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(54) Title: MICRO-MOLECULAR HYPER-SATURATION OF CONVENTIONAL COOKING OILS FOR HIGH ALTITUDE AND CONFINED SPACE APPLICATIONS

(57) Abstract: The instant invention is directed toward a process of Micro-Molecular Hyper-Saturation or Microsaturation, which results in transforming common, whole, Essential Fatty Acid (EFA) rich cooking oils into a product exhibiting increased shelf life while simultaneously eliminating or severely decreasing the need for hydrogenation; and resulting in an end product specific to the extreme operational profile necessary to accommodate unique nutritional requirements. The method of manufacture and product produced thereby relates to the functional molecular engineering of the fatty acid profile of traditional cooking oils to accommodate unique nutritional requirements, to provide a nutritional product capable of supporting individuals working in an extreme operational envelope associated with, e.g. high altitude and confined space nutrition, thereby reducing obesity and its associated heart disease problems, as well as providing a healthy, dense calorie regimen, for recovering third world famine influenced human populations.



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**MICRO-MOLECULAR HYPER-SATURATION OF CONVENTIONAL COOKING
OILS FOR HIGH ALTITUDE AND CONFINED SPACE APPLICATIONS**

Cross-Reference to Related Applications:

This application claims the benefit of Provisional Application 60/381,680, filed May 20, 2002, the contents of which are herein incorporated by reference in their entirety.

Field of the Invention

This invention relates to modified cooking oils, particularly to cooking oils which are uniquely combined with a mixture of structured triglycerides in a manner effective to yield an intra-spatially saturated configuration of micro-molecules exhibiting hyper-saturation.

Background of the Invention

Various extreme conditions create situations which dictate extraordinary nutritional requirements. Examples of such conditions include high altitude and its' associated cold environment, and long term confined space operations. Examples of these conditions include Submarine based S.E.A.L. team deployment with E.V.A (dark, cold water submersible deployment), long term special-forces high altitude pursuit, after lengthy staging operations, interplanetary travel, such as a Mars mission) or extended space station operations, where the decreased spacesuit pressure mimics high altitude, often requiring high energy, high calorie Extra Vehicular Activity. Such conditions have, for the longest time, presented a most difficult human operational envelope, requiring highly specific but as yet unrealized nutritional tools.

Man's ability to continually expand the human element in extreme operations, relies in large part on an ability to create products which are capable of satisfying nutritional

1 needs above and beyond the current scope of the food and
2 nutritional industries.

3 The current lack of nutritional resources sufficient to
4 provide the required dense calorie logistics is
5 significantly limiting the expansion of the human
6 operational threshold. The statement of need is perhaps
7 better articulated by the Academy of Sciences in their 1996
8 thorough report, "Nutritional Needs in Cold and High-
9 Altitude Environments: Applications for Military Personnel
10 in Field Operations"

11 There is no question that operational logistics would
12 benefit from a dense, healthy fat, calorie platform. The
13 Academy's recommendations following this most exhaustive,
14 functional research compilation on the subject to date,
15 shows their desire to entertain a dense fat calorie regimen.
16 Concern over conventional dietary fat, cholesterol intake
17 and the pathogenesis of atherosclerosis, strokes, and
18 Coronary Heart Disease (CHD) steers them towards their
19 suggested compromise diet of 12-15% Protein, 60%
20 Carbohydrate (CHO) and 25-28% Fat. However, by their own
21 account, "The easiest way for military feeding systems to
22 provide for increased caloric needs during cold-weather
23 operations is to include additional dietary fats. Diets
24 containing more of the high density fat fuels may become an
25 operational necessity."

26 Animal fats and cooking oils are the fat rich dietary
27 elements currently employed in military and space rations.
28 Supplements with a modestly higher fat content tested in
29 1991, did not result in sufficient energy intake.

30 The greatest fear voiced by the Academy is that by
31 introducing additional fats they would be increasing the
32 risk of coronary heart deaths. This fear was echoed in the
33 FDA's address of Trans Fatty Acids and Hydrogenation in its'
34 1999 response to the Department of Health and Human
35 Services, specifically, "Trans Fatty Acids in Nutrition
36 Labeling, Nutrient Content Claims, and Health Claims",
37 echoing the Academy's concerns.

1 The cooking oil formulation of the instant invention is
2 designed to replace current cooking oils, thereby providing
3 the healthiest possible dense calorie scenario for a
4 uniquely defined operational profile, while simultaneously
5 providing a formulation which allays the Academy's fears.

