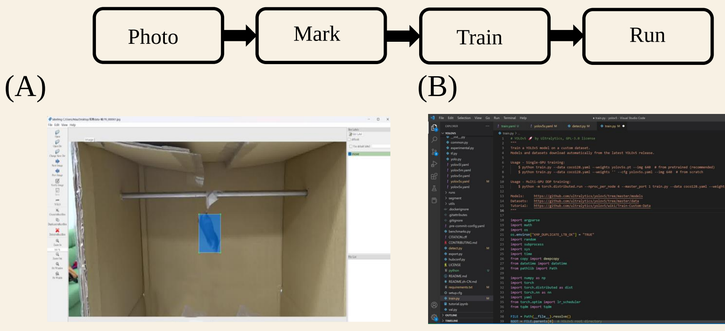

Figure 6. AI-assisted identification (A)Labellmg (B)VScode

Results

Table 1. Physiological parameters

is compare with the control group.*is compare with vehicle group $,#,*p<0.05;

	Control	Vehicle	FIR	EGb 761	PG	FLU	F+E	F+P
Brain(%)	1.9±0.015	1.94+0.02	1.99±0.01	2.05±0.01	1.94±0.01	2.01±0.007	2.01±0.01	1.98±0.1
Red Blood Cell ($10^6/mm^3$)	10.7±1.9	15±1.2#	9.3±1.4	9.2±1.5	11.1±1.5*	10.1±1.1*	8.6±1.1*	11±1.4*
White Blood Cell ($10^3/mm^3$)	25±3.7	58±10.9#	22±3.4*	38±6.5	40±7.1 *	17±4 *	24±5.7 *	44±5.6
Hemoglobin (gm/dl)	13.4±0.9	20±2 #	15.8±0.43	16.1±0.76	15.4±1.4 *	17±1 #	15.3±1*	14±0.7 *

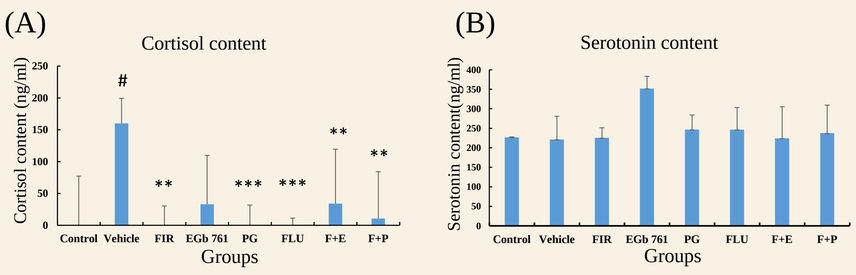

Figure 7. ELISA data (A) Cortisol content in plasma (B) Serotonin content in plasma.
is compare with the control group.*is compare with vehicle group #,*p<0.05;**p<0.01,***p<0.01

