

ENRICHED ALCOHOLIC BEVERAGES

FIELD OF THE INVENTION

The present invention, in some embodiments thereof, relates to alcoholic products, more specifically, but not exclusively to enriched alcoholic beverages.

BACKGROUND

The element which accounts for the psychotropic effect caused by alcoholic beverages is ethanol, a two-carbon chain alcohol molecule that interacts with neurotransmitter systems in the brain, and directly affects brain chemistry by altering the levels of some neurotransmitters. Ethanol has dual properties both of a stimulant and a depressant since it affects both "excitatory" neurotransmitters and "inhibitory" neurotransmitters. As a depressant, it reduces energy levels, and slows down thought, speech and movements, exerts relaxation and drowsiness, mainly by increasing production of the inhibitory neurotransmitter GABA, and suppressing the excitatory neurotransmitter glutamate.

As a stimulant, ethanol indirectly causes release of dopamine in the reward pathway in the nucleus accumbens (NAc) part of the brain, which accounts for euphoric feeling, cheerful mood and incentive to seek pleasure. Dopamine is released to the synapse upon alcohol consumption, and the more dopamine is released the merrier and joyful a person becomes. Re-uptake of dopamine which follows and, thereby, decreased levels of the neurotransmitter in the synapse, leads to a down feelings and depression which often characterize alcohol withdrawal or sobering up.

Excessive and/or prolonged alcohol consumption may have some undesired short-term physiological and psychological effects such as gastric irritation, anxiety disorders and other excitable states, and highly undesired longer-term effects such as cirrhosis, cardiomyopathy and dementia. Alcohol consumption may lead to intoxication, which, in turn, can have serious consequences such as accidents and uncontrolled violent behavior with subsequent medical complications.

The standard way alcohol is consumed is by drinking, usually over a few hours. In the case of beers/lagers, alcohol (i.e., ethanol) is provided as relatively dilute solution, wines are stronger, and spirits contain the maximum alcohol concentration.

One approach to reduce or abolish the undesired effects of ethanol is to reduce the concentration of alcohol in drinks. Dealcoholized beverages have been known for nearly 100 years, and are disclosed, for example, in U.S. Patent Nos. 1,390,710, 1,256,894, 6,472,009, 1,401,700, 4,999,209, and 4,612,916. While removing alcohol may seem a practical option for beers, in some cases, especially in wine and spirits, there is a marked deterioration in taste, bouquet, and other qualities of the beverage due to processes performed to eliminate or reduce alcohol content, such as boiling or steaming.

Another approach which has been practiced is the safer alcohol approach, which utilizes drugs that act in a similar way to alcohol but are free of some of its immediate adverse effects, such as gastric irritation, and do not produce the longer-term effects such as cirrhosis, cardiomyopathy and dementia. However, all the drugs had limited use due to development of dependence thereon, and/or abuse thereof.

There is an unmet need for “safer” consumption of alcoholic beverages that would not deprive the drinker from the pleasure and psychotropic and psychoactive effects provided by drinking alcohol, yet, would reduce or even be devoid of the adverse effects associated with alcohol consumption, particularly with intoxication.

SUMMARY

In an aspect of the present disclosure, an alcoholic food product is provided comprising an edible base material, which may be a liquid, solid or semi-solid edible substance, for example, liquid, alcohol, and at least one neurotransmitter and/or at least one neurotransmitter precursor. The food product thus provided is an alcoholic food product, namely a food product that essentially contains a certain amount of alcohol for example, from about 0.5% to about 98% by volume or by weight. The inclusion of a neurotransmitter and/or a precursor thereof in the alcoholic food product, enriches the alcoholic food product with certain qualities which impart it the ability to effect certain desired psychotropic and psychoactive effects upon consumption thereof.

In some embodiments, a disclosed enriched alcoholic food product is an enriched alcoholic beverage such as beer, wine, spirit, cider, perry and alcopop.

The neurotransmitter may be, for example, norepinephrine, epinephrine, serotonin, dopamine, endorphin, acetylcholine, gamma-aminobutyric acid (GABA), and any combination thereof. The neurotransmitter precursor may be, for example, a norepinephrine precursor, for example dopamine; an epinephrine precursor; a serotonin precursor, for example, 5-hydroxytryptophan; a dopamine precursor such as L-phenylalanine, L-tyrosine or levodopa; an endorphin precursor; an acetylcholine precursor; or a gamma-aminobutyric acid (GABA) precursor, and any combination thereof.

In exemplary embodiments, a disclosed enriched alcoholic beverage comprises the dopamine precursor tyrosine, in amounts ranging, e.g., from about 10 mg to about 5000 mg per 1 liter, for example, from about 100 mg/L to about 1000 mg/L.

A contemplated enriched alcoholic food product, for example, enriched alcoholic beverage, may further comprise one or more psychostimulant substances, namely, a substance that is directly or indirectly involved in enhancement of a neurotransmitter synthesis and/or stability, inhibition of degradation of a neurotransmitter and/or inhibition of reuptake of a neurotransmitter. Such a psychostimulant is exemplified in some embodiments, by caffeine, wherein the amount of caffeine in a disclosed enriched alcoholic food product may be from about 10 mg/L to about 750 mg/L.

In exemplary embodiments, an enriched beer is provided, comprising tyrosine and caffeine, for example, ale, stout, porter, or lager.

The alcoholic food product and/or the enriched alcoholic beverage, upon consumption thereof, exerts one or more positive psychoactive effects and/or one or more positive psychotropic effects which may commence 5 minutes and last up to 24 hours, or even up to 48 hours after alcohol consumption. For example, consumption of a disclosed enriched alcoholic beverage such as beer may promote enhanced and prolonged sense of euphoria.

A contemplated enriched beer, wine, spirit, alcopop and/or cider provided herein may exert upon a consumer stimulant effects such as elevated mood (high spirit), energy, excitement, talkativeness, vigorous and vitality which exceed in intensity and duration of similar effects exerted by a corresponding non-enriched beer, wine, spirit, alcopop or cider, while reducing intoxication effects and sedative effects such as difficulty in concentrating,

down feeling, heavy head, heavy body, sedative, slow thinking, and sluggishness compared to corresponding non-enriched alcoholic beverages.

Also provided herein is a process for the preparation of an enriched alcoholic beverage, such as beer, wine, whisky, vodka a liquor, comprising combining a base alcoholic liquid with one or more neurotransmitter precursors, and, optionally, one or more psychostimulant substances.

Unless otherwise defined, all technical and/or scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of embodiments of the invention, exemplary methods and/or materials are described below. In case of conflict, the patent specification, including definitions, will control. In addition, the materials, methods, and examples are illustrative only and are not intended to be necessarily limiting.

BRIEF DESCRIPTION OF THE FIGURES

[0001] Some embodiments of the invention are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of embodiments of the invention. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the invention may be practiced.

[0002] In the drawings:

Figs. 1A-1B are bar graphs showing STIM (short for “stimulant effects”) values obtained in an exemplary Biphasic Alcohol Effects Scale (BAES) test conducted with enriched beer of the disclosure (1B) and a corresponding non-enriched beer (1A); and

Figs. 2A-2B are bar graphs showing SED (short for “sedative effects”) values obtained in an exemplary Biphasic Alcohol Effects Scale (BAES) test conducted with enriched beer of the disclosure (1B) and a corresponding non-enriched beer (1A).

DETAILED DESCRIPTION

The present invention, in some embodiments thereof, relates to enriched alcoholic food products, more specifically, but not exclusively to enriched alcoholic beverages.

Alcohol is one of the favorite, commonly used, yet a somehow dangerous psychoactive substance. The prevailing and predominant way alcohol is consumed is by drinking alcoholic beverages, usually over a few hours. People consume alcohol for several reasons such as quenching thirst, heating or cooling the drinker, for the taste of alcohol, the association alcoholic beverages have with other aspects of life such as food and friendship, and mostly due to the psychological and psychotropic effects of alcohol associated with alcohol consumption. Consuming alcohol often confers upon the consumer a euphoric feeling, a cheerful mood, relaxation, and a reduced self-awareness. Part of the pleasure of alcohol - at least for the non-dependent consumer - is the taste and the associated rituals of consumption that may fill primitive appetitive functions.

While seeking for the emotional and psychological benefits when consuming alcoholic products, there are, inherently, short term and long-term undesired consequences of consuming alcohol, more so when consuming excessive amount of alcohol.

Dealcoholized beverages, such as beer and wine, designed in attempt to address the need to reduce the hazardous consequences of alcohol intoxication, are available in reasonably palatable forms. However, while non-alcoholic drinks can fill such use-values of alcoholic beverages as quenching thirst and heating or cooling the drinker, they do not provide the range of psychoactivity and palatability which people are seeking in alcohol.

Unless stated otherwise, "alcohol" as referred to herein is ethanol.

The present disclosure is based on a discovery by the present inventor that the effects associated with consumption of alcoholic food products, for example, alcoholic beverages, that contain a neurotransmitter precursor, particularly the pleasurable effects, may be enhanced and prolonged without the need to increase the amount of alcohol in the product. Moreover, the present inventor envisaged and successfully obtained alcoholic beverages containing at least one neurotransmitter and/or a precursor thereof, and optionally further containing a psychostimulant substances such as caffeine, which provide to the consumer stronger and continuing euphoric feeling while minimizing and even

circumventing at least some of the non-pleasurable effects associated with alcohol consumption, particularly the undesired physical and emotional sensations of intoxication.

Disclosed herein is a discovery by the present inventor that consumption of alcoholic food products containing neurotransmitter precursors affects the level of certain neurotransmitters in the brain, for example neurotransmitters that are boosted or released due to alcohol consumption. Alteration, for example, elevation, of certain brain neurotransmitters level, increases or enhances, e.g., the euphoric sensation provided or bestowed by alcohol. This euphoric feeling lasts longer than that induced by consuming alcohol alone, and, furthermore, it is mostly not accompanied by undesired physiological and psychological short-term effects associated with the concomitant and rather intense decrease in neurotransmitters level that follows shortly afterward.

In an aspect of the disclosure, there is provided a food product comprising an edible base material, alcohol and one or more neurotransmitters and/or neurotransmitter precursors.

The term “food product” as used herein refers to a substance that can be used or prepared for use as food by humans or non-humans.

“Alcoholic food product” (or “alcoholic product”) is a composition of an edible base material defined herein as any substance composed of carbohydrates, fats, proteins and/or water, and alcohol (e.g., ethanol) in the amount of 0-99%, for example from about 1% to about 20%, from about 1% to about 5%, from about 3% to about 8%, from about 5% to about 10%, from about 8% to about 12%, from about 10% to about 15%, from about 15% to about 25%, from about 20% to about 30%, from about 25% to about 40%, from about 30% to about 50%, from about 40% to about 60%, from about 50% to about 65%, or from about 60% to about 80%, ethanol by weight or by volume. It can be eaten or drunk by humans or by animal for nutrition or pleasure.

Non-limiting examples of alcoholic food products include, alcoholic liquids comprising a base material such as water, juice, e.g., fruit or vegetable juice, and milk and alcohol. Alcoholic liquid products include, for example, beverages such as beer, wine, spirit and the like. Solid or semi-solid alcoholic products are edible foods that contain alcohol, for example, foods that have been cooked, combined and/or mixed with alcohol. Such alcohol-containing solid or semi-solid products are exemplified by meat, fish,

chicken, fruits, breads, soups, stews, sauces, fondues, baked desserts such as cakes, pastries such as cookies and pies, and no-bake desserts such as creams, ice-cream, puddings and mousses, extract flavoring such as pure vanilla extract and pure almond extract, filled candies such as filled chocolate, snacks and food flamed with alcohol.

In some embodiments, a contemplated alcoholic food product is an alcoholic beverage.

The terms “enriched alcoholic food product” and “enriched alcoholic beverage” as used herein refer to an alcoholic food product or alcoholic beverage, respectively, enriched by the addition thereto, provision thereto, mixing thereof, or combining it with at least one neurotransmitter and/or at least one neurotransmitter precursor. “Enrichment” of the alcoholic food products or alcoholic beverages contemplated herein is further meant herein enriching the product with desired qualities imparted to it by enriching it with at least one neurotransmitter and/or a precursor thereof.

The term “one or more neurotransmitter precursor” as used herein is interchangeable with the term “at least one neurotransmitter precursor” and means at least one precursor of at least one neurotransmitter.

Neurotransmitters and precursors thereof

The action of alcohol is biphasic, when blood alcohol concentration (BAC) levels are rising, the stimulant properties of alcohol are more pronounced; when BAC levels are falling, the depressant effects of alcohol are more pronounced. Alcohol, for example, ethanol, being a small molecule, can interact with many neurotransmitter systems in the brain. It directly affects brain chemistry by altering levels of neurotransmitters. Alcohol affects both "excitatory" neurotransmitters and "inhibitory" neurotransmitters and, hence, has the properties of both a stimulant and a depressant. This makes the action of alcohol in the brain very different from, and much more complex than, large molecules such as opiates, tetrahydrocannabinol (THC), or amphetamine, which simulate a specific neurotransmitter and interact with a specific neurotransmitter system.