6 **Prior Art**

7 U.S. Patent No. 6,156,369 discloses a food spread
8 which comprises a non-aqueous mixture of an edible oil and
9 a mono-glyceride. The '369 patent does teach a method for
10 forming the food spread which consists of a first heating
11 step albeit to a temperature of 113 to 167 degrees
12 Fahrenheit, but without the vortex mixing which is required
13 by the instantly disclosed invention.

14
15 U.S. Patent No. 5,411,756 discloses fat mixtures which are
16 enriched triglycerides having long saturated fatty acid
17 residues preferably C₁₆ to C₂₂. This patent generally
18 discloses a composition which must include a dairy protein
19 and a fat component wherein at least about 25% of the fat
20 component is a low calorie triglyceride or combination of
21 plural low calorie triglycerides. Neither the disclosed
22 composition, nor its method of making, suggest the
23 conditions or processing steps necessary to form an intra-
24 spatially saturated composition as is instantly disclosed.

25
26 U.S. Patent No. 4,948,618 is directed toward a process for
27 tempering edible plastic fat products such as margarine and
28 shortening, which process comprises crystalizing, with
29 cooling, a starting material including fats and oils with or
30 without other ingredients and then subjecting the resulting
31 product to pressurizing treatment. The process disclosed is
32 essentially an extrusion process wherein the crystalized fat
33 product is subjected to both a pressure and temperature
34 sufficient to age said product. The requirement, as
35 instantly disclosed, of vortical agitation and a velocity of
36 approximately 3 to 10 miles per hour coupled with an
37 increase in a compounds temperature between 85 and 95

1 degrees Fahrenheit is neither suggested or disclosed.

2

3 U.S. Patent No. 4,482,576 is directed toward a method for
4 treating an edible oil which is rich in linoleic acids so as
5 to increase the solid fat content therein. The process
6 comprises interesterification under isothermal conditions.
7 The steps of interesterification, as required in the '576
8 patent, neither discloses nor suggests conditions suitable
9 for forming an intra-spatially saturated long chain fatty
10 acid as is instantly described.

11

12 U.S. Patent No. 2,442,531 is directed toward a process for
13 treating fats and fatty oils. This patent discloses a
14 method for treating oils, for example palmitic and oleic,
15 wherein palmitic acid and oleic acid are first mixed in
16 particular proportions and the mixture is then reacted with
17 glycerin to form triglycerides. This patent, at column 4
18 beginning at line 25, recognizes that fatty acid radicals in
19 triglyceride fats have the ability to rearrange under proper
20 conditions of treatment. The patent seeks to direct and
21 control the rearrangement so as to achieve a result not
22 heretofore obtained. By using a combination of low
23 temperature and a suitable catalyst, rearrangement is
24 permitted to take place at a temperature below that at which
25 the liquid phase is saturated, thereby permitting
26 crystallization of solid triglycerides of low solubility as
27 such triglycerides are formed. This reference requires the
28 use of a catalyst which is not suggested or required in
29 order to perform the appropriate arrangement. In any event,
30 intra- spatial saturated triglycerides, as instantly
31 disclosed, are not produced via the process of the '531
32 patent.

33

34 U.S. Patent No. 6,096,351 discloses edible vegetable fat
35 compositions which do not contain hydrogenated fat and do
36 contain 15 to 45 percent stearic acid, less than 15%
37 palmitic acid, and from 45 to 80% unsaturated C₁₈ fatty acid

1 residues, such that the combined amount of acids with 16 or
2 more carbon atoms is at least about 95%. The process of
3 this invention is essentially an ester interchange involving
4 all three positions of glyceride to obtain an ester
5 interchange fat and further more an optional blending step
6 wherein from 10 to 100% of the ester interchanged fat is
7 blended with up to 90% of a vegetable non-hydrogenated non-
8 interesterified fat. This patent fails to disclose either
9 the mixing or temperature conditions required in order to
10 form the structured triglycerides of the instant invention,
11 having an intra-spatially saturated construction as
12 disclosed by the instant invention.

13
14 U.S. Patent No. 4,832,975 discloses a reduced calorie edible
15 fat/oil comprising tailored triglycerides having a
16 particular combination of saturated medium and long chain
17 fatty acids in combination with unsaturated long chain fatty
18 acids. Both caloric reduction and acceptable autoignition
19 characteristics are pointed toward as unique features, which
20 are deemed to render the end product suitable for use in
21 shortening and cooking oils. The tailored triglycerides
22 herein disclosed, nevertheless fail to provide either the
23 necessary process conditions, nor the appropriate initial
24 blend of components necessary to result in a product having
25 a saturated spatial configuration as is instantly disclosed.

