

**PHENYLETHYLAMINE: HEALTH BENEFITS - A REVIEW****Narinderpal Kaur\* and Beenta Kumari**

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**ABSTRACT**

Phenylethylamine (PEA) is a naturally occurring hormone like substance that acts as a neurotransmitter. It gives the brain psychological energy, focus, get-up-and-go and elevates a depressed mood. PEA is an endogenous stimulant of the human brain that amplifies the activity of major neurotransmitters for increased longevity, slower aging, higher performance, a sense of wellbeing, and a renewed youthful-functioning body. PEA has unique rapid uplifting effects on mood, mental activity, attention, motivation, alertness, creativity, awareness, energy, stamina, physical activity, pleasurable feelings, sexuality, and sensory perceptions. PEA amplifies the signal strength and effectiveness of the major neurotransmitters in the human brain to improve your life. This review article gives emphasis on health benefits or pharmacological uses of phenylethylamine which has been suggested as a 'safe' alternative to drugs, such as amphetamine or methylphenidate, which are accompanied by many undesirable sideeffects.

**KEYWORDS:** Neurotransmitters, Psychostimulant, antidepressant effect, lipolysis, catecholamines, distractibility.

**INTRODUCTION**

Phenethylamine (PEA), also known as  $\beta$ -phenylethylamine ( $\beta$ -PEA) and 2-phenylethylamine is an organic compound and a natural monoamine alkaloid, a trace amine, and also the name of a class of chemicals with many members that are well known for their psychoactive and stimulant effects.<sup>[1]</sup> Phenylethylamine functions as a monoaminergic neuromodulator and, to a lesser extent, a neurotransmitter in the human central nervous system.<sup>[2]</sup> Phenylethylamine is an endogenous neuroamine that has

been linked to the regulation of physical energy, mood, and attention.<sup>[3]</sup> Monoamine oxidase B selectively metabolises phenylethylamine to phenylacetic acid. There is evidence to indicate that levels of phenylethylamine and phenylacetic acid are very low in the biological fluids of depressed patients.<sup>[4]</sup> The biogenic subgroup is comprised of well characterized neurotransmitters such as dopamine (DA), norepinephrine and serotonin, and neurotransmitters broadly named trace amines (TAs), which include  $\omega$ -phenylethylamine (PEA). In the mammalian brain, PEA is heterogeneously distributed, with the highest levels found in the nigrostriatal and mesolimbic regions.<sup>[5]</sup>

### Natural Occurrence

Phenethylamine is widely distributed throughout the plant kingdom and also present in animals, such as humans<sup>[9,10,11]</sup> acts as a potent anti-microbial against certain pathogenic strains of *Escherichia coli* (e.g., the O157:H7 strain) at sufficient concentrations.<sup>[12]</sup>

PEA can be found in many algae<sup>[6]</sup>, fungi and bacteria<sup>[7]</sup> as well as a variety of different plant species PEA synthesized by fungi and bacteria can also be found in food products<sup>[8]</sup>, where it serves an indicator of food quality and freshness.

### Synthesis

A much more convenient method for the synthesis of  $\beta$ -phenethylamine is the reduction of  $\omega$ -nitrostyrene by lithium aluminum hydride in ether, whose successful execution was first reported by R. F. Nystrom and W. G. Brown in 1948.<sup>[13]</sup>

One more method for preparing  $\beta$ -phenethylamine, involves the reduction of benzyl cyanide with hydrogen in liquid ammonia, in the presence of a Raney-Nickel catalyst, at a temperature of 130 °C and a pressure of 13.8 MPa.<sup>[14]</sup> Phenethylamine can also be produced via the cathodic reduction of benzyl cyanide in a divided cell.<sup>[15]</sup>

### Pharmacological uses of Phenylethylamine

PEA is a member of the trace amines.<sup>[16]</sup> It is an endogenous psychostimulant that shares similar mechanisms of action with Amphetamine.<sup>[17,18]</sup> which involves binding to a novel G protein-coupled receptor, called TAAR (trace amine-associated receptor).<sup>[19,20]</sup> PEA is reported to play important role in depression, weight loss, attention deficit hyperactivity disorder, schizophrenia etc.