Neurotransmitters play a key role in the function of the central nervous system, being chemical “messengers” that transmit signals throughout the body, signals such as those controlling thinking processes, behavior and emotion. Neurotransmitters are excreted to, and travel through, the synapses, those extremely small gaps between the axon terminal

of neurons that release neurotransmitters in response to an impulse, and the membrane of adjacent axons, dendrites, muscle or gland cells having the appropriate receptors for binding the neurotransmitters. Neurotransmitters can either prompt or suppress the further signaling of nearby neurons. The main neurotransmitters include norepinephrine, epinephrine, serotonin, dopamine, endorphin, acetylcholine, gamma-aminobutyric acid (GABA), glycine, glutamic acid, aspartic acid, and taurine, the first six of which are neurotransmitters synthesized from amino acids, and the last three are amino acids *per se*.

The term “neurotransmitter precursor”, as used herein, refers to a substance that can be converted into a neurotransmitter in the body, particularly in the brain, usually through enzymatic reactions such as metabolic processes. For example, 5-hydroxytryptophane is a serotonin precursor.

Neurotransmitters which may be directly or indirectly affected by alcohol include, for example, GABA, endorphins, glutamate, dopamine, norepinephrine and adrenaline (epinephrine).

Gamma-aminobutyric acid (GABA) is an inhibitory neurotransmitter, which reduces energy levels and calms everything down. Drugs like Xanax and Valium increase GABA production in the brain, resulting in sedation. Alcohol increases the effects of GABA and affects the GABA system in a manner similar to valium leading to relaxation and drowsiness. Alcohol's effect on the GABA system may also be responsible for its depressant effects.

Glutamate is an excitatory neurotransmitter which normally increases brain activity and energy levels. Alcohol suppresses glutamate levels probably by inhibiting the N-methyl-d-aspartate (NMDA) glutamate receptor, resulting in a slowdown along the brain's highways. It is alcohol's effects on the glutamate system which lead to staggering, slurred speech, and memory blackouts.

Alcohol may exert depressant effects because it suppresses the excitatory neurotransmitter glutamate and increases the inhibitory neurotransmitter GABA. What this means is that the thought, speech and movements of a person consuming alcohol are slowed down, and the more alcohol is consumed the more of these effects will be felt (hence the stumbling around, falling over chairs and other clumsy things drunk people do). Cerebral cortex is this region in the brain where thought processing and consciousness are centered,

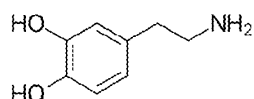
alcohol depresses the behavioral inhibitory centers, making the person less inhibited; it slows down the processing of information from the eyes, ears, mouth and other senses; and it inhibits the thought processes, making it difficult to think clearly. Alcohol also affects the cerebellum, the center of movement and balance in the brain, resulting in the staggering, off-balance swagger often associated with the so-called "falling-down drunk."

Endorphins are produced in response to certain stimuli, especially stress, fear or pain. They originate in various parts of the body such as the pituitary gland, spinal cord and throughout other parts of the brain and nervous system and interact mainly with receptors in cells found in regions of the brain responsible for blocking pain and controlling emotion. Alcohol affects the endorphin system in a manner similar to opiates, acting as a pain-killer and giving an endorphin "high".

Alcohol increases the release of dopamine (interchangeable herein with "DA"), adrenaline and norepinephrine.

Adrenaline (epinephrine) and its precursor norepinephrine (noradrenalin), are important hormones produced by the adrenal gland. They increase the heart rate, blood pressure, and blood glucose levels, open up the airways in the lungs and, like cortisol, help inhibit non-essential bodily functions. Alcohol causes the adrenal glands to release adrenaline and norepinephrine which ultimately enter the brain and promote alertness and "fight response". This is one reason why alcohol acts as stimulant.

Dopamine, 3,4-dihydroxyphenethylamine, is an organic chemical of the catecholamine and phenethylamine families having the chemical structure:



This amine is synthesized by removing a carboxyl group from its precursor levodopa (L-dopa; dihydroxyphenylalanine), which is synthesized in the brain and kidneys during the metabolism of the amino acid tyrosine. It is a neurotransmitter in itself, and a precursor of the hormone neurotransmitters epinephrine and norepinephrine. Two main brain areas produce dopamine that relays signals that travel throughout the brain: the *substantia nigra*, a tiny strip of tissue on either side of the base of the human brain (situated in a region known as the midbrain), and the close by *ventral tegmental area*. Dopamine from the *substantia nigra* helps in movements and speech. Dopamine, thus,

helps regulate movement and emotional responses. When the brain cells that make dopamine in this area start to die off, a person can have trouble initiating movement.

The *ventral tegmental* area usually sends dopamine into the brain when animals or human expect or receive a reward, and helps control the brain's reward and pleasure centers. The reward center (also known as the “reward pathway”) is comprised primarily of the *nucleus accumbens* (NAc), the *ventral tegmental* area (VTA), and a part of the prefrontal cortex. This combination of brain areas which form the reward center is affected by virtually all pleasurable activity, including everything from hanging out with friends, going on vacation, ingesting drugs (e.g., cocaine), listening to music, eating and drinking, having sexual activity, and consuming alcohol. All things which give us pleasure, cause a release of dopamine in the reward pathway as well as trigger a number of other events in the brain including endorphin release and activation of the orbitofrontal region of the prefrontal cortex. Dopamine is known as the “motivation molecule” or the “reinforcement molecule” as it is responsible for reward-seeking behavior and helps provide the drive, focus and concentration needed to get things done. This dopamine release tells the brain that whatever it just experienced is worth getting more of, and that helps animals and humans change their behaviors in ways that will help them attain more of the rewarding item or experience. This brain reward system is associated with “feeling good” and promotes survival of the species by rewarding behaviors necessary for continued survival.

Dopamine is also involved in many other functions of the brain including motor activity, motivation, learning, pain processing, mood, attention span and regulation of sleep. It regulates stress relief.

Lowering dopamine can make animals and humans lose pleasure in activities like eating and drinking. This joyless state, where animals or human no longer find pleasure in activities they used to enjoy and are no longer motivated to do those activities, is called anhedonia. People with some mental illnesses, such as depression and schizophrenia, may experience anhedonia as part of their disease.

Dopamine deficiency results in Parkinson's Disease, and people with low dopamine activity may be more prone to addiction. Alcohol as well as all drugs which lead to dependence appear to affect the dopamine system. Stimulants like amphetamine and

cocaine affect dopamine directly whereas alcohol and other drugs appear to affect it indirectly.

Alcohol consumption triggers a boost of dopamine release. Alcohol does not lead to an increase of dopamine throughout the brain; it only causes an increase in dopamine in the reward center, leading to the relaxing and carefree experience of the alcohol "buzz". Consumption of even small amounts of alcohol increases the amount of dopamine in the NAc in a dose-response manner. Alcohol increases DA via the promotion of synaptic terminal DA release rather than via the inhibition of DA transporters. Alcohol can also indirectly increase DA levels by affecting the GABA system and the endorphin system. Neurons from the GABA system extend into the reward pathway and when alcohol affects the GABA system these neurons release dopamine into the reward pathway. Likewise, neurons extend from the endorphin system into the reward pathway and these also release dopamine into the reward pathway when alcohol directly stimulates the endorphin system.

It is unlikely that the increase in dopamine alone is responsible for the stimulant properties of alcohol. It is most likely that the stimulating effects of alcohol are due to its effects on adrenaline, norepinephrine, and the prefrontal cortex as well.

A boost in the activation of Dopaminergic pathways eventually causes a depletion of the dopamine reserves within the brain cells, leaving the brain in an imbalanced state. As Dopamine itself is impenetrable to the blood-brain barrier, it must be synthesized *in situ* from its precursors. Over time, with more drinking, the dopamine effect diminishes until it's almost nonexistent.

It has been postulated by the present inventor that kicking-off brain DA release via alcohol consumption, and simultaneously providing means to sustain elevated brain DA level by providing DA building blocks, may enhance the euphoric feeling and afford qualities such as increased motivation, focus and concentration to pursue rewarding actions such as working and learning, increased sociability, and attention, while at the same time alleviating alcohol withdrawal symptoms and, moreover, substantially decreasing addiction disposition.

The present inventors envisaged, and successfully practiced enriched alcoholic food products, for example, enriched alcoholic beverages, containing a precursor of DA, for example, tyrosine, and, optionally, a psychostimulant substance such as caffeine, based

on their strong affiliations to the metabolism of DA within the brain, thereby promoting DA synthesis within the central nervous system and establishing a long lasting steady state of readily available DA. This sustained supply of DA building blocks from the very first moment of alcohol intake, may increase the positive and enjoyable effects of alcohol consumption, while neutralizing negative effects associated with DA depletion followed by it.

Furthermore, enhancement of the positive effects of alcohol may help reduce the risk of alcohol abuse. Motives of alcohol consumption are classically "enhancing motives" (drinking to enhance positive and social mood) and "coping motives" (drinking to cope with negative mood). While enhancing drinkers enjoy the positive effects of alcohol consumption, coping drinkers rely on its sedative effects, and are strongly exposed to risks of alcohol abuse and alcoholism. Through the enhancement of alcohol's positive effects and the negation of its sedative effects, provided herein is a method to reduce risks of alcohol abuse amongst coping drinkers.

In some embodiments, the alcoholic products described herein are designed to promote at least the levels of dopamine, endorphin norepinephrine and/or epinephrine in the brain. To this end, the alcoholic products are enriched with one or more neurotransmitters and/or neurotransmitters precursors.

For example, L-phenylalanine (Phe), L-tyrosine (Tyr) and/or levodopa (L-dopa) are the precursors of dopamine and other catecholamines such as norepinephrine and epinephrine.

The terms "dopamine precursor" and "dopamine immediate metabolic precursor" as used herein are interchangeable and refer to a substance that can be converted into dopamine in the body through a series of one or more metabolic reactions.

The primary and minor metabolic pathways for obtaining DA from its precursors are:

Primary: Phe → Tyr → levodopa → DA

Minor: Phe → Tyr → p-Tyramine → DA

Minor: Phe → m-Tyrosine → m-Tyramine → DA

The direct or immediate metabolic precursor of dopamine, L-dopa, can be synthesized indirectly from the essential amino acid Phe or directly from the non-essential

amino acid Tyr. Additionally or alternatively it can be supplemented from plants (e.g. legumes) and animals. Most of the levodopa is immediately broken down (e.g., in the intestine) before it enters the brain primarily by decarboxylase enzymes and catecholamine-O-methyltransferase (COMT).

L-Phenylalanine is converted into Tyr by the enzyme phenylalanine hydroxylase, with molecular oxygen (O_2) and tetrahydrobiopterin (THB) as cofactors. L-Tyrosine is converted into L-dopa by the enzyme tyrosine hydroxylase, with tetrahydrobiopterin, O_2 , and iron (Fe^{2+}) as cofactors. L-dopa is converted into dopamine by the enzyme aromatic L-amino acid decarboxylase (also known as dopa decarboxylase), with pyridoxal phosphate (the active form of vitamin B6) as the cofactor.

Dopamine is converted into norepinephrine by the enzyme dopamine β -hydroxylase, with O_2 and L-ascorbic acid (vitamin C) as cofactors. Norepinephrine is converted into epinephrine by the enzyme phenylethanolamine N-methyltransferase with S-adenosyl-L-methionine (S-AMe) as the cofactor.

In some embodiments, the enriched alcoholic food product provided herein may increase DA brain level. In some embodiments, the enriched alcoholic product may afford continued elevated DA levels in the brain initiated by alcohol consumption, to thereby provide at least some of the desired benefits exerted by dopamine release, for example joyful and euphoric feeling, and relaxation. In the context of any of these embodiments, a disclosed enriched alcoholic food product may comprise or may be supplemented with DA and/or one or more DA precursors.

Without wishing to be bound by theory, it is assumed that when the enriched alcoholic food product, e.g. an alcoholic beverage, is consumed, the alcohol in the product causes an immediate release of dopamine. A dopamine precursor contained in the product, reinforces the neurotransmitter supply in the brain, thereby maintaining or even amplifying its level for a prolonged period of time. This prolonged and sustained level of neurotransmitters in the brain, which last long after the alcohol level in the blood has gone down to zero, affords not only a prolonged euphoric feeling but, moreover, quenches or circumvents the unpleasant psychological and physiological sensations associated with alcohol withdrawal such as headache, nausea and depression. These effects outgo the psychotropic effects associated with consumption of high amounts of alcohol alone.