26 27 **Summary of the Invention**

28 The instant invention is directed toward a process of
29 Micro-Molecular Hyper-Saturation or Microsaturation, which
30 results in transforming common, whole, Essential Fatty Acid
31 (EFA) rich cooking oils into a product exhibiting increased
32 shelf life while simultaneously eliminating or severely
33 decreasing the need for hydrogenation; and resulting in an
34 end product specific to the extreme operational profile
35 necessary to accommodate unique nutritional requirements.

1 Accordingly, it is a primary objective of the instant
2 invention to teach a method, and a product produced thereby
3 which relates to the functional molecular engineering of
4 fatty acid profile of traditional cooking oils to
5 accommodate unique nutritional requirements, as illustrated
6 by NASA and the Military's extreme operational envelope
7 associated with high altitude and confined space nutrition.

8 It is another objective of the instant invention to
9 provide a novel saturation process for creating a product
10 which displaces the need for unhealthy Long Chain Fatty
11 Acids (LCFA).

12 It is an additional objective of the instant invention
13 to provide a fatty acid profile closely related to human
14 milk satiety.

15 It is a further objective of the instant invention to
16 provide a product which follows a ketogenic obligatory
17 alternative fat digestive pathway, thereby limiting corporal
18 fat deposition and improving oxygen utilization, while
19 displacing inefficiently caloric CHO as a primary energy
20 source.

21 It is a still further objective of the instant
22 invention to provide an improved nutritional product having
23 a functionally engineered fatty acid profile for use by the
24 general population.

25 It is yet an additional objective of the instant
26 invention to provide a novel compositional performance
27 enhancement process, which eliminates or greatly reduces the
28 need for hydrogenation, while targeting specific physiologic
29 needs and providing a healthy calorie dense alternative to
30 unhealthy fats and carbohydrates, as a primary energy
31 source.

32 It is yet a further objective of the instant invention
33 to provide a product which exhibits enhanced shelf life and
34 preservation characteristics without requiring

1 hydrogenation.

2 Other objectives and advantages of this invention will
3 become apparent from the following description taken in
4 conjunction with any accompanying drawings wherein are set
5 forth, by way of illustration and example, certain
6 embodiments of this invention. The drawings constitute a
7 part of this specification and include exemplary embodiments
8 of the present invention and illustrate various objects and
9 features thereof.

10 Detailed Description of the Invention

11 The present invention uses a strategic combination of
12 saturated short and medium chain fatty acids as a process
13 tool, thereby providing the spatial saturation associated
14 with the product produced in accordance with the instant
15 invention. A pre-calculated molecular ratio for the
16 polyunsaturated and monounsaturated fat molecules creates
17 extended preservation qualities of such Long Chain Fatty
18 Acids (LCFA). A ratio of 1.8 molecules of Medium Chain
19 Fatty Acids vs Long Chain Fatty Acids has been studied in
20 parenteral nutrition for in-vivo examination of speed of
21 clearance by examination of the responsible enzymes of
22 oxidation, Lipoprotein Lipase and Hepatic Lipase, revealing
23 rapid clearance and rapid fatty acid availability to various
24 tissues.

25 This molecular ratio, (extended to include 1.8-2), also
26 plays a very important in-vitro application in that the
27 saturated fats used (medium chain fatty acids), act as
28 oxidative bumper guards for the mono and polyunsaturated
29 long chain fatty acids in the resulting cooking oil, greatly
30 extending its shelf life and that of associated While not
31 wishing to be bound to any particular theory of operation,
32 this preservation effect might be attributed to the
33 observation that MCT treated neutrophils, upon lipid removal
34 by cell washing in-vitro, showed decreased production of

1 Hydrogen Peroxide, a substance well-known for the oxidation
2 and break down of fats.

3 Molecular size and its associated clearance kinetics
4 are highly important to the instant invention since an
5 additional obligatory fat kinetic pathway is a key aspect.
6 This invention uses 1-5% of C_6 as an in-vivo catalyst for
7 this kinetic pathway, accelerating the entrance into the
8 obligatory digestive pathway, allowing the liver to burn it
9 as energy. $C:b$ is also a significant molecular contributor
10 to the in-vitro hypersaturation process. Molecular carbon
11 chain length and its kinetics show slower kinetics of entry
12 into circulation as chain length increases from C_8 to C_9 to
13 C_{10} . This also would be consistent with the generally
14 accepted belief that the rate of metabolism of fatty acids
15 varies in proportion to their water solubility.