### Depression

Depression is a very common, sometimes serious disease that affects a wide range of people. It is currently the second leading cause of disability in the age group of 15 to 44. By the year 2030, depression is predicted to be the primary cause of disability.<sup>[21]</sup> The prevalence of depression is likely to be 50% more in women than men and depression can shorten a person's life by 25-30.

Years.<sup>[22]</sup> A deficiency of phenylethylamine can be responsible for depression.<sup>[23]</sup>

phenylethylamine can relieve depression, even in those that were unresponsive to standard treatments.<sup>[24,25]</sup> PEA improves mood without producing a tolerance often associated with amphetamines.<sup>[25]</sup> In one study PEA was shown to relieve depression in 60% of depressed patients<sup>[26]</sup> which is better than regular antidepressant drug therapy. PEA production is increased with exercise which is probably one of the reasons why exercise produces an antidepressant effect.<sup>[27]</sup> PEA increases the release of other neurotransmitters: serotonin, dopamine and norepinephrine again producing an antidepressant effect.

**Weight loss:** PEA is reported to reduce appetite.<sup>[28]</sup> It may also stimulate lipolysis through its ability to stimulate catecholamine release and delay reuptake.<sup>[29]</sup> Phenylethylamine may have contributed to the greater reliance on fat as an energy source. It is used as an appetite suppressant, included in weight loss supplements, e.g. Fastin.

### **Attention deficit hyperactivity disorder**

ADHD is a chronic childhood disorder which is characterized by a number of behavioral symptoms, including a small attention span, increased frustration, distractibility, and often depression and anxiety.<sup>[30]</sup> The urinary output of PEA was lower in a population of children suffering from ADHD, as compared to the healthy control population, an observation that was paralleled by reduced PEA levels in ADHD individuals.<sup>[31,32]</sup> In a consecutive study, those of the children suffering with ADHD were treated with methylphenidate, also known as Ritalin. Patients whose symptoms improved in response to treatment with methylphenidate had a significantly higher PEA level than patients who did not experience such an improvement in their condition.<sup>[32]</sup>

**Schizophrenia:** Schizophrenia is a rare mental disorder that could potentially be related to PEA. About 1% of the world's population is affected by schizophrenia. It is characterized by problematic thinking and perception.<sup>[33]</sup> Schizophrenia starts around adolescence and will stay

with the patient for the rest of their life. Another complication is community attitude because many people perceive schizophrenic patients as potentially dangerous.<sup>[34]</sup> There are different ideas on how one develops schizophrenia. One hypothesis proposes that dopamine contributes to the development of schizophrenia.<sup>[35]</sup> A new perspective is given by the TAAR1 receptor. TAAR1 activation improves the symptoms that are associated with both schizophrenia and depression (in rodent and primate models), without causing the range of negative effects that result from direct blockage of the dopamine receptor.<sup>[36]</sup> There are other factors that may contribute to schizophrenia like inflammatory cytokines<sup>[37]</sup> and phospholipase.<sup>[38]</sup>

### **Natural Painkiller**

Phenylethylamine in the form of D-phenylalanine can act as painkiller. D-phenylalanine possess natural non-toxic analgesic effect. DPA increases endorphin levels which are our body's own natural painkillers. This can be done by inhibiting an enzyme in our body that breaks down enkephalins which is an endorphin with powerful painkilling properties.<sup>[39]</sup>

### **Neuroprotective Effects**

chocolate contains powerful antioxidants called polyphenols and PEA which are supposed to show neuro-protective effects.<sup>[40]</sup>

### **CONCLUSION**

Phenylethylamine is a neurotransmitter which shows many potential effects that can be helpful in treating many ailments. The present review shows the pharmacological potentials of Phenylethylamine which is very helpful to researcher to explore more about this valuable neurotransmitter.

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