In some embodiments, supplementing an alcoholic food product, for example, alcoholic beverage such as beer or wine, with precursors of neurotransmitters as provided herein, enriches the alcoholic food product and imparts to it at least the following positive psychoactive effects: blissful, joyful and euphoric sensation. The term “psychoactive” as used herein means affecting the mood, and “positive psychoactive effect” herein means affect the mood in a positive, desired manner.

Positive psychoactive effects exerted by the enriched alcoholic food product provided herein may sustain long after consumption of the product, and it may not be accompanied by drunkenness or intoxication. In some embodiments, the euphoric feeling lasts from about 5 minutes up to 24 hours post consumption, with almost no accompanying feeling of intoxication. For example, a euphoric state of mind may last about 5-10 min, about 10-15 min, about 10-20 min, about 20-30 min, about 30-40 min, about 40-50 min, 0-1 hours, about 1-3 hours, about 1-4 hours, about 2-5 hours, about 3-5 hours, about 4-6 hours, about 5-8 hours, about 5-9 hours, about 6-10 hours, about 7-10 hours, about 8-11 hours, about 9-10 hours, about 9-11 hours, about 9-15 hours, about 10-12 hours, about 12-15 hours, about 15-18 hours, about 15-20 hours, about 18-22, about 20-24 hours, or even longer, after blood alcohol level has already dropped to zero.

One of the unique and unexpected properties of the enriched alcoholic food product provided herein, e.g., an alcoholic beverage, is that it does not dim the consumer’s sense of alertness as often happens upon alcohol consumption, but to contrary: the enriched alcoholic food product provided herein keeps the consumer well and sharply focused, fully conscious, in-control and with the ability to remain concentrated for extended periods, contrary to the psychotropic effects exerted by regular alcoholic products particularly alcoholic beverages. In fact, the enriched alcoholic product provided herein affords to the consumer a better, higher and prolonged focusing and concentration abilities in spite the alcohol it contains.

The term “psychotropic”, as used herein, means the ability to influence the mind or cognitive abilities of a person, and/or to affect mental processes (e.g., emotions, perception) and mental activity (e.g., behavior). The term “positive psychotropic effects” herein means affect the mind, mental and/or the cognitive abilities in a positive, desired manner.

In some embodiments, supplementing an alcoholic food product, for example, alcoholic beverage such as beer or wine, with one or more neurotransmitters and/or one or more precursors of neurotransmitters as described herein, enriches the alcoholic food product by imparting to it the ability to exert at least the following positive psychotropic effects: (i) higher motivation e.g., to work, learn and take part in rewarded activities; (ii) improved concentration and focus; (iii) higher self-confidence; (iv) arousal; (v) wakefulness; (vi) elevated alertness; (vii) improved creativity and creative thinking (viii) curiosity and openness to new experiences; (ix) sense of self-fulfillment, self-contempt; (x) relaxation; (xi) improved capacity to switch attention efficiently between tasks; (xii) improved sociability and extroversion behavior (xiii) better cognitive and/or mental function; and (xiv) emotional and physical sense of well-being.

The positive psychotropic effects exerted by an enriched alcoholic food product may last hours and even days after consumption thereof. In some embodiments, a positive psychotropic effect, for example, higher motivation, or improved ability e.g., to concentrate and maintain focused, alert, awaken, self-confident and/or improved sociability lasts from 10 minutes to about 72 hours after consuming the enriched alcoholic food product.

For example, a person consuming e.g., an enriched alcoholic beverage such as beer or wine may experience higher motivation to conduct rewarding activities, improved sociability, better cognitive and/or mental or emotional function, and/or physical sense of well-being, from about 5 min to about 10 min, from about 8 min to about 15 min, from about 10 min to about 20 min, from about 25 min to about 40 min, from about 0.5 hour to about 2 hours, from about 1.5 hours to about 4 hours, from about 2 hours to about 5 hours, from about 3 hours to about 6 hours, from about 4 hours to about 7 hours, from about 4 hours to about 8 hours, from about 5 hours to about 8 hours, from about 6 hours to about 9 hours, from about 6 hours to about 10 hours, from about 7 hours to about 12 hours, from about 9 hours to about 15 hours, from about 8 hours to about 16 hours, from about 10 hours to about 15 hours, from about 15 hours to about 20 hours, from about 18 hours to about 22 hours, from about 20 hours to about 25 hours, from about 25 hours to about 35 hours, or even from about 35 hours to about 48 hours, after consuming the beer or wine enriched with one or more neurotransmitter and/or precursors thereof.

In some embodiments, a person consuming e.g., an enriched alcoholic beverage such as beer, wine or spirit may experience higher motivation, better or improved creative thinking, concentration, wakefulness, self-confident and/or joyful self-contentment that lasts from about 0.25 day to about 0.5 day, from about 0.5 day to about 0.75 day, from about 0.5 day to about 1.0 day, from about 0.5 day to about 1.25 days, from about 0.75 day to about 1.0 day, from about 1.0 day to about 1.5 days, from about 1.5 days to about 2.0 days, from about 1.5 days to about 2.5 days, from about 2.0 days to about 2.5 days, or from about 2.5 days to about 3.0 days, and even longer, after consuming the beer, wine or spirit enriched with one or more neurotransmitter and/or precursors thereof.

In some embodiment, a disclosed enriched alcoholic food product comprises dopamine and/or one or more dopamine precursors.

In some embodiments, a disclosed enriched alcoholic food product comprises at least one dopamine precursor.

For example, elevated levels of DA conferred or induced by a contemplated enriched alcoholic food product may enhance the expectation of pleasure in a person consuming the product.

A contemplated alcoholic food product enriched, for example, with one or more DA precursors, for example Tyr, may positively affect memory and learning, as dopamine activity in the brain plays a substantial part in memory and learning. It is essential for long-term memory storage and retrieval. Dopamine further signals important events: it helps remembering events that have motivational significance. This ensures that memories are relevant and accessible for future behavior. Dopamine also plays an essential role in working memory. Working memory is the capacity to use information from short-term memory for guiding one's own actions.

For example, a contemplated alcoholic food product enriched with one or more DA precursors may positively affect focus and attention. Moderate levels of dopamine (not too high or too low) improve the capacity of individuals to switch attention efficiently between tasks. Furthermore, moderate levels of dopamine direct attention more efficiently to stimuli that are relevant to ongoing tasks.

For example, a contemplated alcoholic food product enriched with one or more DA precursors may positively affect pathways associated with social and extroversion behavior

and/or with forming romantic attachments. Intense romantic love is associated with the dopamine reward system, and the crosstalk between oxytocin, the “love molecule”, and dopamine.

A contemplated alcoholic product enriched with one or more DA precursors may further confer or bestow to the consumer one or more of the following benefits or effects:

(a) controlled sleep-wake cycle. Dopamine D1 receptor (DRD1) activation induces arousal and wakefulness;

(b) increased creativity. Dopamine is involved in cognitive flexibility - one of the main components of creativity and creative thinking. Dopamine is also responsible for openness to new experiences, another factor associated with creativity;

(c) stimulated sexual drive. A person’s response to sex, just like other rewards, is largely dependent on DA. Erections are dependent upon activation of both dopaminergic neurons (*ventral tegmental area*) and dopamine receptors (NAc); and

(d) depression amelioration. Elevated DA levels exerted by a disclosed product may ameliorate mental conditions related to low DA levels, such as hopelessness, worthlessness, stress handling, lack of interest in life, decreased motivation, procrastination, inability to feel pleasure, altered sleep patterns, mood swings, and impulsive or self-destructive behaviors.

In exemplary embodiments the neurotransmitter precursor or the DA precursor of a contemplated enriched alcoholic food product is L-tyrosine (Tyr).

In some embodiments, the enriched alcoholic product is an alcoholic beverage supplemented with at least one neurotransmitter precursors which is a DA precursor selected from Phe, Tyr or L-dopa.

In exemplary embodiments, the dopamine precursor supplemented to the beverage is Tyr.

The amounts of tyrosine provided to the alcoholic beverages described herein is determined depending on some variables, for example, the amount of alcohol in the beverage, the amount and type of other supplements in the alcoholic beverage that may cross react with tyrosine, and the amount and type of other supplements provided to the beverages that may further promote elevated levels of dopamine. Usually, the amount of Tyr is in the range of 10 mg to 5000 mg per 1 liter of beverage, for example, from about

10 mg to about 30 mg, from about 20 mg to about 50 mg, from about 30 mg to about 60 mg, from about 50 mg to about 70 mg, from about 50 mg to about 100 mg, from about 100 mg to about 150 mg, from about 150 mg to about 200 mg, from about 100 mg to about 250 mg, from about 200 mg to about 400 mg, from about 200 mg to about 300 mg, from about 200 mg to about 500 mg, from about 300 mg to about 400 mg, from about 300 mg to about 700 mg, from about 400 mg to about 800 mg, from about 500 mg to about 900 mg, from about 500 mg to about 1000 mg, from about 800 mg to about 1000 mg, from about 900 mg to about 1100 mg, from about 1000 mg to about 1200 mg, from about 1000 mg to about 1500 mg, from about 1000 mg to about 1600 mg, from about 1500 mg to about 2000 mg, from about 2000 mg to about 3000 mg, from about 3000 mg to about 4000 mg, or from about 4000 mg to about 5000 mg per liter, and any intermediate ranges therebetween.

In exemplary embodiments, the amount of tyrosine is about 350 mg/L, about 500 mg/L, about 750 mg/L or from about 100 mg/L to about 1000 mg/L.

Psychostimulant substances

The enriched alcoholic food products described herein may further comprise supplements that promote or support increased level of a neurotransmitter such as, but not limited to, norepinephrine, serotonin, dopamine, endorphin, acetylcholine, GABA, glycine, glutamic acid, aspartic acid, and/or taurine.

The terms “psychostimulant supplement” and “psychostimulant substance”, herein used interchangeably, refer to an edible substance that has a direct or indirect effect in increasing the levels of one or more neurotransmitters in the body, particularly in the brain, or in maintaining elevated neurotransmitter levels brought about, for example, by *in situ* conversion of a neurotransmitter precursor into a neurotransmitter, and/or by consuming alcohol. A psychostimulant substance may be directly or indirectly involved in enhancement of neurotransmitter synthesis and/or neurotransmitter stability, or upregulation of a neurotransmitter, for example, by upregulating enzymes that synthesize the neurotransmitter or protect the neurotransmitter from metabolic degradation. A psychostimulant substance may, additionally or alternatively, be directly or indirectly involved in inhibition of neurotransmitter reuptake and/or neurotransmitter degradation, for example, by inhibiting or down regulating a neurotransmitter metabolic enzyme.

Psychostimulant substances may further foods which supply building blocks for production of a neurotransmitter or a precursor thereof.

In some embodiments, a psychostimulant substance increases metabolism rate in the body, thereby increasing metabolic conversion of a neurotransmitter precursor into a neurotransmitter.

In some embodiments, a psychostimulant substance inhibits or blocks metabolic enzymes that degrade a neurotransmitter precursor in the blood stream or in the digestive system.

Non-limiting examples of psychostimulant substances include caffeine, omega-3, fatty acids such as docosahexaenoic acid (DHA), magnesium, soluble fibers, folate, olive oil or monounsaturated fats extracted therefrom, green tea or theanine extracted therefrom, pregnenolone and any derivative thereof, uridine, iron, spices such as turmeric or curcumin extracted therefrom, *Rhodiola rosea* or an extract thereof, oregano or an extract thereof, co-factors, vitamins such as vitamin C and vitamin B6, minerals and the like.

Caffeine is the most widely consumed psychostimulant substance. It is known to highly effects the metabolism within the central nervous system via the blockade of adenosine receptors, which modulate the neurotransmission of glutamate, serotonin, acetylcholine and dopamine. Caffeine itself has a wide variety of effects on the dopaminergic system, which is crucial for the expression of caffeine's stimulating properties. Furthermore, caffeine promotes tyrosine hydroxylase activation via cellular Ca^{2+} entry stimulation mechanism, and it has been shown that chronic caffeine intake increases tyrosine hydroxylase mRNA expression. As tyrosine hydroxylase is the rate-limiting enzyme in the biosynthesis of DA and other catecholamines, caffeine may accelerates DA synthesis through upregulation of this enzyme. Caffeine may provide an energy boost just like sugar and alcohol. However, caffeine alone indirectly promotes DA level elevation only temporarily.

Without being limited by theory, it is assumed that providing caffeine and alcohol together with a supply of DA precursors such as tyrosine, phenylalanine and/or any other DA precursor, may enable enhanced and continued conversion of immediate metabolic DA precursors to DA, thus affording stable elevated levels of DA in the brain for a prolonged time, hence a prolonged duration of desired psychotropic and/or psychoactive effects such

as euphoric and bliss feelings, high motivation and energy, that would last long after consumption of alcohol ceased.