16 This may be supported by various studies on gastric
17 emptying of carbohydrate and MCT suspensions, revealing that
18 all MCT containing drinks emptied faster than the 100%
19 Carbohydrate drink. This may be explained by observations
20 that CHO content and osmolality increases with increases in
21 MCT content, and that MCT may not inhibit gastric emptying
22 as common fat does, due to a better solubility and
23 absorption in the small intestine, resulting in a decreased
24 duodenal-gastric feedback. This is very important for our
25 high altitude applications, showing gastric compliance,
26 since change of carbon chain formulation, for other human
27 and non-human applications, while maintaining the integrity
28 of our "micro-saturation" process, may be crucial.

29 Fat emulsion particle size studies further indicate
30 that, for a given quantity of triglycerides and
31 phospholipids the lipolytic activity is proportional to the
32 total interfacial area and that going from a long chain to

1 medium chain triglycerides there is acceleration in the
2 clearance rate of infused lipid.

3 Other absorption studies echo similar results and add
4 that MCT are not only hydrolysed by the above enzymes, but
5 also Lingual and Gastric Lipase which are incorporated into
6 mucosal cells, where the hydrophilic properties continue
7 intracellular hydrolyzation, further assisting as an
8 obligatory fuel and aiding its digestive speed.

9 Parenteral or vein forced feeding of such medium chain
10 fatty acids, however, may have a hypercholesterolemic
11 affect. This LCFA known action is a voiced concern of the
12 Academy. This is not true of enteral feeding, however. As
13 described in the extended study, comparing plasma
14 cholesterol concentrations in rats, with MCT-LCT vs. LCT and
15 intragastric vs. intravenous showing elevated plasma
16 cholesterol concentrations in the intravenous and not in the
17 intragastric digestive pathway in groups fed our formula.
18 Another MCT Cholesterol lowering study supportive of our
19 MCT/LCT formulation in neonates, reveals a greater than 100%
20 mean plasma cholesterol rise in the conventional fat fed
21 group, as compared to our formulation.

22 Another concern voiced by the Academy for high altitude
23 nutrition, is the potential for a conventional high fat diet
24 to cause adverse metabolic effects and gastric symptoms,
25 difficult to distinguish from heart attack.

26 Gastrointestinal tolerance studies with compositions having
27 a similar MCT-LCT composition to this invention have been
28 studied in low birth weight infants, revealing excellent
29 gastrointestinal tolerance. This is the perfect type of study
30 assuming the delicate nature of infantile gastrointestinal
31 tissues.

32 The Academy indicates that at altitude 2.2 to 2.3X the
33 amount of calories at sea level is necessary for maintaining
34 lean body mass. Current diet increases potential for Chronic
35 Heart Disease and requires modification to increase safe fats.

1 Soldiers deployed in cold environments/high altitude reveal
2 enhanced appetite which may account for the initial 1kg/month
3 weight gain. This weight gain must be addressed also for low
4 metabolism, confined space individuals, such as submariners and
5 extended stay astronauts.

6 The importance of satiety is methodically addressed by our
7 formulation. The strategic formulation of the cooking oils
8 developed by micro-molecular hypersaturation in accordance with
9 the instant invention, intentionally has a resulting fatty acid
10 profile with a saturated fat component greater than 50%. This
11 closely resembles the fatty acid profile of human milk. Human
12 milk is divided into two parts. Fore milk, which is primarily
13 a light watery carbohydrate and protein mixture, and hind milk
14 which is primarily saturated fat. This dense hind milk with its
15 inherent saturated fatty acid profile, is what creates the
16 trigger for the infant to stop nursing. Human milk however,
17 contains 25-30% of palmitic acid as part of its saturated fatty
18 acid profile and becomes inherently dangerous for heart disease.

19 This is due to the high amount of saturated fat. The
20 Medium Chain Triglycerides involved in the hyper-saturation
21 process, although precisely, molecularly configured to provide
22 certain molecules for our process, acts as the trigger
23 mechanism. Studies show in chicken feeding behavior that as
24 early as 30 minutes after feeding cumulative food intake in MCT
25 (C_8 and C_{10} supplemented diets) decrease significantly over Long
26 Chain Triglycerides. Another study suggesting satiety with our
27 resulting formulation, reveals that rats showed significant
28 decrease in cumulative food intake in a dose dependent fashion
29 after MCT/LCT and not in LCT.

30 Furthermore, this cumulative effect is echoed in human
31 studies comparing food intake in dieters and non-dieters
32 following meal containing MCTs. The main finding here was that
33 30 minutes after consuming their MCT preloads, at all doses, the
34 non-dieters showed a significant decrease in caloric intake,

1 when offered a varied self-selection lunch.

