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SHORT COMMUNICATION

Anti-Parkinsonian Effect of Mushrooms Against Haloperidol Induced Catalepsy in Wistar Rats

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ABSTRACT
Haloperidol caused Parkinson's disease (PD) in Wistar rats. This study sought to ascertain whether ~~or not~~ mushrooms could be used as an effective medicine in Parkinson's disease treatment, as well as how haloperidol affected the disease's progression. The antioxidants in mushrooms amplify the impacts of haloperidol, such as increased hanging time, locomotor activity, and orofacial dyskinesia (OD). The study's objective was to evaluate the neuroprotective efficaciousness and the antioxidant status in vivo of ethanolic extracts derived from three distinct species of mushrooms, namely Pleurotus ostreatus, Agaricus bisporus, and Cantharellus cibarius, in relation to OD, locomotor activity, and hanging time, by haloperidol. For 21 days, haloperidol (1milligram/kg) was given to induce muscle rigidity, OD and catalepsy in rats. The rats were then evaluated and examined in response to an ethanolic extract of various species of mushrooms, including P. ostreatus, A. bisporus, and C. cibarius. It was observed that the antiparkinsonian animal models treated with ethanolic mushroom extracts had a therapeutic effect against Parkinson's disease.
Keywords: *antioxidant, antiparkinsonian effect, mushrooms, orofacial dyskinesia, locomotor activity and hanging time.*

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INTRODUCTION

A common adverse extrapyramidal adverse reaction to the antipsychotic haloperidol, a D2 receptor antagonist, is akinesia, or stiffness in drive [1]. Rats and mice after treatment with haloperidol may become immobile to the point of catalepsy, which is comparable to bradykinesia, akinesia, and PD [2]. Commonly used method to assess the severity of catalepsy in animals is the catalepsy bar test, which measures how long it takes an animal to adjust to an externally imposed position [3]. Catalepsy by haloperidol is a commonly used animal model for parkinsonian research and the screening of possible antiparkinsonian drugs because of its simplicity in testing combinations and ease of use [4]. For example, PD non-motorized indicators may coexist with cognitive and emotional abnormalities. Among these non-motor manifestations are the motor symptoms bradykinesia, stiffness, tremors, and postural instability [5]. Despite the assumption that a correlation exists between the two, there has been evidence of a relationship between increasing anxiety and both improving and worsening motor symptoms [6]. Some people may occasionally exhibit significant motor complaints, others may be able to execute typical, quick, and accurate movements or tasks. Paradoxical kinesia is a syndrome that is initiated by strong feelings such as panic or fury, or even unexpected visual inputs [7, 14]. The possibility that different motor paths may be fully or partially useful and that therapies aimed at these circuits may improve or restore mobility in patients with Parkinson's disease makes paradoxical kinesia particularly intriguing [8]. PD is mostly accompanying with a dopamine shortage in the nigrostriatal pathway [9]. The adaxial tegmental region, the origin of the dopaminergic mesocorticolimbic pathway and a crucial substrate elaborate [23] in the regulation of emotion and cognition, may see a significant loss of neurons as PD progresses [5]. Given the motor impairments associated with PD, it is not surprising that the

mesocorticolimbic pathway influences fear/anxiety related reactions, which in turn influences the patient's expressive utter to some extent [10, 23]. The ability of the dopaminergic systems to regulate adaptive responses to potentially detrimental situations appears to be influenced by the kind of stressful or unpleasant stimuli that set off the managing response [14, 16]. In the context of catalepsy, however, there has been less discussion in the literature about the dopaminergic regulation of adaptive reactions to traumatic situations [25, 29]. Research on the connection between emotional states and catalepsy is therefore essential. Most of the current PD drugs target symptoms rather than slowing the progression of the disease or stopping the degeneration of dopaminergic neurons [9, 27]. Parkinson's disease (PD) treatment guidelines abound and recommend levodopa for elderly individuals and dopamine agonists for young-onset PD patients. For patients experiencing their first episodes of erratic movements, MAO-B inhibitors are a better option for initial treatment. COMT inhibitors have the ability to enhance the benefits of levodopa when feelings of fatigue arise [10]. Two highly effective treatments are pharmaceutical dopamine replacement and deep brain stimulation. Parkinson's disease has been effectively managed in recent decades by improving quality of life [11]. In future, several methods will be developed to identify the population most susceptible to Parkinson's disease [11]. Furthermore, novel formulations of existing marketed drugs are being explored to improve their efficacy and reduce their toxicity [12]. β-asarone was one such drug that demonstrated potential in treating Parkinson's disease [13]. It has been discovered that many plant genera offer remarkable medicinal potential against neurodegenerative disorders. [4]. It has been found to have many positive benefits that reduce devastating neurodegeneration [13]. Most plant species that contain antioxidants are thought to slow down the progression of illness [15, 16, 17, 18]. *P. armeniaca L*. contains a variety of flavonoids, including quercetin, a strong antioxidant believed to protect neurons from free radical-caused PD cell death [19]. However, a variety of bioactive compounds that have been isolated from medicinal plants have demonstrated the ability to treat neurodegenerative diseases [20]. The intension of the study was to objectively assess the efficacy of *P. ostreatus, C. cibarius,* and *A. biosporus* in treatment of PD using an animal model of haloperidol.