In an enriched alcoholic food product, for example, a liquid product, the amount of caffeine may range from about 0 mg to about 2 gr per 1 liter of beverage. For example, from about 5 mg/L to about 10 mg/L, from about 10 mg/L to about 20 mg/L, from about 10 mg/L to about 50 mg/L, from about 50 mg/L to about 80 mg/L, from about 60 mg/L to about 100 mg/L, from about 200 mg/L to about 300 mg/L, from about 200 mg/L to about 400 mg/L, from about 300 mg/L to about 500 mg/L, from about 500 mg/L to about 800 mg/L, from about 600 mg/L to 900 mg/L, from about 700 mg/L to 750 mg/L, from about 800 mg/L to about 1000 mg/L, from about 800 mg/L to about 1200 mg/L, from about 900 mg/L to about 1200 mg/L, from about 1100 mg/L to about 1400 mg/L, from about 1200 mg/L to about 1500 mg/L, from about 1500 mg/L to about 1700 mg/L, from about 1500 mg/L to about 2000 mg/L, or from about 1700 mg/L to about 2000 mg/L.

In certain embodiments, liquid alcoholic food products described herein contain from about 10 mg/L to about 1200 mg/L, for example, about 35 mg/L about 50 mg/L, about 100 mg/L or 350 mg/L of caffeine.

In exemplary embodiment an enriched beer is provided comprising a DA precursor such as tyrosine and a psychostimulant substance such as caffeine.

A contemplated enriched beer, for example, can contain Tyr and about 0.75 mg/ml caffeine and yet maintain the original taste, aroma, palatability and gas content of a beer with no hint for caffeine's dominant bitter taste.

Enriched beers as well as other enriched alcoholic beverages provided herein, provide the exact combination of alcohol, DA precursor such as tyrosine and psychostimulant substance such as caffeine, that affords an optimal rate of brain dopamine level increase, as well as optimal, stable DA level that provide to the consumer intensified, long lasting pleasure and a pleasant drinking experience, while circumventing the "down" feeling often associated with alcohol consumption.

Certain minerals and B-vitamins, especially zinc, vitamin B6, and folate, are necessary for dopamine synthesis and neurotransmission. These nutrients are often depleted in individuals due to medications, inadequate diets, excessive stress, and toxic environmental exposures, compromising the ability to properly synthesize

neurotransmitters like dopamine. Dopamine is easily oxidized, thus antioxidants such as vitamins C and E may assist in maintaining desired levels of DA.

Magnesium deficiency can cause decreased levels of dopamine, which might lead to depression.

Pregnenolone is the main steroid produced from cholesterol mainly in the brain, gonads and adrenal glands. Pregnenolone and its sulfate (pregnenolone sulfate) are excitatory neurosteroids, i.e., they stimulate the brain, and can increase DA. Pregnenolone and/or its derivatives have anti-stress and mood-elevating effect, they enhance learning and memory and increase the amount of deep sleep, improve energy, vision, clarity of thinking, wellbeing, and often sexual enjoyment or libido.

The amount of pregnenolone and derivatives thereof, particularly pregnenolone sulfate, in, e.g., a liquid alcoholic product described herein is in the range of from about 0 mg to 3.0 mg per liter, for example 0.1-0.5 mg/L, or about 1 mg/L.

Curcumin is known to be the most active phytochemical in yellow dietary spice turmeric. Curcumin has been proven to have anti-oxidant, anti-inflammatory, anti-microbial, hypoglycemic, anti-rheumatic, wound healing and anti-cancer activities. Curcumin further possesses antidepressant properties by way of interacting with dopamine receptors and increasing brain dopamine levels. For example, curcumin increases DA concentration in the brain by inhibiting monoamine oxidase (MAO)-mediated DA break down. Curcumin may be taken daily in large amounts, even up to 8 gr/day.

The amount of curcumin in, e.g., liquid alcoholic product described herein is in the range of from about 0.1 mg/ml to 2.0 g/ml, for example about 0.2-0.5 g/ml.

L-theanine is an amino acid uniquely found in green tea that creates an alert state of relaxation without drowsiness. L-theanine is known to be able to cross the blood-brain barrier and increase dopamine levels in the brain. As such, it may have anti-depressant and anti-anxiety effects, it may reduce mental and physical stress, and lead to improvements in learning and memory in humans and animals. Even just a single, small dose of L-theanine (100 mg) significantly improves the ability to pay attention and maintain focus.

The amount L-theanine e.g., in a liquid alcoholic product in accordance with some embodiments, is in the range of from about 0 mg to about 2000 mg per 1 liter of beverage, for example, from about 10 mg/L to about 30 mg/L, 20 mg/L to about 50 mg/L, 50 mg/L

to about 100 mg/L, 80 mg/L to about 150 mg/L, 100 mg/L to about 150 mg/L, 150 mg/L to about 200 mg/L, 150 mg/L to about 400 mg/L, 300 mg/L to about 500 mg/L, 550 mg/L to about 750 mg/L, 500 mg/L to about 1000 mg/L, 700 mg/L to about 1200 mg/L, 1100 mg/L to about 1250 mg/L, 1200 mg/L to about 1500 mg/L, 1550 mg/L to about 1850 mg/L, or 1700 mg/L to about 1000 mg/L.

In certain embodiments, enriched alcoholic beverages described herein contain 600 mg/L, 1200 mg/L or 1800 mg/L of L-theanine.

Rhodiola rosea, or “golden root,” is a popular plant in traditional medicine in Eastern Europe and Asia, with a reputation for improving depression, enhancing work performance, eliminating fatigue and treating symptoms resulting from intense physical and psychological stress. *Rhodiola* exerts its benefits via multiple effects on the central nervous system, including enhancing the stability of dopamine and supporting its reuptake. This leads to notable decreases in depression, anxiety, and fatigue, as well as an increased ability to handle stress.

Rhodiola extract derived from *Rhodiola rosea* root and standardized to contain 3% total rosavins and a minimum 1% salidroside may be included in, e.g., enriched liquid alcoholic product described herein in amounts which range from about 300 mg to about 2000 mg per liter, for example, 510 mg/L, 800 mg/L or 1100 mg/L.

Other psychostimulant substances contemplated herein include, for example, nutritional or brewer's yeasts which is rich in uridine-5'-monophosphate that may increase DA levels in the brain; oregano, which increases DA levels by decreasing DA break down and reuptake; and resistant starch, a type of soluble fiber that increases butyrate, which may increase dopamine levels.

In some embodiment, a disclosed enriched alcoholic food product comprises one or more psychostimulant substances that directly or indirectly affect DA brain level, for example, caffeine, theanine, curcumin, uridine, pregnenolone, and/or oregano.

The amounts of psychostimulant substance provided to the enriched alcoholic products described herein vary and depend on the psychostimulant substance itself as well as on the other ingredients provided to the enriched alcoholic product, particularly to the amount of alcohol, the amount and type of DA precursor(s), the presence of other neurotransmitter or precursors thereof, and/or the amount and type of other supplements

that may cross react or enhance the effect of a particular psychostimulant substance. Excess dopamine is dangerous and needs to be avoided, and a skilled person would appreciate that the amount and number of psychostimulant substances provided to the alcoholic beverages are to be adjusted so as to avoid secretion, production and/or otherwise promotion of excess DA.

The amount of one or more psychostimulant substances in a contemplated enriched alcoholic food product may be in a range of from 0 to about 10% by weight. For example, from about 0.01% to about 1.00%, from about 0.01% to about 1.00%, from about 0.05% to about 1.00%, from about 0.1% to about 0.3%, from about 0.2% to about 0.5%, from about 0.5% to about 1.0%, from about 1.0% to about 3.0%, from about 1.0% to about 5.0%, from about 5.0% to about 10.0%, from about 8% to about 10.0%, by weight or by volume of total enriched alcoholic product, and any sub-ranges and/or individual values therebetween.

The amount of psychostimulant substances in a contemplated product are adjusted such that the original texture, smell and palatability of the product is maintained.

Alcoholic beverages

In an aspect of the disclosure, there is provided an enriched alcoholic beverage comprising a base liquid, alcohol, one or more neurotransmitter and/or one or more neurotransmitter precursors as defined herein.

In some embodiments, a contemplated enriched alcoholic beverage optionally further comprises one or more psychostimulant substances as defined herein.

In some embodiments, provided herein is enriched alcoholic beverage comprising a base liquid, alcohol, dopamine and/or at least one dopamine precursor and, optionally, one or more psychostimulant substances as described herein, for example, caffeine.

Herein throughout, the term “base liquid” describes a liquid form of a substance or a mixture of substances which either alone or when mixed with other additives can form a beverage. In some embodiments, the base liquid is a base beverage.

In some embodiments, the base beverage is an alcohol-free base beverage.

The phrase “alcohol-free base beverage”, as used herein, is a beverage having alcohol percentage that is no more than 50% of the alcohol content in a corresponding alcoholic beverage, preferably no more than 40%, no more than 30%, no more than 20%,

no more than 15%, no more than 10%, no more than 5%, no more than 1%, no more than 0.5%, no more than 0.1%, no more than 0.05%, or no more than 0.01%, of the alcohol content acceptable for a certain beverage, including any subranges and any intermediate values there between. This phrase is used herein as encompassing both base beverages that are typically used for forming alcoholic beverages, and base beverages which are typically used as non-alcoholic beverages, for example, juices.

In some embodiments, the alcohol-free base beverage is devoid of alcohol.

By “devoid of alcohol” is meant herein less than 0.01% or less than 0.005%, or less than 0.001%, of alcohol by volumes, or even null.

Exemplary alcohol-free base beverages which form the liquid base for the enriched alcoholic beverages described herein include, but are not limited to, natural or artificially flavored fruit juice (such as grape, mango, elder, apple, orange juice, and the like), vegetable juice, fruit syrup, concentrate or nectar from fruits, plant materials such as agave, jello, carbonated beverages such as cola, optionally with addition of roasted malt beer, caffeinated beverages, specialized flavor formulations emulating the taste of existing wines and spirits, non-alcoholic cocktails ("mocktails"), malt beer, dealcoholized ciders, dealcoholized wines, dealcoholized beers, dealcoholized spirits, tonic water and water.

When the liquid base comprises alcohol, it is termed herein a “base alcoholic liquid”. In some embodiments, the base alcoholic liquid is an alcoholic beverage. The term “alcoholic beverage” as used herein encompasses any beverage having an alcohol (ethanol) content of at least 2% by volume, whether distilled, fortified, brewed, or produced by fermentation, and includes, but is not limited to, wine, beer, fermented liquids derived in whole or in part from fruit juices, such as cider and perry (pear cider), spirits, flavored alcoholic beverages collectively termed herein and in the art as “alcopops”, and the like.

In some embodiments, the base alcoholic liquid is an alcoholic beverage substitute that has residual alcohol content of 0-20% by volume, depending on the alcoholic beverage being substituted.

Embodiments described herein provide an enriched alcoholic beverage comprising a base alcoholic liquid, one or more neurotransmitter and/or one or more neurotransmitter precursors as defined herein.

In some embodiments, a contemplated enriched alcoholic beverage optionally further comprises one or more psychostimulant substances as defined herein.

In some embodiments, provided herein is enriched alcoholic beverage comprising a base alcoholic liquid, dopamine and/or at least one dopamine precursor as described herein and, optionally, one or more psychostimulant substances as described herein.

Any combination of the base liquid, base alcohol-free liquid and base alcoholic liquid as described herein is contemplated for the enriched alcoholic beverages described herein.

The contemplated enriched alcoholic beverages provided herein provide the drinker with the palatability effect of common alcoholic beverages, and further provide the drinker with a sustained euphoric feeling, pleasure and overall sensation of wellbeing and vitality which far exceed the effects provided by corresponding alcoholic beverages which do not contain these enriching supplements and additives. Moreover, unlike common alcoholic beverages, the enriched alcoholic beverages provided herein provide a substantial relief of the adverse effects associated with alcohol consumption, particularly the “down” feeling or depression associated with intoxication and sobering up.

A unique and surprising feature of the enriched alcoholic beverage provided herein is that they provide the drinker with intensified and prolonged pleasurable, joyful, and euphoric feelings accompanied with a boost of energy and motivation, while affording a substantial reduction in drunkenness symptoms.

Contemplated enriched alcoholic beverages provide substantial reduction of intoxication effects, namely, they substantially minimize intoxication effects. For example, these beverages reduce intoxication by 10-95%, or minimize intoxication effects to at least 5% of the effect associated with consuming a corresponding non-enriched alcoholic beverage having the same alcohol content.