2 The strategic method used by this invention to address such
3 lean body weight loss is to provide dense, specific fat
4 calories, in the form of cooking oil, to provide a protein and
5 glycogen sparing effect. The same formulation has a satiety
6 effect, which helps with the initial weight gain and calorie
7 intake in the form of volume, for the less metabolically
8 challenged confined space individual.

9 However, these same individuals from time to time must perform
10 very calorically challenged activities such as EVAs, accounting
11 for 2-3x normal caloric needs and corporal tissue injury,
12 similar to that of high altitude. For example: Astronaut EVA's
13 fighting against a pressurized suit, Submarine deployment of
14 SEAL Teams. Preparation of corporal tissue by chronic ingestion
15 and immediate ingestion prior to activity has very specific
16 benefits. Persistence of metabolic effects after long term oral
17 feeding of traumatized rats by medium chain saturated
18 triglycerides and Omega 3 oil, have shown greater liver weight,
19 total liver protein, % of Leucine flux oxidized, and glucose and
20 insulin increase than long chain fatty acid (safflower oil rich
21 in Omega 6).

22 Of human significance is that surgically stressed patients,
23 when tested for kinetics of MC Triglycerides and Free Fatty
24 Acids, show that the stressed patient is able to effectively use
25 our special lipid profile in face of increased metabolic demand.
26 Also mentioned is that MCT hydrolysis plays particular
27 importance in those stress situations, such as sepsis or surgery
28 to promote healing. Furthermore, the study indicates that LCT
29 administration, together with MCT administration, is still
30 necessary because LCTs not only provide essential fatty acids
31 but also reduce MCT induced ketogenesis.

32 This suggests that a soldier in any environment would be
33 best served by our developed formulation in case of injury, an

1 inherent element of warfare. Our formulation takes into account
2 studies showing that a 75%MCT and 25%LCT formulation decreases
3 whole body lipolysis by 53%, in multiple trauma patients.
4 However, this would be harmful for long term, in that it results
5 in clinical Essential Fatty Acid (EFA) deficiency, thereby
6 proving the value of our formulation. Our process answers the
7 call by the Academy, providing the necessary fats for energy,
8 yet significantly reducing the potential of CHD. This is
9 another imperative reason for our strategic formulation of
10 50%MCT/50% edible oil base.

11 Of further concern by the Academy, is maintaining a
12 significant amount of carbohydrate in high altitude
13 operations, due to its thermic effect as related to normal
14 fat. Displacement of a significant amount of carbohydrate and
15 LCFA can be successfully accomplished as follows:

16 CHO is preferred as the primary energy source because
17 of its oxidation characteristics and glycogen sparing.
18 Cycling performance studies of carbohydrate and MCT, show
19 that MCT oxidation decreased the direct and/or indirect
20 oxidation of muscle glycogen. Adequate stores of muscle
21 glycogen are of particular need in intense, prolonged
22 exercise, as indicated by the Academy. Furthermore,
23 subjects showed faster T-trials of CHO+MCT, suggesting a
24 reduced reliance on carbohydrate oxidation at a given Oxygen
25 uptake being similar to an endurance training effect.
26 Therefore our ingested cooking oil as part of military
27 rations would enhance their CHO effectiveness, as well as
28 the general population's, making better utilization of Low-
29 Carbohydrate Diets.

30 Glucose oxidation is further assisted by 50%MCT-50%LCT
31 infusion, without inhibiting glucose tissue uptake 12-436.
32 The study goes on to suggest interference with glucose
33 tissue uptake in the presence of just LCTs, precisely in
34 line with our suggestive correction of LCT displacement. Of

1 further significance is the study indicating that animals
2 fed Safflower oil (high linoleic LCFA) or lard, showed large
3 decrease in plasma glucose and concomitant increases in
4 plasma ketone bodies, again showing that Linoleic catabolism
5 did not prevent fasting hypoglycemia. This again suggests
6 the necessity to displace LCFA in our focused applications.
7 When proven glycogen sparing capacities are backed by
8 improvement in protein utilization it becomes an
9 overwhelming argument for lean body mass maintenance. Such
10 studies include further exploration into surgical patients
11 and their ability to improve nitrogen retention, an inherent
12 necessity if protein utilization and sparring is to
13 effectively exist. Documentation supports that our
14 formulation is not only safe, but muscle utilization was
15 significantly improved, again showing an increase in
16 Nitrogen retention. Additionally, kinetic analysis of MCT
17 vs. LCT reveals a 4-6 fold smaller Vmax (protein velocity
18 into brush border membrane vesicles) in the LCT Group. Also
19 of great importance, is the transport of sodium. Sodium
20 independent transport was 10-fold lower in the LCT group
21 than in the MCT group. This is highly suggestive of
22 transport interference by bulky LCFA molecules, and
23 absorbability of important electrolytes, compared to our
24 formulation.