MATERIAL AND METHODS

Plants and the Extraction Method

Purchased mushrooms from the local market, including *Pleurotus ostreatus* (PO) (*Pleurotaceae*), *Agaricus biosporus* (AB) (*Agaricaceae*), and *Cantharellus cibarius* (CC) (Cantharellaceae). The plant specimen was recognized and confirmed by Dr. D. G. Shimpi of the Botany Department of RNC Arts, JDB Commerce, and NSC Science College, located on Nashik Road in Maharashtra. The ethanolic extract was made using the Soxhlet extraction technique (Extract yield in percentage: AB-65%, PO-72%, CC- 68%).

Animals

The 150–200 gram male Wistar rats were acclimated to the laboratory setting. The institutional animal ethics committee of the institution authorized the experimental protocols Sudhakar Rao Naik Institute of Pharmacy, Pusad (729/PO/Re/S/11/CPCSEA), and the study was carried out in compliance with the rules established by the New Delhi, India-based Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

Drugs and Treatment Schedule:

A D2 antagonist called haloperidol was used to cause cataleptic episodes. Haloperidol (1milligram/kilogram, i.p.), *A.bisporus* (25milligram/kilogram p.o., 50milligram/kilogram p.o., and 100milligram/kilogram p.o.), *C. cibarius* (100milligram/kilogram p.o., 200 milligram/kilogram p.o., and 400milligram/kilogram p.o.), *P. ostreatus* (50milligram/kilogram p.o., 100milligram/kilogram p.o., and 250milligram/kilogram p.o.), and vitamin E (10milligram/kilogram). The animals were divided into twelve groups. Distilled water administered to Group I (orally, once day for 21 days). For a period of 21 days, group II received haloperidol, groups III to XI were given with oral extract and haloperidol, respectively. Group XII received Vit. E (10milligram/kilogram, i.p.) and 1milligram/kilogram of haloperidol 30 minutes before to the latter's administration during the length of the 21-day study period.

Phytochemical Evaluation

The purpose of the phytochemical examination was to determine whether the chosen species included any alkaloids, flavonoids, terpenoids, steroids, glycosides, or phenolic chemicals.

The antiparkinsonian activity was measured using the following tests.

Hang Test

The neuromuscular strength will be assessed using the grid hang test [29]. The rats were elevated by their tails, progressively placed on a parallel grid, and kept there till they could use both of their front and back paws to grab the grid. The grid will then invert, allowing the mice to dangle inverted. In order to

discourage falls and avoid injuries in the unlikely event that an animal does fall, the grid will be placed 20 cm above a stable surface. To stop animals from crossing across to the grid's upper side, a 3-inch wall was incorporated inside the device. Animals must use the grid for thirty seconds. The grid hang test will last thirty seconds for the animals (Fig. a) [6].

Orofacial dyskinesia

After being administered haloperidol, each rat was housed in a tiny (22 x 22 x 22 cm) plexiglass cage. If the unoccupied chewing motions and tongue protrusion occurred during a grooming session, they will be taken into consideration. The oral dyskinesia behavioral indicators will be constantly assessed for five minutes (fig. c,d,e). [7, 10]

Locomotor activity

The locomotor activity will be measured with an actophotometer. Six photocells and six lights are positioned around the outer edge of the base of the cage to ensure that a single rat can only block one beam at a time. Photocells are activated when light beams hit them. Every time an animal crosses the laser beam, there is a cut, and the number of cut interruptions was counted for 10 minutes (fig. f). [10].

Statistical Analysis

A one-way ANOVA with post-hoc Dunnett's test was used for statistical analysis. It was determined that $P<0.0001$ was statistically noteworthy (**$P<0.001$, ***$P<0.0001$, ****$P<0.00001$, * $P<0.05$). Analysis performed by comparing the treatment groups with the control group, represented as group I.

RESULT AND DISCUSSION

Following administration of vitamin E (10 mg/kg), extracts of *A. bisporus*, *P. ostreatus*, and *C. cibarius* significantly and dose-dependently reduced haloperidol-induced vacuous chewing movements, tongue protrusions, orofacial bursts, body weight change (fig.b), locomotor activity and hanging time.