In some embodiments, intoxication and/or other negative physical and emotional feelings accompanying sobering up may be relieved, eased or alleviated by about 0 to 100%. For example, alleviation of undesired effects exerted by a contemplated enriched alcoholic beverage may be up to 10%, up to 20%, up to 30%, up to 40 %, up to 50%, up to 60% up to 70%, up to 80%, up to 90%, up to 95%, or up to 100% as compared to a corresponding non-enriched alcoholic beverage. The extent of intoxication relief or

moderation changes from one person to another and depends on a collective of variable such as the person's tolerance to alcohol, the amount of alcohol in the beverage or the amount of beverage consumed. In some embodiments, the drinker does not experience any insobriety at all even though relatively high amount of alcohol is consumed, for example, at least 1 liter of enriched beer or at least 3 glasses of enriched wine.

Any combination of neurotransmitter precursors and psychostimulant substances as described herein is contemplated herein.

Because the enriched alcoholic beverage of the present disclosure affords palatability and psychotropic effect which outgo the effects of a corresponding non-enriched alcoholic beverages, these enriched beverages may be provided with reduced amounts of alcohol as compared to the corresponding non-enriched alcoholic beverages. For example, the alcohol amount in a contemplated enriched alcoholic beverages may be about 100%, about 95%, about 90%, about 80%, about 75%, about 70%, about 65%, about 60%, about 55%, about 50%, about 45%, about 40%, about 35%, about 30%, about 20%, about 15%, about 10%, about 5%, about 3%, about 1% or about 0.5%, of the amount of alcohol in a corresponding non-enriched alcoholic beverage.

In some embodiments, the enriched alcoholic beverage is selected from enriched beer, wine, cider, spirit and/or enriched alcopop beverage. In some embodiments, these enriched alcoholic beverages comprise one or more neurotransmitter precursors. In exemplary embodiments, the neurotransmitter precursor is a precursor of dopamine, for example, L-tyrosine.

The term "beer" as used herein and in the art means an alcoholic beverage obtained by malting and fermenting one or more of the cereal grains, and includes ale, stout, porter and lager. Typical alcoholic beer beverages include an alcoholic content of 3-8%. Some high-alcohol content beers comprise 8-12% alcohol, for example 10% alcohol.

In some embodiments, the beer is a "reduced alcohol beer", namely a beer as defined herein comprising up to 3.5% alcohol, for example, up to 3.0%, up to 2.2%, up to 2.0%, up to 1.5%, up to 1.0%, up to 0.5%, up to 0.3%, up to 0.1%, up to 0.05%, up to 0.01%, alcohol, or the beer may be devoid of alcohol.

Non-limiting examples of enriched beers provided in embodiments described herein include:

(i) *Ale*. A type of beer brewed using a warm fermentation method, resulting in a sweet, full-bodied and fruity taste. As with most beers, ale typically can have a bittering agent to balance the sweetness of the malt and act as a preservative. Ale is usually bittered with hops, the dried, cone-shaped flowers of the Mulberry plant used in the beer-brewing process to give a beer a bitter taste. Ale is typically fermented at temperatures between 15 and 24 °C (60 and 75 °F). At temperatures above 24 °C (75 °F) the yeasts can produce significant amounts of esters and other secondary flavour and aroma products, and the result is often a beer with slightly "fruity" compounds resembling those found in fruits such as apple, pear, pineapple, banana, plum, cherry, or prune.

Contemplated enriched Ale beers may be based on, or correspond to known (non-enriched) varieties, for example: (a) Brown Ale, a lightly hopped beer, fairly mildly flavoured, often with a nutty taste. Brown ales range from dark brown beers containing around 3-3.5% alcohol and quite sweet, to red-brown containing 4.5-5% alcohol, and drier beers; (b) Pale Ale, also known as "Bitter Ale", a beer made from malt dried with coke; (c) India Pale Ale (IPA), a Pale Ale containing extra hops, a beer appreciated for its light and refreshing character; (d) Golden Ale, similar to pale ale but paler, having from 3.5% to 5.3% alcohol; (e) Scotch Ale, a malty, strong ale, amber-to-dark red in color. The malt may be slightly caramelized to impart toffee notes; (f) Barley wine, range from 10% to 12% alcohol, optionally stored for long periods of time, e.g., about 18 to 24 months. Barley wine may taste like massive sweet malt and ripe fruit of pear, orange and lemon, or like darker fruits, chocolate and coffee if darker malts are used; (g) Mild Ale, or unaged ale, having dark brown color and low strength, typically between 3.0 and 3.5% alcohol; (h) Burton Ale, a strong, dark, somewhat sweet ale; (i) Old ale, a malty, medium-strong dark beer (generally above 5% alcohol), may be treated to resemble the traditional English old ales; (j) Belgian Ale, ale high in alcoholic content but relatively light in body due to the substitution of part of the grist for sucrose, which provides an alcohol boost without adding unfermentable material to the finished product. This process often makes a beer more digestible; and (k) Cask Ale, or cask-conditioned beer, an unfiltered and unpasteurized beer, which is conditioned (including secondary fermentation) and is served from a cask without additional nitrogen or carbon dioxide pressure;

(ii) *Porter or Stout*. Porter is a dark style of beer made from brown (roasted) malt or roasted barley, hops, water and yeast;

(iii) *Lager*. Lager (from German: storeroom or warehouse) a beer that is conditioned at low temperatures. It may be pale, golden, amber, or dark. Lager beer uses a process of cool fermentation, followed by maturation in cold storage. Specific yeast (*Saccharomyces pastorianus*) is used for brewing Lager.

Contemplated enriched lager beers may be based on, or correspond to known (non-enriched) varieties, for example: (a) Pale Lager, such as any one of the common lager beers in worldwide production, for example, Pilsner beer. The flavor of these lighter lagers is usually mild, and it is preferably served refrigerated. Pale lager is a very pale to golden-colored lager with a well attenuated body and noble hop bitterness; (b) Vienna Lager, a reddish-brown or copper-colored beer with medium body and slight malt sweetness. The malt aroma and flavor may have a toasted character; (c) Dark lager, typically ranging in color from amber to dark reddish brown and even black such as a Schwarzbier having a chocolate or liquorice-like flavour similar to stout. Alcohol concentrations of 4.5% to 6% by volume; and (d) Bock, a sweet, relatively strong (6.3%–7.2% alcohol by volume) lager. This beer is clear, ranging in color from light copper to brown, with a bountiful and persistent off-white head.

(iv) *Wheat beer*. Wheat beer is a beer, usually top-fermented, which is brewed with a large proportion of wheat relative to the amount of malted barley.

Contemplated enriched wheat beers may be based on, or correspond to known (non-enriched) varieties, for example: (a) a German style beer such as Weißbier (German – "white beer"), based on the German tradition of mixing at least 50% wheat to barley malt to make a light colored top-fermenting beer; and (b) a Belgian style beer such as Witbier, based on the Belgian tradition of using flavorings such as coriander and orange peel. Belgian style white beers are often made with raw unmalted wheat, as opposed to the malted wheat used in other varieties.

In some embodiments, an enriched beer is provided, comprising one or more dopamine precursors and, optionally, one or more psychostimulant substances as described herein in an amount that imparts to the beer palatability and/or positive psychotropic effects as defined herein and/or positive psychoactive effects as described herein, and/or pleasure

of drinking, at least as those provided by a corresponding non-enriched and/or any known beer containing 3.8-10% alcohol by volume.

In certain embodiments, the enriched beer provided herein affords positive psychoactive effects such as euphoric and joyful feeling, which exceed the effects exerted by a corresponding non-enriched beer containing 3.8-10% alcohol by volume, while substantially minimizing intoxication effects.

In the enriched beer described herein, the amount of dopamine precursor, for example, tyrosine, is within a range of from about 0.10 mg/ml to 5.0 mg/ml, for example, from about 0.10 mg/ml to about 0.20 mg/ml, from about 0.10 mg/ml to about 0.30 mg/ml, from about 0.25 mg/ml to about 0.45 mg/ml, from about 0.30 mg/ml to about 0.50 mg/ml, from about 0.30 mg/ml to about 0.60 mg/ml, from about 0.45 mg/ml to about 0.65 mg/ml, from about 0.50 mg/ml to about 0.70 mg/ml, from about 0.50 mg/ml to about 0.80 mg/ml, from about 0.60 mg/ml to about 0.90 mg/ml, from about 0.80 mg/ml to about 1.00 mg/ml, from about 0.90 mg/ml to about 1.10 mg/ml, from about 0.95 mg/ml to about 1.25 mg/ml, from about 1.00 mg/ml to about 1.30 mg/ml, from about 1.20 mg/ml to about 1.50 mg/ml, from about 1.45 mg/ml to about 1.75 mg/ml, from about 1.75 mg/ml to about 2.10 mg/ml, from about 2.00 mg/ml to about 2.50 mg/ml, from about 2.45 mg/ml to about 3.00 mg/ml, from about 2.50 mg/ml to about 3.50 mg/ml, from about 3.00 mg/ml to about 4.00 mg/ml, from about 3.75 mg/ml to about 4.50 mg/ml, or from about 4.35 mg/ml to about 5.00 mg/ml, including any subranges and any intermediate values therebetween.

In exemplary embodiment, the enriched beer provided herein comprises from about 0.1 mg/ml to about 0.45 mg/ml of tyrosine.

When the enriched beer described herein comprises a psychostimulant substance, the amount of the psychostimulant substance, for example, caffeine, may be within a range selected from 0.01 mg/ml to 0.04 mg/ml, 0.02 mg/ml to 0.05 mg/ml, 0.05 mg/ml to 0.08 mg/ml, 0.05 to 0.09 mg/ml, 0.05 to 0.10 mg/ml, 0.08 to 0.10 mg/ml, 0.08 to 0.12 mg/ml, 0.09 to 0.15 mg/ml, 0.10 to 0.15 mg/ml, 0.12 to 0.18 mg/ml, 0.12 to 0.20 mg/ml, 0.15 to 0.25 mg/ml, 0.20 to 0.25 mg/ml, 0.25 to 0.45 mg/ml, 0.25 to 0.50 mg/ml, 0.45 to 0.60 mg/ml, 0.50 to 0.75 mg/ml, 0.65 to 0.85 mg/ml, 0.85 to 0.95 mg/ml, 0.95 to 1.00 mg/ml, 0.95 to 1.30 mg/ml, 1.00 to 1.30 mg/ml, 1.00 to 1.50 mg/ml, 1.25 to 1.75 mg/ml, 1.50 to 2.00 mg/ml, 2.00 to 3.00 mg/ml, 3.00 to 5.00 mg/ml, 3.50 to 5.00 mg/ml, 4.50 to 6.00

mg/ml, or 6.00 to 9.00 mg/ml, including any subranges and any intermediate values therebetween.

In certain embodiment, the enriched beer herein comprises from about 0.01 mg/ml to about 0.9 mg/ml (or 10 mg/L to about 900 mg/L) of caffeine.

In an exemplary embodiment, an enriched beer is provided, comprising a lager beer, about 0.1 mg/ml to about 0.6 mg/ml of tyrosine and about 0.01 mg/ml to about 0.75 mg/ml caffeine.

In some embodiments, the base liquid of the enriched alcoholic beverages described herein is wine. The wine may have an alcohol content of 10-14%. The term “wine” as used herein and in the art includes the fermented juice of grapes, made in many varieties, such as red, white, sweet, dry, still, and sparkling. Exemplary wine beverages include, but are not limited to, dry red or white wine; semi-dry red or white wine; rosé wine; dessert wine such as Muscato wine; fruit wine; fortified wine such as Marsala, Port, Madeira, Sherry, vinsanto, and vermouth; sparkling wine such as Champagne, sangria, table wine.

In some embodiments, the wine is a “reduced alcohol wine”, namely a wine as defined herein comprising up to 8% alcohol, for example, up to 7%, up to 6%, up to 5%, up to 4.5%, up to 4%, up to 3.5%, up to 3%, up to 1%, up to 0.5%, up to 0.1%, up to 0.05%, or the wine may be devoid of alcohol.

In some embodiments, an enriched wine is contemplated, comprising a dopamine precursor and, optionally, a psychostimulant substance as described herein in an amount that imparts to the wine palatability and/or positive psychotropic effects as defined herein and/or positive psychoactive effects as defined herein, and/or pleasure of drinking, at least as those provided by a corresponding non-enriched or any known wine containing 10-14% alcohol by volume.

In certain embodiments, the enriched wine contemplated herein affords positive psychoactive effects such as euphoric and joyful feeling, which exceed the effects exerted by a corresponding non-enriched wine containing 7.5-14% alcohol by volume, while substantially minimizing intoxication effects.