25 In approaching high altitude operations and artificial
26 atmospheric conditions, no research would be complete
27 without evaluation of how the proposed system would effect
28 oxygenation of pulmonary gases and associated excretory
29 elements. A highly specific study on ventilated patients,
30 individuals without any muscular response to exert any
31 mechanical false positives, performed as a prospective,
32 randomized, crossover trial, revealed the following; 1) that
33 patients infused through intravenous forced feeding where
34 50% of total caloric energy was supplied by MCT/LCT revealed
35 an increase in oxygen consumption by 27.8% and a minute
36 ventilation increase by 14.3% than conventional LCFA fat,

1 consistent with an increase in metabolic demand. Also of
2 importance is that excretory gases of CO_2 , PaO_2 , and PaCO_2 ,
3 were not different between groups. Studies in kinetics and
4 thermogenesis of M Chain monocarboxylic and dicarboxylic
5 acids also reveal similar results of 19% increase in oxygen,
6 suggesting that our triglyceride results are approximately
7 33% better.

8 The case for limiting conventional fat, Long Chain
9 Fatty Acids as edible oils in our applications, can also be
10 approached from the area of safety, suggested by research
11 exploring immune system effects of various TPN on T-
12 lymphocyte subpopulations. The research revealed that Long
13 Chain Triglycerides, when compared with our formulation,
14 showed a significant decrease in the ratio of helper to
15 suppressor T-cells.

16 As extended stay space exploration becomes a reality,
17 the greatest nutritional problem facing NASA is the ability
18 for astronauts to maintain skeletal density. The problem of
19 Calcium mal-absorption and utilization is not unique to
20 space travel and if solved will create solutions for heart
21 patients, osteoporotic individuals, and the like.
22 Examination of mineral absorption, during medium chain fatty
23 acid usage
24 in accordance with formulas as taught by the instant
25 invention, reveals a 13% greater value. This is a profound
26 difference of the benefits of our formulation, especially
27 since increase in Magnesium absorption was also noted.
28 Furthermore, the edible oil formulation of the instant
29 invention may be the only functional bulk food as a dense
30 calorie regimen, that is useful, for example for a Mars
31 voyage since researchers plan on manufacturing non-dense
32 calories on board.

1 **Process of Manufacture**

2 Military rations ideally should have a three year
3 shelf life, a parameter essentially unheard of in cooking
4 oils. Unfortunately, the oxidative degradation of
5 polyunsaturated fatty acids is the primary factor in
6 limiting the shelf life of most manufactured foods. The
7 instant process of Micro-Molecular HyperSaturation or
8 "Microsaturation" creates an oxidative barrier novel to
9 today's food manufacturing processes. The microsaturation
10 process, as instantly disclosed, is illustrated for plant
11 derived cooking oils such as peanut, olive, soybean,
12 canola oils, and the like; and for animal derived oils,
13 such as anhydrous butter oil, beef fat, lard, or the like.
14 These oils are merely illustrative, and it is within the
15 purview of this invention to treat all cooking oils,
16 inclusive of long chain fatty acid containing oils,
17 whether plant or animal derived.

18 The process of the instant invention begins with a
19 fraction of short and medium chain saturated triglycerides
20 derived from coconut and palm kernel oils, containing about
21 1-5% of C_6 , about 65% of C_8 , and about 30% of C_{10} .

22 In a heated reaction container the structured
23 triglycerides are first introduced in their complete pre-
24 weighed end result configuration; i.e. a 1-1 w/w formulation
25 based on calculated molecular weight ratios of structured
26 triglycerides to cooking oil base is necessary. Therefore,
27 if a 40,000 lb. batch is in production, 20,000 lbs. of
28 structured triglycerides would comprise the first
29 ingredient. The triglycerides are vortically agitated at a
30 velocity of about 3-10 mph, while the container steadily
31 increases the temperature of the compounds to between about
32 85-95°F. This is a very functional and critical process step
33 which significantly increases the molecular kinetics, and

1 creates a changing intramolecular spatial configuration
2 between molecules, thus preparing the totally transparent
3 liquid for receipt of the cooking oil base.