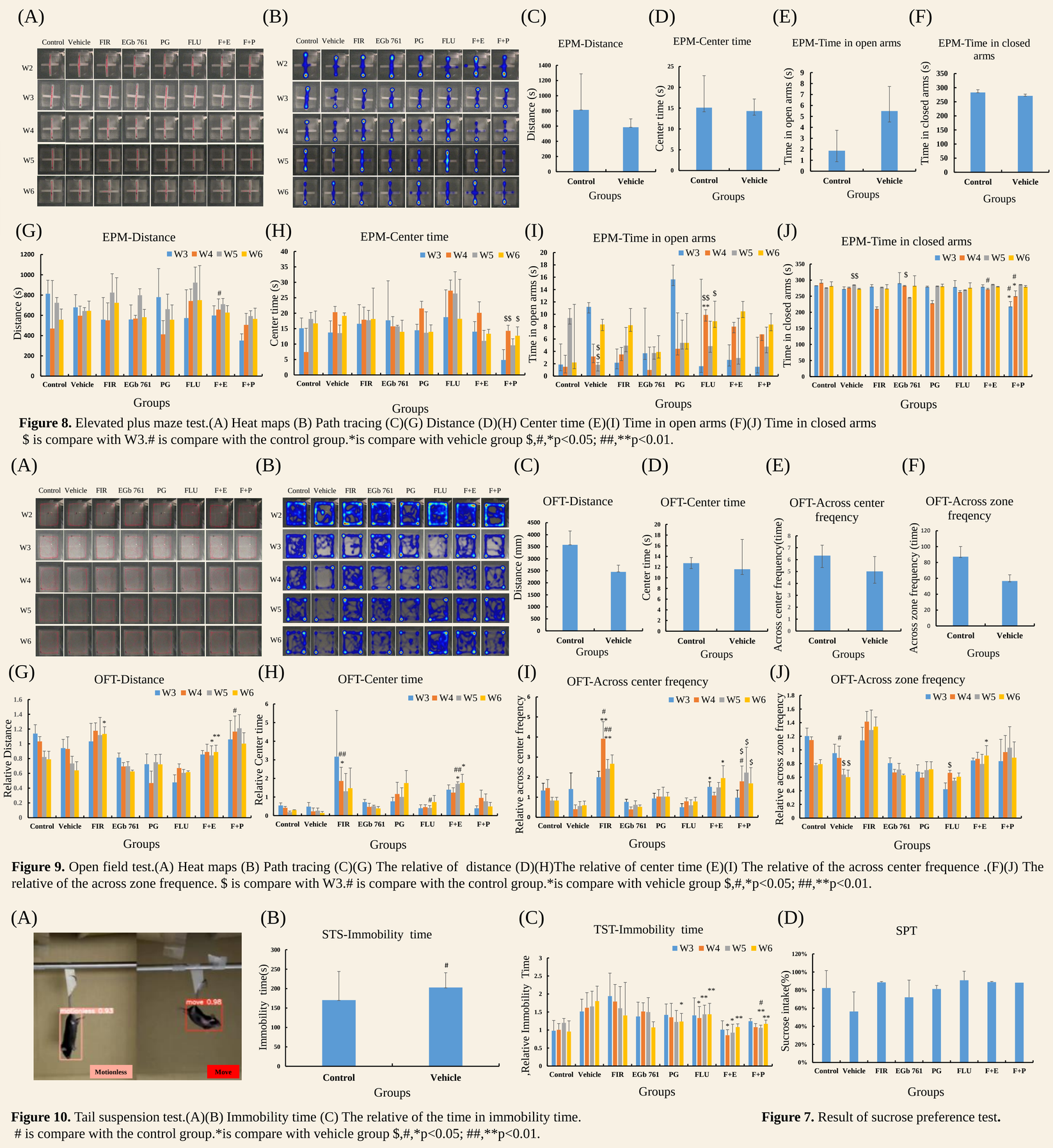

Figure 8. Elevated plus maze test.(A) Heat maps (B) Path tracing (C)(G) Distance (D)(H) Center time (E)(I) Time in open arms (F)(J) Time in closed arms
$ is compare with W3.# is compare with the control group.*is compare with vehicle group $,#,*p<0.05; ##,**p<0.01.

Figure 9. Open field test.(A) Heat maps (B) Path tracing (C)(G) The relative of distance (D)(H)The relative of center time (E)(I) The relative of the across center frequence .(F)(J) The relative of the across zone frequence. $ is compare with W3.# is compare with the control group.*is compare with vehicle group $,#,*p<0.05; ##,**p<0.01.

Figure 10. Tail suspension test.(A)(B) Immobility time (C) The relative of the time in immobility time.
is compare with the control group.*is compare with vehicle group $,#,*p<0.05; ##,**p<0.01.

Figure 7. Result of sucrose preference test**.**

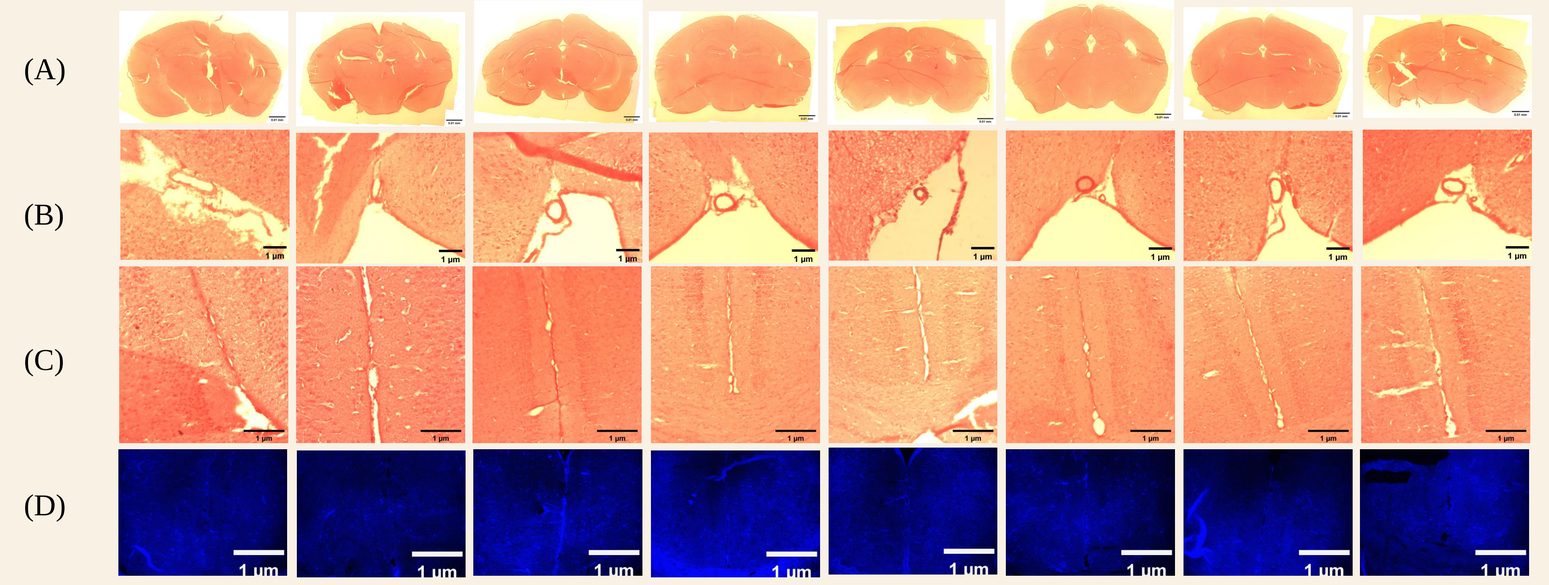

Figure 11. Brain organization and vascular networks.(A)H&E staining of brain sections.(B)The blood vessels (C) Vascular networks (D) Immunohistochemistry of Vascular networks

Conclusion

The data showed that the far-infrared light irradiation had brought improvement in treating depression: (1) increased locomotion activity, (2) reduced anxiety, and (3) improved the ability to feel anhedonia. In addition, the far-infrared light irradiation combined with PG and EGb761 treatment can also achieve a similar effect. Thus, this project demonstrates that These natural medicine treatments are effective in treating depression, and their effects are similar to the depression drug fluoxetine.

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