In a contemplated enriched wine, the amount of dopamine precursor, for example, tyrosine, is within a range of from about 0.10 mg/ml to 5.0 mg/ml, for example, from about 0.10 to about 0.30 mg/ml, from about 0.25 to about 0.45 mg/ml, from about 0.30 to about

0.50 mg/ml, from about 0.30 to about 0.60 mg/ml, from about 0.35 to about 0.65 mg/ml, from about 0.45 to about 0.65 mg/ml, from about 0.50 to about 0.70 mg/ml, from about 0.50 to about 0.80 mg/ml, from about 0.60 to about 0.90 mg/ml, from about 0.80 to about 0.95 mg/ml, from about 0.80 to about 1.00 mg/ml, from about 0.90 to about 1.10 mg/ml, from about 0.95 to about 1.25 mg/ml, from about 1.00 to about 1.30 mg/ml, from about 1.10 to about 1.50 mg/ml, from about 1.50 to about 1.80 mg/ml, from about 1.55 to about 1.95 mg/ml, from about 1.70 to about 2.00 mg/ml, from about 1.95 to about 2.50 mg/ml, from about 2.55 to about 2.95 mg/ml, from about 2.80 to about 3.50 mg/ml, from about 3.50 to about 4.00 mg/ml, from about 3.80 to about 4.50 mg/ml, or from about 4.50 to about 5.00 mg/ml, including any subranges and any intermediate values therebetween.

In certain embodiment, the enriched wine contemplated herein comprises from about 0.1 mg/ml to about 1.80 mg/ml of tyrosine.

When the enriched wine described herein comprises a dopamine supplement, the amount of dopamine supplement, for example, caffeine, may be within a range selected from 0.01 mg/ml to 0.04 mg/ml, 0.02 to 0.05 mg/ml, 0.05 to 0.10 mg/ml, 0.08 to 0.10 mg/ml, 0.08 to 0.12 mg/ml, 0.09 to 0.15 mg/ml, 0.10 to 0.15 mg/ml, 0.12 to 0.18 mg/ml, 0.12 to 0.20 mg/ml, 0.15 to 0.25 mg/ml, 0.20 to 0.25 mg/ml, 0.25 to 0.45 mg/ml, 0.25 to 0.50 mg/ml, 0.45 to 0.60 mg/ml, 0.50 to 0.75 mg/ml, 0.65 to 0.85 mg/ml, 0.85 to 0.95 mg/ml, 0.95 to 1.00 mg/ml, 0.95 to 1.30 mg/ml, 1.00 to 1.30 mg/ml, 1.00 to 1.50 mg/ml, 1.25 to 1.75 mg/ml, or 1.50 to 2.00 mg/ml, including any subranges and any intermediate values therebetween.

In exemplary embodiments, the enriched wine contemplated herein comprises from about 0.01 mg/ml to about 0.75 mg/ml (or 10 mg/L to about 750 mg/L) caffeine.

The term “spirit” as used herein and in the art refers to a distilled alcohol beverage obtained, for example, by distilling starchy material, and includes, but not limited to, variety of raw grain alcohols, brandies, liquors, saki, Ouzo, arrack, rum, vodka, tequila, schnapps, whiskey, gin, cordial, Cachaça, absinthe, baijiu, eau de vie, soju, aguardiente, pálinka, fernet and slivovitz.

In some embodiments, the spirit is a “reduced alcohol spirit”, namely a spirit as defined herein comprising up to 80% alcohol, for example, up to 60%, up to 50%, up to 45%, up to 40%, up to 35%, up to 30%, up to 25%, up to 20%, up to 15%, up to 10%, up

to 8%, up to 7%, up to 6%, up to 5%, up to 4%, up to 3.5%, up to 3%, up to 2%, up to 1%, up to 0.5%, or the spirit may be devoid of alcohol.

In some embodiments, an enriched spirit is contemplated, comprising one or more dopamine precursors and, optionally, one or more psychostimulant supplements as described herein in an amount that imparts to the spirit palatability and/or positive psychotropic effects as defined herein and/or positive psychoactive effects as described herein, and/or pleasure of drinking, at least as those provided by any known corresponding non-enriched spirit containing 50-98% alcohol by volume.

In certain embodiments, the enriched spirit contemplated herein affords positive psychoactive effects such as euphoric and joyful feeling, which exceed the effects exerted by a corresponding non-enriched spirit containing 50-98% alcohol by volume, while substantially minimizing intoxication effects.

In the enriched spirit described herein, the amount of dopamine precursor, for example, tyrosine, is within a range of from about 0.10 mg/ml to 5.0 mg/ml, for example, from about 0.10 to about 0.30 mg/ml, from about 0.25 to about 0.45 mg/ml, from about 0.30 to about 0.50 mg/ml, from about 0.30 to about 0.60 mg/ml, from about 0.35 to about 0.65 mg/ml, from about 0.45 to about 0.65 mg/ml, from about 0.50 to about 0.70 mg/ml, from about 0.50 to about 0.80 mg/ml, from about 0.60 to about 0.90 mg/ml, from about 0.80 to about 0.95 mg/ml, from about 0.80 to about 1.00 mg/ml, from about 0.90 to about 1.10 mg/ml, from about 0.95 to about 1.25 mg/ml, from about 1.00 to about 1.30 mg/ml, from about 1.10 to about 1.50 mg/ml, from about 1.50 to about 1.80 mg/ml, from about 1.55 to about 1.95 mg/ml, from about 1.70 to about 2.00 mg/ml, from about 1.95 to about 2.50 mg/ml, from about 2.55 to about 2.95 mg/ml, from about 2.80 to about 3.50 mg/ml, from about 3.50 to about 4.00 mg/ml, from about 3.80 to about 4.50 mg/ml, or from about 4.50 to about 5.00 mg/ml, including any subranges and any intermediate values therebetween.

In exemplary embodiments, the enriched spirit contemplated herein comprises from about 0.1 mg/ml to about 2.5 mg/ml of tyrosine.

When the enriched spirit described herein comprises a psychostimulant supplement, the amount of psychostimulant supplement, for example, caffeine, may be within a range selected from 0.01 mg/ml to 0.04 mg/ml, 0.02 to 0.05 mg/ml, 0.05 to 0.10

mg/ml, 0.08 to 0.10 mg/ml, 0.08 to 0.12 mg/ml, 0.09 to 0.15 mg/ml, 0.10 to 0.15 mg/ml, 0.10 to 0.17 mg/ml, 0.12 to 0.18 mg/ml, 0.12 to 0.20 mg/ml, 0.15 to 0.25 mg/ml, 0.20 to 0.25 mg/ml, 0.23 to 0.35 mg/ml, 0.25 to 0.45 mg/ml, 0.25 to 0.50 mg/ml, 0.45 to 0.60 mg/ml, 0.50 to 0.75 mg/ml, 0.65 to 0.85 mg/ml, 0.70 to 0.95 mg/ml, 0.95 to 1.00 mg/ml, 0.95 to 1.30 mg/ml, 1.00 to 1.30 mg/ml, 1.00 to 1.50 mg/ml, 1.25 to 1.75 mg/ml, 1.50 to 2.00 mg/ml, 1.60 to 2.30 mg/ml, or 2.30 to 2.60 mg/ml, including any subranges and any intermediate values therebetween.

In exemplary embodiments, the enriched spirit contemplated herein comprises from about 0.01 mg/ml to about 0.75 mg/ml (or 10 mg/L to about 750 mg/L) caffeine.

Other known alcoholic beverages which can be made enriched alcoholic beverages in accordance with embodiments described herein, include, but are not limited to, Desi daru, made by fermenting molasses or high sugar containing fruits; Huangjiu (Chinese, made from rice, millet, or wheat using a special starter culture of yeast, mold, and bacteria); Icarine Liquor; Kasiri (made from cassava); Kilju (Finnish, made from sugar); Kumis (central asia, traditionally made from horse milk but now primarily cow milk); Mead (made from honey); Nihamanchi (South America) a.k.a. nijimanche (Ecuador and Peru) (made from cassava); Palm wine (made from the sap of various palm trees); Parakari (made from cassava); Pulque (originally made by the natives of Mexico, made from the sap of the maguey plant); Sakurá (made from cassava); Sake (made from rice); Sonti; Tepache; Tiswin (made from corn or saguaro, a large cactus); and Tonto.

Herein throughout, whenever a percentage (%) is indicated, volume % of the total volume of the beverage is meant, unless otherwise indicated.

Alcopop beverages, also termed herein and in the art “coolers” or “spirit coolers”, are flavored alcoholic beverages or flavored malt beverages based on fruit juice or nectar, and/or a variety of naturally and/or artificially flavored syrups. Exemplary alcopop beverages include, but are not limited to (i) a malt beverage, designate herein “a beer cooler”, containing a malt base or beer and at least 5% by volume of added natural or artificial blending material, such as fruit juice, flavors, flavorings, colorings, and, optionally, preservatives; (ii) a wine cooler which is a beverage containing wine and more than 15% by volume of added natural or artificial blending material, such as fruit juices, flavors, flavorings, adjuncts, water (plain, carbonated, or sparkling), colorings, and,

optionally, preservatives; and (iii) a beverage designated herein “a spirit cooler”, containing distilled alcohol, and added natural or artificial blending material, such as fruit juices, flavors, flavorings, colorings, and, optionally, preservatives.

Alcopop brands are numerous and their alcoholic base vary greatly. Most alcopop beverages contain 3.8-7% alcohol by volume, and some may even contain as much as 12.5% alcohol by volume. Some notable brands include, but are not limited to, Smirnoff Ice, Mike's Hard Lemonade, Bacardi Breezer, Skyy Blue, Jack Daniel's Hard Cola, WKD Original Vodka, Six Degrees and MG Spirits.

In some embodiments, an enriched cider and/or enriched alcopop beverage is contemplated, comprising one or more dopamine precursors and, optionally, one or more psychostimulant supplements as described herein in an amount that imparts to the beer palatability and/or positive psychotropic effects as defined herein and/or positive psychoactive effects as described herein, and/or pleasure of drinking, at least as those provided by a corresponding non-enriched or any known alcopop or cider containing 3.8-10% alcohol by volume.

In certain embodiments, the enriched alcopop or enriched cider contemplated herein affords positive psychoactive effects such as euphoric and joyful feeling, which exceed the effects exerted by a corresponding non-enriched alcopop or non-enriched cider containing 3.8-10% alcohol by volume, while substantially minimizing intoxication effects.

In the enriched alcopop described herein, the amount of dopamine precursor, for example, tyrosine, is within a range of from about 0.10 mg/ml to 5.0 mg/ml, for example, from about 0.10 mg/ml to about 0.20 mg/ml, from about 0.10 to about 0.30 mg/ml, from about 0.25 to about 0.45 mg/ml, from about 0.30 to about 0.50 mg/ml, from about 0.30 to about 0.60 mg/ml, from about 0.35 to about 0.65 mg/ml, from about 0.45 to about 0.65 mg/ml, from about 0.45 to about 0.70 mg/ml, from about 0.50 to about 0.70 mg/ml, from about 0.50 to about 0.80 mg/ml, from about 0.60 to about 0.90 mg/ml, from about 0.80 to about 0.95 mg/ml, from about 0.80 to about 1.00 mg/ml, from about 0.90 to about 1.10 mg/ml, from about 0.95 to about 1.25 mg/ml, from about 1.00 to about 1.30 mg/ml, from about 1.10 to about 1.30 mg/ml, from about 1.20 to about 1.50 mg/ml, from about 1.55 to about 1.75 mg/ml, from about 1.75 to about 2.10 mg/ml, from about 1.95 to about 2.50

mg/ml, from about 2.55 to about 2.95 mg/ml, from about 2.80 to about 3.50 mg/ml, from about 3.50 to about 4.00 mg/ml, from about 3.80 to about 4.50 mg/ml, or from about 4.50 to about 5.00 mg/ml including any subranges and any intermediate values therebetween.

In certain embodiment, the enriched alcopop contemplated herein comprises from about 0.1 mg/ml to about 0.45 mg/ml of tyrosine.

When the enriched alcopop described herein comprises a psychostimulant supplement, the amount of psychostimulant supplement, for example, caffeine, may be within a range selected from 0.01 mg/ml to 0.04 mg/ml, 0.02 to 0.05 mg/ml, 0.05 to 0.10 mg/ml, 0.08 to 0.10 mg/ml, 0.08 to 0.12 mg/ml, 0.09 to 0.15 mg/ml, 0.10 to 0.15 mg/ml, 0.12 to 0.18 mg/ml, 0.12 to 0.20 mg/ml, 0.15 to 0.25 mg/ml, 0.20 to 0.25 mg/ml, 0.25 to 0.45 mg/ml, 0.25 to 0.50 mg/ml, 0.45 to 0.60 mg/ml, 0.50 to 0.75 mg/ml, 0.65 to 0.85 mg/ml, 0.85 to 0.95 mg/ml, 0.95 to 1.00 mg/ml, 0.95 to 1.30 mg/ml, 1.00 to 1.30 mg/ml, 1.00 to 1.50 mg/ml, 1.25 to 1.75 mg/ml, or 1.50 to 2.00 mg/ml, including any subranges and any intermediate values therebetween.