4 The cooking oil base is next prepared for introduction.
5 This oil should be at room temperature, about 10-20°F less
6 than the temperature of the agitated triglycerides. As the
7 base is introduced to the reaction container, a cloudy,
8 turbid phase begins. The warm saturated triglycerides, with
9 their inherent excellent water miscibility, begin to strip
10 off the unsaturated long chain fatty acids, which in some
11 cases are three times or more the molecular weight, from
12 their counterparts, surrounding them and creating a
13 saturated spatial configuration.

14 This is a physical mixture and there is no intended
15 alignment of fatty acids, such as in structured, unsaturated
16 bond alignment or chemical hydrogenation of LCFAs.

17 The process now nears completion, as agitation
18 progresses and the total of LCFAs are added to the mixture.

19 Completion of the process is indicated by a very
20 sharply delineated clarity of the mixture, indicating
21 complete intra-spatial saturation. This resulting product
22 now uses the saturated micro molecules as "oxidative bumper
23 guards" for the LCFAs. The pre-calculated molecular ratios
24 of "micro molecules" (short & medium carbon C₆-C₁₀ molecules)
25 to Long Chain Fatty Acids are between about 1.8-2.0. as a
26 result of Micro-Molecular Hyper-Saturation
27 "Microsaturation".

28 Fatty Acid Compositions of conventional cooking oils vs our
29 technologically advanced products have the following common
30 profiles:

1				
2		Saturated %	Monounsaturated %	Polyunsaturated
3	Butter Oil	36	32	32
4	<u>Sat-Butter Oil*</u>	68**	16	16
5	Peanut Oil	17	61	22
6	<u>Sat-Peanut Oil*</u>	59**	30	11
7	Olive Oil	14	77	9
8	<u>Sat-Olive Oil*</u>	57**	38.5	4.5
9	Soybean oil	15	21	61
10	<u>Sat-Soybean Oil*</u>	57.5**	12	30.5
11	Canola Oil	6	58	36
12	<u>Sat-Canola Oil*</u>	53**	29	18

13 * Result of Micro-Molecular Hyper-Saturation

14 * * >50% of this resulting saturated fat will be
15 metabolized by the liver as energy and will not be
16 deposited as fat.

17 Unfortunately, the food industry has made decisions
18 to modify cooking oils, for commercialization reasons,
19 that do not provide the best health benefits to the
20 public. The industry has hydrogenised cooking oils to
21 increase their shelf lives, and allow them to be used at
22 high heat for frying. It has been shown in many studies
23 that the above modifications have proven unhealthy to the
24 human population, with 500,000 people dying from CHD each
25 year. This has placed a significant financial and
26 emotional burden upon surviving family members.

27 The formulation of the instant invention also acts as
28 an aid to reduction of triglyceride levels and serum
29 cholesterol levels.

30 In one study, over approximately a 90 day period,
31 triglyceride levels dropped 51% and serum cholesterol
32 dropped 15% as a result of substituting the product
33 produced in accordance with the instant invention for
34 conventional cooking oils.

35 Additionally, utilization of the instant product

1 eliminates the need for hydrogenation while significantly
2 increasing the shelf life of products that substitute the
3 instant formulation for current oils.

4 All patents and publications mentioned in this
5 specification are indicative of the levels of those
6 skilled in the art to which the instant invention
7 pertains. All patents and publications are herein
8 incorporated by reference to the same extent as if each
9 individual patent and publication was specifically and
10 individually indicated to be incorporated by reference.

11 It is to be understood that while a certain form of
12 the invention is illustrated, it is not to be limited to
13 the specific form or arrangement of parts herein described
14 and shown. It will be apparent to those skilled in the art
15 that various changes may be made without departing from
16 the scope of the invention and the invention is not to be
17 considered limited to what is shown and described in the
18 specification.

19 One skilled in the art will readily appreciate that
20 the present invention is well adapted to carry out the
21 objects and obtain the ends and advantages mentioned, as
22 well as those inherent therein. Any oligonucleotides,
23 peptides, polypeptides, biologically related compounds,
24 methods, procedures and techniques described herein are
25 presently representative of the preferred embodiments, are
26 intended to be exemplary and are not intended as
27 limitations on the scope. Changes therein and other uses
28 will occur to those skilled in the art which are
29 encompassed within the spirit of the invention and are
30 defined by the scope of the appended claims. Although the
31 invention has been described in connection with specific
32 preferred embodiments, it should be understood that the
33 invention as claimed should not be unduly limited to such
34 specific embodiments. Indeed various modifications of the
35 described modes for carrying out the invention which are
36 obvious to those skilled in the art are intended to be
37 within the scope of the following claims.