In the current study, dopamine-producing neurons in the nigra substantia die as a result of PD, a chronic neurodegenerative disorder. Bradykinesia, flexed posture, resting tremor, and a shuffling stride are the outcomes of this. Numerous research has linked post-synaptic striatal dopamine D2 receptor blockage, which results in tardive dyskinesia and haloperidol-induced toxicity [19, 20]. These investigations have involved reactive oxygen species in this process [24]. Haloperidol acts as a neuroleptic. Haloperidol neurotoxicity and other neuroleptics have been concurrent to the inhibition of striatal dopamine D2 receptors post-synaptic [22]; this research has indicated that reactive oxygen species may be the source of haloperidol-induced toxicity [20]. Haloperidol-induced motor abnormalities may be lessened by medications, which may also diminish extrapyramidal Parkinson's disease symptoms. Three behavioral assessment parameters were used in the current investigation to evaluate mice with haloperidol-induced Parkinson disease: tardive dyskinesia, the hanging test, body weight change and locomotor activity.

CONCLUSION

The neurodegenerative disorder known as PD primarily causes the dopaminergic neuron death [21] in the nigra substantia pars compacta and worsens over time. Haloperidol often disrupts D2 receptors to provide an experimental model of PD. The conclusion of this investigation clearly showed that the locomotor activity, hang, and orofacial dyskinesia tests were all improved by mushrooms [26] .

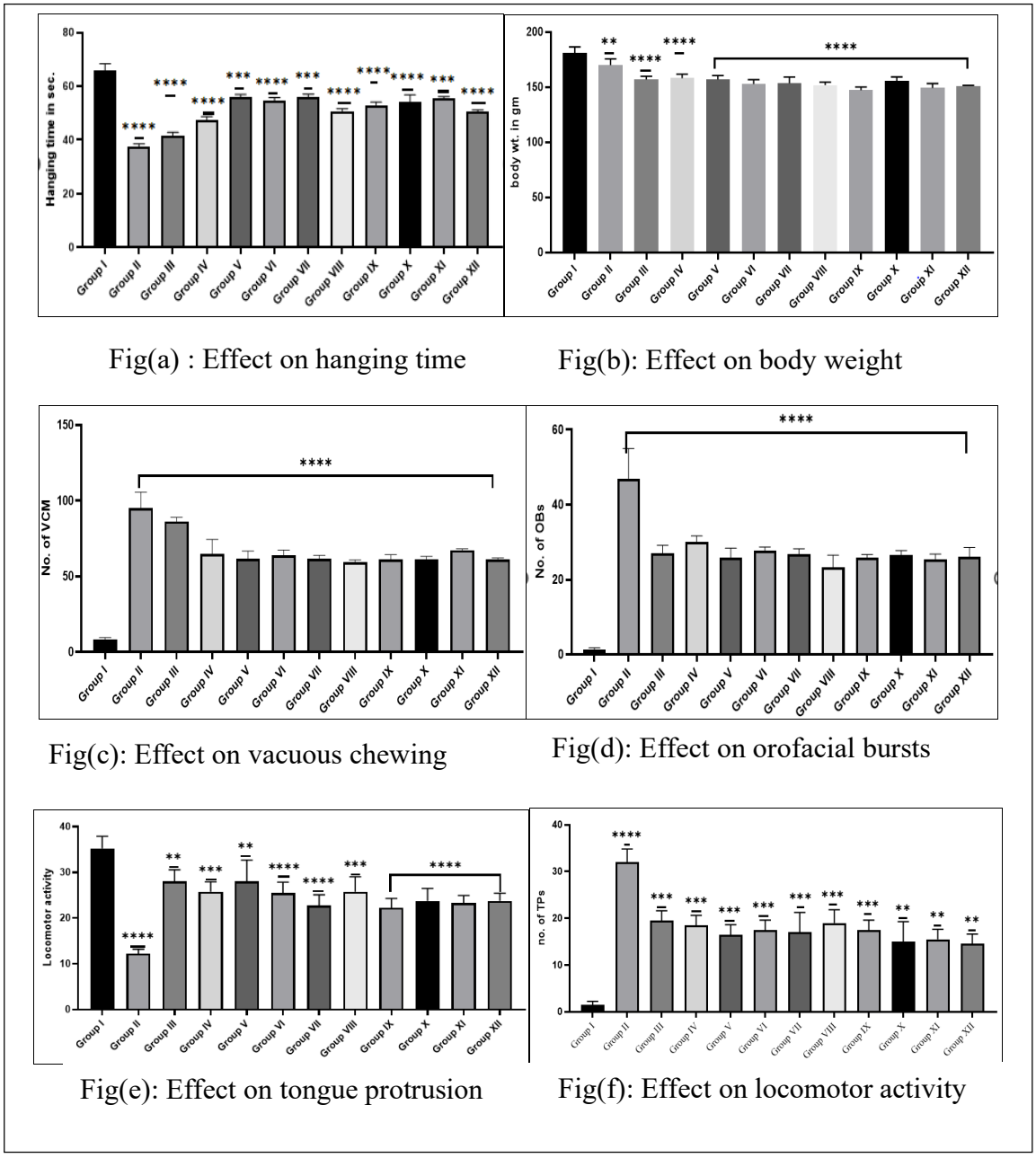

Fig. No. 1:Effect of Haloperidol on orofacial dyskinesia, hang test, body weight change and locomotor activity.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest associated with this work.

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