In exemplary embodiments, the enriched alcopop contemplated herein comprises from about 0.01 mg/ml to about 0.75 mg/ml (or 10 mg/L to about 750 mg/L) caffeine.

Herein throughout, whenever a percentage (%) is indicated, % volume of the total volume (% v/v) of the beverage is meant, unless otherwise indicated.

In some of any one of the embodiments of the present invention, optionally or additionally, the base material of the enriched alcoholic food product, for example, base liquid or base alcoholic liquid, is formulated to include additives, such as flavoring agents, colorants, odoriferous agents, enzymes, CO₂ and/or other additives such as viscosity modifying agents, foaming agents, antifoaming agents, and preservatives that account for the taste and texture of e.g., wine or beer or spirit, such that the enriched alcoholic product will contain at least part or all the ingredients used to form the corresponding non-enriched alcoholic product. Preferably, additives used in the enriched alcohol products described herein are FDA-approved, and/or edible. In some embodiments, the additives are selected as soluble in the base material, e.g. base alcoholic beverage or base liquid.

The phrases "flavoring agent" and "odoriferous agent", as used herein, describe a class of substances which are added to edible products in order to induce a certain flavor or smell in the product, respectively, and are commonly referred to also as "flavorants".

Flavorants, also termed herein “taste-improving additives”, can be synthetic or natural extracts, which are extracted from a source substance. Typical flavorants are specific and often complex mixtures of singular naturally occurring or synthetic flavor compounds combined together to either imitate or enhance a natural flavor. Many flavorants are esters, which can be characterized by a typical flavor, such as diacetyl which gives a buttery flavor, isoamyl acetate that is perceived as banana, cinnamic aldehyde which is the basis for the typical flavor of cinnamon, ethyl propionate is perceived as fruity, limonene is perceived as orange, ethyl-(E, Z)-2,4-decadienoate is perceived as pear, allyl hexanoate is perceived as pineapple, ethyl maltol, is perceived as sugar or cotton candy, methyl salicylate is known as the wintergreen flavor, and benzaldehyde is perceived as bitter almond. Further synthetic flavorant are exemplified by amaretto, cola and ice cream flavors

Flavoring agent of a natural source can be, for example, an extract of a fruit, a vegetable, a herb or of any other edible substance, a fruit juice or a vegetable juice, or any combination thereof. Non-limiting examples of fruit flavorants include elder, grape, orange, ginger, red apple, anise, or lemon grass. These additives are added in addition to or instead of those found in the alcoholic beverage, if indeed present therein.

The term "colorant", as used herein, refers to any natural or synthetic coloring substance, and describes any substance that is added to food or drink in order to alter its color. Exemplary usable colorants include, but are not limited to, synthetic colorants such as FD&C Blue No. 1 - Brilliant Blue FCF (E133), FD&C Blue No. 2 – Indigotine (E132), FD&C Green No. 3 - Fast Green FCF (E143), FD&C Red No. 40 - Allura Red AC (E129), FD&C Red No. 3 – erythrosine (E127), FD&C Yellow No. 5 – tartrazine (E102), and FD&C Yellow No. 6 - Sunset Yellow FCF (E110), and natural food colorants such as carmine (E120), enocianin (E163), black carrot (E163), paprika (E160c), annatto (E160b), beta carotene (E160a), lutein (E161b), riboflavin (E101), curcumin (E100), copper chlorophyllin (E141), chlorophyll (E140), caramel (E150), and extracts of foodstuffs such as elderberry, aronia, grape, beetroot, carrot, turmeric (tumeric) root, spinach, stinging nettle and burnt sugar (caramelized sugar).

The term "preservative", as used herein, describes a synthetic or natural additive substance that is added to edible products in order to prevent or retard chemical and biochemical decomposition of the product by oxygen, moisture and/or microbes.

Exemplary anti-microbial preservatives include, but are not limited to, calcium propionate, sodium nitrate, sodium nitrite, sulfites (sulfur dioxide, sodium bisulfite, potassium hydrogen sulfite, etc.), disodium EDTA, sodium benzoate, potassium sorbate. Natural substances that retard microorganisms growth include lactic acid, salt, sugar and vinegar.

Exemplary antioxidant preservatives include, but are not limited to, butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT). Natural antioxidants include, but are not limited to, herbal extracts such as rosemary and oregano, and vitamins such as Vitamin E and Vitamin C (ascorbic acid).

The phrase "foaming agent", as used herein, describes an edible surfactant, which when present in small amounts, facilitates the formation of a foam, or enhances its colloidal stability by inhibiting the coalescence of bubbles. Exemplary foaming agents include, without limitation, sodium laureth/lauryl sulfate (SLS), sodium lauryl ether sulfate (SLES) and ammonium lauryl sulfate (ALS).

The phrase "antifoaming agent", as used herein, describes an edible substance that inhibits the formation of foam and curbs effusion or effervescence in edible products. An exemplary antifoaming agent is polydimethylsiloxane.

The phrases "viscosity modifying agent" or "thickener" as used herein are interchangeable and describe agents that enable to control the viscosity of the enriched alcoholic products described herein. Exemplary thickeners include, but are not limited to, starch-based thickeners such as maltodextrin and gum-based thickeners such as xanthan or cellulose gum.

The enriched alcoholic products described herein may be contained in any of the known containers applied for alcoholic products in general. For example, when the enriched alcoholic product is a beverage, for example a beer, it may be contained and marketed in a 330 ml, 500 ml, 750 ml and 1-liter bottle or tin, or in a barrel. The stability of the enriched alcoholic product obtained according to any of the embodiments described herein is preferably more than 365 days at room temperature, and it may be stored for up to 999 days at 10° C.

In an aspect of some embodiments of the present invention there is provided a process for the preparation of an enriched alcoholic beverage. The process comprises mixing a base liquid as defined herein with an amount of one or more neurotransmitter

precursors and/or one or more neurotransmitter precursors as described herein. In some embodiments, the process further comprises the addition of one or more psychostimulant supplements as described herein. In some embodiments, the base liquid is an alcoholic beverage such as beer, wine, spirit, cider or alcopop.

In some embodiments, the base liquid is a non-alcoholic beverage (e.g, juice, water and the like), and one or more neurotransmitter precursors and/or one or more neurotransmitter precursors and, optionally one or more psychostimulant supplements may be added to the non-alcoholic base beverage together with a desired amount of alcohol.

In some embodiments, the enriched alcoholic beverage, for example beer, is prepared by brewing the beer together with neurotransmitter precursor(s) and the psychostimulant supplement(s). Likewise, wine and spirit may be fermented or distilled, respectively, in processes that are adjusted to includes steps of addition of neurotransmitter precursor(s) and psychostimulant supplement(s), as long as the fermentation, distillation or brewing processes maintain the neurotransmitter precursor(s) and the psychostimulant supplement(s) intact and bioavailable, and further provided that the palatability, texture and appearance of the beverage is not substantially affected by including neurotransmitter precursor(s) and/or the psychostimulant supplement(s) in the process of preparation thereof.

In exemplary embodiments, the process described herein is for the preparation of enriched beers comprising one or more dopamine precursors and, optionally further comprising one or more psychostimulant supplements in the amounts described herein.

In exemplar embodiments, in the process provided herein, tyrosine and caffeine are provided to a base alcoholic beer. In alternative embodiments, an enriched beer is brewed together with tyrosine and caffeine in the brewery.

It is to be understood that the invention as described and discussed in the foregoing and in following sections of the description is not necessarily limited in its application to the details set forth in the present description.

Whenever a numerical range is indicated herein, it is meant to include any cited numeral (fractional or integral) within the indicated range. The phrases “ranging/ranges between” a first indicate number and a second indicate number and “ranging/ranges from”

a first indicate number “to” a second indicate number are used herein interchangeably and are meant to include the first and second indicated numbers and all the fractional and integral numerals therebetween.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “10 μm ” is intended to mean “about 10 μm ”.

The term “about” as used herein means within an acceptable error range for a particular value as determined by one of ordinary skill in the art, which will depend in part on how the value is measured or determined, i.e., the limitations of the measurement system. For example, “about” can mean a range of up to 10%, more preferably up to 5%, and still more preferably up to 1% of a given value.

The terms “comprises”, “comprising”, “includes”, “including”, “having” and their conjugates mean “including but not limited to”.

The term “consisting of” means “including and limited to”.

The term “consisting essentially of” means that the compositions, for example, enriched alcoholic beverages, may include additional ingredients but only if the additional ingredients do not materially alter the basic and novel characteristics of the claimed composition.

As used herein, the singular form “a”, “an” and “the” include plural references unless the context clearly dictates otherwise. For example, the term “a compound” or “at least one compound” may include a plurality of compounds, including mixtures thereof.

It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable subcombination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

Various embodiments and aspects of the present invention as delineated hereinabove and as claimed in the claims section below find experimental support in the following examples.

EXAMPLES

EXAMPLE 1

Preparation of beer enriched with tyrosine and caffeine

Beer enriched with tyrosine and caffeine was prepared using a protocol comprising the following steps:

- (i) grinding barley;
- (ii) immersing the grinded barley in water at a temperature of 50-75°C for about an hour;
- (iii) adding caffeine;
- (iv) transferring the mixture of grinded barley and caffeine to a boiler;
- (v) adding hops to the mixture in the boiler, and boiling the mixture for about an hour;
- (vi) transferring the boiling mass (herein referred to as the “must”) into a fermentation tank via a heat exchanger apparatus that cools the must from 100°C to about 20°C;
- (v) adding yeasts to the cooled must;
- (vi) fermenting the must for a period of 14 to 16 days so as to obtain a beer;
- (vii) transferring the fermented mass into a second tank (herein also termed “intermediate tank”);
- (viii) adding tyrosine and, optionally, glucose and to the fermented beer; and
- (ix) transferring the beer to bottles, cans or barrels and storing for a second fermentation for a period of 12-40 days at 18 °C.

The enriched beer was unfiltered and contained 5.5% alcohol by volume, and 40 mg tyrosine and 35 mg caffeine, per 100 ml.

EXAMPLE 2***Beer enriched with tyrosine and caffeine***

A further recipe for brewing beer enriched with tyrosine and caffeine comprises the following steps:

- (i) milling malted barley;
- (ii) mashing: transferring milled malted barley into mash tun, adding water and heating to a temperature of from about 50 °C to about 75 °C for about 1 - 2 hour;
- (iii) lautering: separating the wort (the malty liquid that was extracted during mashing) from the grains;
- (iv) adding tyrosine (from about 100 mg/L to about 5000 mg/L);
- (v) boiling the wort;
- (vi) adding hops and boiling the mixture for about 45 - 90 minutes;
- (vii) separating hopped wort from solid particles;
- (viii) cooling the wort to fermentation temperature (about 4 – 25 °C) and aerating it;
- (ix) adding brewer's yeasts and fermenting the wort for several weeks;
- (x) conditioning/maturing: separating fermented beer from dead yeasts and other debris and transferring it into a conditioning tank for a period of several weeks to several months;
- (xi) filtering the beer;
- (xii) adding caffeine (from about 10 mg/L to about 700 mg/L);
- (xiii) heating the beer to 70°C for pasteurization (elimination of harmful bacteria) and to fully dissolve added tyrosine and caffeine; and
- (xiv) packaging the enriched beer (i.e., bottling, canning and/or transferring to a barrel), and cooling for storage.

EXAMPLE 3***Alcopop (“hard lemonade”) enriched with tyrosine and caffeine***

Hard lemonade, an alcopop, enriched with tyrosine and caffeine is prepared according to the following steps:

- (i) grinding mint leaves with brown sugar;

- (ii) adding boiling water;
- (iii) adding tyrosine (from about 100 mg/L to about 5000 mg/L), and stirring the tyrosine-containing mixture;
- (iv) adding the following ingredients to the above mixture: water (at room temperature), a spirit with at least 40% alcohol (e.g., vodka), and freshly squeezed lemon juice with pulp, in a ratio mixture:water:vodka:lemon juice of about 1:5:4:2;
- (v) adding caffeine (from about 10 mg/L to about 700 mg/L); and
- (vi) bottling and/or canning the enriched alcopop and cooling for storage.