CLAIMS

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3 What is claimed is:

4 Claim 1. A process for microsaturation of cooking
5 oils comprising:6 providing a structured triglyceride mixture
7 containing an amount of short and medium chain saturated
8 triglycerides derived from coconut oil, palm kernel oil or
9 mixtures thereof, said mixture containing about 1-5% of C₆,
10 about 65% of C₈, and about 30% of C₁₀;11 providing an equal amount, on a weight basis, of a
12 long chain fatty acid containing cooking oil base;13 placing said structured triglycerides in a reaction
14 container;15 vortically agitating said structured triglycerides at
16 a velocity of about 3-10 mph, while said structured
17 triglycerides are heated to a temperature of between about
18 85-95°F;19 introducing said cooking oil to said reaction
20 container at a temperature of about 10-20°F less than the
21 temperature of the agitated triglycerides, whereby a
22 turbid mixture is created; and23 continuing agitation until said turbid mixture
24 clarifies;25 wherein intra-spatial saturation of said structured
26 triglycerides and long chain fatty acids results in a
27 microsaturated product having a molecular ratio of C₆-C₁₀
28 molecules to long chain fatty acids of between about 1.8-
29 2.0.

30

1

2 Claim 2. The process of claim 1, wherein said
3 cooking oil base is selected from plant derived cooking
4 oils, animal derived cooking oils, or combinations
5 thereof.

6

7 Claim 3. The process of claim 2 wherein said plant
8 derived cooking oil is selected from the group consisting
9 of peanut oil, olive oil, soybean oil or canola oil.

10

11 Claim 4. The process of claim 2, wherein said animal
12 derived oil is selected from the group consisting of
13 anhydrous butter oil, beef fat, and lard.

14

15 Claim 5. The product produced in accordance with the
16 process of claim 1.

17

18 Claim 6. The product produced in accordance with the
19 process of claim 2.

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21 Claim 7. The product produced in accordance with the
22 process of claim 3.

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24 Claim 8. The product produced in accordance with the
25 process of claim 4.

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International Application No
PCT/US 03/16177

According to International Patent Classification (IPC) or to both national classification and IPC

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 096 258 A (HANSON HAROLD WAYNE) 20 June 1978 (1978-06-20) column 3, line 67 -column 4, line 7 example claims 1,4,9 ---	1-8
A	US 4 192 898 A (HANSON HAROLD W SR) 11 March 1980 (1980-03-11) column 5, line 19 - line 27 examples 1,3 claims 1,9 ---	1-8
A	EP 0 488 800 A (AMERICAN HOME PROD) 3 June 1992 (1992-06-03) page 7, line 33 - line 45 claim 1 --- -/--	1-8

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/16177

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 542 560 A (TOMARELLI RUDOLPH M ET AL) 24 November 1970 (1970-11-24) the whole document ---	1-8
A	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 11, 26 December 1995 (1995-12-26) -& JP 07 203848 A (NIPPON OIL & FATS CO LTD), 8 August 1995 (1995-08-08) abstract -----	1-8

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/16177

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4096258	A	20-06-1978	NONE	
US 4192898	A	11-03-1980	NONE	
EP 0488800	A	03-06-1992	AT 129007 T	15-10-1995
			AU 646309 B2	17-02-1994
			AU 8825591 A	04-06-1992
			BR 9105195 A	21-07-1992
			CA 2056058 A1	31-05-1992
			CY 2056 A	30-04-1998
			DE 69113755 D1	16-11-1995
			DE 69113755 T2	04-04-1996
			DK 488800 T3	22-01-1996
			EG 19138 A	29-09-1994
			EP 0488800 A2	03-06-1992
			ES 2078461 T3	16-12-1995
			FI 915590 A	31-05-1992
			GB 2250749 A ,B	17-06-1992
			GR 3018273 T3	29-02-1996
			HK 1000031 A1	17-10-1997
			HU 59572 A2	29-06-1992
			HU 9500454 A3	28-09-1995
			IE 914172 A1	03-06-1992
			IL 100072 A	30-03-1995
			JP 3131477 B2	31-01-2001
			JP 4287637 A	13-10-1992
			KR 192643 B1	15-06-1999
			MX 9102253 A1	01-06-1992
			NZ 240768 A	26-05-1994
			PT 99630 A ,B	30-11-1992
			TR 25748 A	01-09-1993
			US 5601860 A	11-02-1997
			ZA 9109194 A	21-05-1993
US 3542560	A	24-11-1970	NONE	
JP 07203848	A	08-08-1995	JP 2741339 B2	15-04-1998