EXAMPLE 4

White wine enriched with tyrosine and caffeine

White wine enriched with tyrosine and caffeine is prepared according to the following steps:

- (i) crushing, pressing and extracting the grape juice (wort) of white-flesh grapes (so as to separate it from skins, seeds and other solids);
- (ii) clearing the wort to remove lees, for example, by settling or by other methods;
- (iii) adding tyrosine (from about 100 mg/L to about 5000 mg/L);
- (iv) optionally, adding wine yeasts to the wort in addition to the existing natural yeasts;
- (v) fermenting the wort in fermentation tanks for several weeks at a temperature of 12 – 37 °C;
- (vi) eliminating fermentation, if desired.
- (vii) clearing and refining: separating the fermented wine from dead yeasts and other debris, for example, by filtration or by other methods;
- (viii) adding caffeine (from about 10 mg/L to about 700 mg/L; and
- (ix) bottling the enriched wine.

EXAMPLE 5

Red wine enriched with tyrosine and caffeine

Red wine enriched with tyrosine and caffeine is prepared according to the following steps:

- (i) destemming and crushing grapes to create a must (i.e., a mixture of grapes, skins, juice and seeds);
- (ii) settling the must for pre-fermentation maceration at a temperature of about 10 °C for a period of 1 to 4 days;
- (iii) adding tyrosine (from about 100 mg/L to about 5000 mg/L);
- (iv) optionally, adding wine yeasts to the wort in addition to the existing natural yeasts;
- (v) fermenting the must in fermentation tanks for several weeks at a temperature of 12 – 37 °C. During fermentation, the contact between skins and liquid phase can be maximized by a desired mixing method;
- (vi) extracting the juice from the must by pressing and separating it from remaining solids;
- (vii) allowing for malolactic fermentation;
- (viii) racking: decanting off lees (dead yeasts and other solids) and providing sulfur dioxide preservative to avoid oxidation and bacterial spoilage;
- (ix) aging/maturing the wine for a desired period;
- (x) clearing and refining, for example, by filtration or by other methods;
- (xi) adding caffeine (from about 10 mg/L to about 750 mg/L; and
- (xii) bottling the enriched wine.

EXAMPLE 6

Cider enriched with tyrosine and caffeine

“Hard cider” enriched with tyrosine and caffeine is prepared according to the following steps:

- (i) crushing and pressing apples to acquire must (apple juice) from pomace (mixture of solid remains of pressed apples, skins, juice and seeds);
- (ii) adding tyrosine to concentrations of 100 mg/L – 5 gr/L;
- (iii) optionally, adding cider yeasts to the must, in addition to existing natural yeasts;
- (iv) fermenting the must in fermentation tanks for several weeks at a temperature of 4 – 16 °C;

- (v) racking: siphoning the liquor into new vats, separating it from dead yeasts and undesirable materials;
- (vi) aging/maturing the cider for a desired period;
- (vii) adding caffeine to concentrations of 10 mg/L to about 750 mg/L; and
- (viii) packaging the enriched cider (i.e., bottling, canning and/or transferring to a barrel), and cooling for storage.

EXAMPLE 7

Single Malt whisky enriched with tyrosine and caffeine

Single Malt whisky enriched with tyrosine and caffeine is prepared according to the following steps:

- (i) milling malted barley;
- (ii) mashing: transferring milled malted barley into mash tun, adding hot water in three stages and exceeding temperatures (beginning with approx. 60 °C, then approx. 75 °C and, finally, approx. 90 °C). Wort (the malty liquid that is extracted during mashing) is transferred into a washback;
- (iii) cooling the wort to fermentation temperature (about 4-25 °C);
- (iv) adding whisky yeasts;
- (v) fermenting the cooled wort for up to several days to receive the "wash";
- (vi) distilling the wash twice using stills: first using wash stills to obtain "low wine", and a second time using spirit stills to obtain the final "new-make" spirit (unaged whisky). During the second distillation, the more volatile compounds which distil off first (foreshots), and the final stage where more oily compounds are vaporized, are both channeled off so that only the pure center cut is collected;
- (vii) optionally, diluting the new-make prior to aging;
- (viii) transferring new-make to wooden casks and aging for several years;
- (ix) chill filtrating: precipitating and filtering to remove fatty acid esters;
- (x) adding tyrosine (final concentration 100 mg/L – 5 gr/L);
- (xi) adding caffeine (final concentrations 10 mg/L to about 750 mg/L); and
- (xii) bottling the enriched whisky.

EXAMPLE 8***Vodka enriched with tyrosine and caffeine***

Vodka enriched with tyrosine and caffeine is prepared according to the following steps:

- (i) mashing desired starchy ingredient (potatoes, milled grains, etc.), adding water and boiling;
- (ii) cooling the mash to enzyme activity temperatures;
- (iii) adding starch-breaking enzymes, such as amylase;
- (iv) allowing enzyme activity to break down starch within mash to small sugars;
- (v) adding vodka yeasts;
- (vi) fermenting the starch-broken mash for several days in yeast-activity temperatures (about 4 – 25 °C) to obtain the "wash" (i.e., insipid beverage);
- (vii) distilling the wash using standard methods to obtain raw spirit of ~60% alcohol by volume (ABV). Separating and discarding products of the first and last distillation stages (i.e., first 5% and final 35% of the whole distillation process);
- (viii) rectifying the raw spirit to neutral spirit of ~96% ABV;
- (ix) preparing demineralized water solution containing tyrosine (80 - 585 mg/L) and caffeine (15-670 mg/L), heating to ~80 °C until homogenous, and then cooling to ambient temperature;
- (x) adding the demineralized water solution to the neutral spirit to reduce ABV to ~40%;
- (xi) filtering the obtained enriched vodka using standard methods; and
- (xii) bottling the enriched vodka.

EXAMPLE 9***Coffee liqueur enriched with tyrosine and caffeine***

Coffee liqueur enriched with tyrosine and caffeine is prepared according to the following steps:

- (i) combining 3 cups of sugar, 2 cups of water and a tablespoon of vanilla extract in a saucepan;
- (ii) boiling and stirring for approx. 30 minutes until volume is reduced by half;

- (iii) adding 100 - 400 mg tyrosine and about 100 gr instant coffee, stirring until homogenous and allowing the syrup mixture to cool;
- (iv) combining the syrup with 750 ml 40% ABV vodka in a closed 1-liter bottle, and shaking well;
- (v) optionally, adding up to 180 mg caffeine;
- (vi) settling for 10 days in a cool, dark place;
- (vii) Straining/filtering the enriched liqueur; and
- (viii) bottling the enriched liqueur.

EXAMPLE 10

Biphasic Alcohol Effects Scale (BAES) study

The stimulant and sedative effects caused by consuming a beer enriched with a neurotransmitter precursor such as Tyr and, optionally, a psychostimulant substance such as caffeine, versus the stimulant and sedative effects exerted by a corresponding non-enriched beer was assessed in self-reporting participants using a Biphasic Alcohol Effects Scale (BAES)-based questionnaire. The BAES is a reliable and valid systematic 14-item self-report scale designed to measure stimulant and sedative effects of alcohol as separate and distinct constructs. BAES and a brief version thereof (B-BAES) comprising only 6 items are described, for example, in Rueger and King, 2013 (*Alcohol Clin Exp Res.* 37(3): 470–476; and references cited therein).

Seven items comprise the stimulant subscale of the BAES (elated, energized, excited, stimulated, talkative, up, vigorous), and another seven items comprise the sedative subscale (difficulty in concentrating, down, heavy head, inactive, sedated, slow thoughts, sluggish). The BAES test demonstrates strong psychometric properties, including high internal consistency, reliability and a four-factor structure reflecting the distinctness of the stimulant and sedative constructs during both the ascending and descending limbs of the breath alcohol concentration (BrAC) curve. With use of a conversion factor, called the blood:breath ratio (BBR), the blood alcohol concentration (BAC) can be estimated from BrAC. This four-factor structure is invariant to dose, drinking history, and sex, and demonstrates robustness to an instructional set that does not disclose the content of the alcoholic beverage (see, for example, Rueger et al., 2009, *Alcohol Clin Exp Res.* 33:916–924).

The BAES study of alcohol effects in accordance with the disclosed study had multiple assessments in one session. For example, the BAES questionnaire was administered before alcohol was consumed and then the assessment was repeated 3–4 more times after consumption to capture rising and declining BrAC limb effects.

In the BAES questionnaire exemplified herein, each participant was presented with 14 items in alphabetical order, 7 of which describe sensations (feelings, perception) associated with stimulant effects (elevated mood (high spirit), energy, excitement, stimulated, talkativeness, vigorous and vitality), and 7 items describing sensations (feelings, perception) associated with sedative effects (difficulty in concentrating, down feeling, heavy head, heavy body, sedative, slow thinking, sluggishness). Each participant had to assign, next to each of these 14 items, a number in the range from 0 to 10 indicating how closely or how well a certain item expresses, corresponds or describes his/her current feeling/sensation, where “0” indicates “not at all describing” or “irrelevant”, and “10” indicates “exactly (or very much) describing”.

The numerical indications of the stimulant and sedative effects were averaged to obtain two numerical values designated STIM and SED, respectively.

Participants

Healthy nonalcoholic 198 social drinkers participated in the study. Participants were recruited from the wider community via advertising placed, for example, in web sites. Each participant’s eligibility was subject to the following criteria: (i) aged 18–60 years; (ii) no history of alcohol addiction; (iii) not taking medication having a stimulative or sedative action; (iv) moderate to low regular consumption of alcohol.

Participants were randomly supplied with either one of: (i) an alcoholic beverage, e.g., beer, enriched with tyrosine and caffeine; or (ii) a corresponding non-enriched alcoholic beverage. The study was double-blind, and the participants did not know whether they were supplied with alcoholic beverage (i) or (ii). The gender split was equal across both groups. All participants were requested to refrain from alcohol consumption at least 24 hours before the study.

Study design

The study was a 2-session (2 days) study, wherein the second session (day) was at least a week apart from the first session. Participants were either given an enriched (i.e., comprising Tyr and caffeine) or non-enriched beer having 5.2% alcohol.

In each session, participants first filled a BAES questionnaire to set up a baseline assessment, followed (about 5 minutes later) by the consumption of either enriched beer (i) or non-enriched beer (ii). For each participant, the amount of beer provided was calculated so as to reach blood alcohol level of 0.35 gr per kg body weight. For example, for a participant weighting 75 kg, 26.25 gr of alcohol are required in order to reach the predetermined blood alcohol concentration, thus this participant was supplied with 504.8 ml beer having 5.2% alcohol.

The total amount of alcohol for a participant was divided into 5 equal portions, and the participant was requested to consume each portion within 2 minutes (overall, 10 min for consuming the whole amount of alcoholic beverage). Immediately after the last portion of beverage was fully consumed, time point zero (T=0) was set. Participant were requested to fill a BAES questionnaire at T= 30 min, T= 60 min and at T=120 min.

Answers obtained from all BAES questionnaires were gathered, averaged (standard deviation was calculated) to obtain the STIM and SED values, and presented graphically. The results are shown in Figures 1A-1B and 2A-2B, and presented in Tables 1 and 2.

Table 1. BAES study for non-enriched (regular) beer

Regular (non-enriched) Beer				
	STIM	SD	SED	SD
Baseline	3.20	0.76	1.51	0.39
30 min	3.54	0.69	1.90	0.50
60 min	2.49	0.52	2.78	0.53
120 min	2.15	0.45	3.33	0.64

Table 2. BAES study for beer enriched with tyrosine and caffeine

Enriched Beer				
	STIM	SD	SED	SD
Baseline	3.08	0.77	1.30	0.40
30 min	5.32	0.83	1.10	0.38
60 min	5.04	0.79	1.07	0.38
120 min	4.05	0.61	1.10	0.35

As seen in Table 1, and Figures 1A and 2A, 30 minutes after the regular (non-enriched beer) was consumed, participants experienced slight stimulant and sedative effects. Sixty minutes (T=60) and 120 minutes after consumption, the sedative effects increase while stimulant effects decreased even below baseline levels.

On the other hand, as seen in Table 2, and Figures 1B and 2B, 30 minutes after the enriched beer was consumed, significant elevation of stimulant effects was demonstrated, along with a slight rise in sedative effects. Sixty minutes (T=60) and 120 minutes after consumption of the enriched beer, the stimulant effects gradually regress or decrease, but they were still higher compared to consumption of non-enriched beer. No significant change was seen in the sedative effects, namely, they remained low even after 120 min.

It is shown herein that the beer enriched with Tyr and caffeine significantly strengthens and prolongs the stimulant and mood elevating effects associated with alcohol consumption as compared to a corresponding non-enriched beer, while significantly reducing, nearly nulling, the sedative effects, and for much longer time compared to non-enriched beer.

Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the spirit and broad scope of the appended claims.

All publications, patents and patent applications mentioned in this specification are herein incorporated in their entirety by reference into the specification, to the same extent as if each individual publication, patent or patent application was specifically and

individually indicated to be incorporated herein by reference. In addition, citation or identification of any reference in this application shall not be construed as an admission that such reference is available as prior art to the present invention. To the extent that section headings are used, they should not be construed as necessarily limiting.