

**PSYCHOACTIVE FUNGI FORMULATIONS IN NUTRITIVE AND PALATABLE FOOD
MATRICES: A VERSATILE OPTION FOR CLINICAL AND NON-CLINICAL USE**

A Capstone Project

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Master of Food Science (MFS)

by

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ABSTRACT

The primary purpose of this graduate project is to share and discuss the benefits of entheogenic psychoactive fungi for common mental health challenges that significantly burden public health. The secondary aim is to develop food-based formulations of a single species of fungi from the genus *Psilocybe* for clinical therapeutic use and non-clinical use. These high-dose formulations were designed for both inpatient and outpatient settings for use under clinical supervision or as an adjunctive treatment for drug-resistant mood disorders. The full-dose formulations could be used in clinical settings to help treat mild to severe depression or a range of anxiety disorders. Use of these products should involve guidance and facilitation by a trained practitioner during an extended psychotherapy session, in an inpatient, or in an outpatient setting based on the client's needs, followed by integrative counseling. In addition to the full-dose formulations, other food-based options were developed at sub-perceptual dosages for use in a self-directed manner in a non-clinical setting. These food product formulations aim to enhance cognitive functioning, focus, mood, or creativity.

BIOGRAPHICAL SKETCH

Roman Libov is pursuing a graduate degree in the Food Science department at Cornell University's College of Agricultural and Life Sciences (CALS), specializing in both food microbiology and psychoactive fungi. With a professional and educational background spanning functional foods, nutraceuticals, clinical psychology, and education, he approaches his studies from a unique perspective. Roman passionately supports the adoption of evidence-based nutrition centered around plants and fungi as an ethical and existential imperative. As our understanding of the gut-brain axis continues to advance along with our knowledge of the microbiome, he anticipates the use of psychoactive fungi as a tool to improve public health outcomes. Roman's work focuses on helping others achieve mental and physical health through a combination of plant-based nutrition, psychology, and psychedelics. These interests have led him to pursue graduate studies in the field of food science.

I dedicate this project to my dad, George. Thank you for your unwavering support.

ACKNOWLEDGMENTS

First, I would like to provide a special acknowledgment to indigenous knowledge of *Psilocybe cubensis* and other psychoactive fungi and cultural practices of using plant and fungal medicines of indigenous peoples of Mesoamerica, which comprises modern-day Mexico, including the peoples of Zapotec, Nahua, and Mixtec and their dependents, as well as medicinal and spiritual use in Guatemala El Salvador, Belize, and Honduras (Carod-Artal, 2015). Evidence also suggests that ancient Maya and Aztec populations used fungi containing psilocybin (Stamets, 1996). It is crucial to acknowledge, recognize, and thank these cultures for their use and sharing their knowledge about psilocybin-containing fungi.

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1. INTRODUCTION

The topic and conversation of using psychoactive fungi and other psychedelics in clinical and non-clinical settings has reemerged and gained significant attention in recent years after years of state and federal regulatory suppression in the U.S. and abroad.

While psilocybin and psilocybin-containing fungi are currently categorized as Schedule 1 substances at the federal level with their possession and distribution potentially resulting in felony convictions (US DEA, 2023), there are exceptions in two states and certain cities. Notably, there appears to be a trend of regulatory easing in relation to using psilocybin for mental health treatment (Jacobs, 2023) and a variety of efforts are underway at addressing the paradoxical scheduling of this beneficial compound and its associated fungi with more nuance (Siegel JS. et al, 2023). As discussed further, decriminalization measures have taken hold in some parts of the country; however, at the federal level, the scheduling exists in full force. Psychoactive fungi use remains wide, albeit illegally, as people seek to find treatment for otherwise untreatable or poorly managed mental health difficulties. The failure of our healthcare system in helping people overcome mental health challenges has created an environment where people are seeking out alternatives.

In this project, I specifically focus on *Psilocybe cubensis*, a single species of psychoactive fungi, and explore its applications in clinical and non-clinical contexts. It

is essential to clarify that the project has a very narrow scope and does not aim to assess this fungus for either application comprehensively.

The project delves into the formulation of products for clinical "macro-dose" and non-clinical use, "micro-dosing," or consuming sub-perceptual doses of psychoactive fungi. I want to emphasize that the concept of "products" raised concerns about commodification and restricted access to this medicine. While individuals can consume and fully benefit from this medicine in its natural form, the presented product(s) or product concepts offer alternative consumption methods to appeal to those seeking a more pleasurable "setting" experience. I firmly believe that no one should be limited by commodified "products" or systems when seeking access to this medicine. Instead, I encourage systems where people can receive support through facilitation or therapy when consuming these psychoactive fungi. The focus should be more on the individual consuming the fungus and their experience rather than the method of consumption. This method improves the experience of consuming strong-tasting fungi, such as sweeteners, flavor, or texture enhancers used in other foods or products.

The reason for employing food science and product development in the context of psychoactive fungi extends beyond using a "novel" or "unique" ingredient to create a new product sold to consumers. The goal is to explore the potential beyond the simplistic notion of a food product. Food science has the capacity to address not only food safety, preservation, and stability but also support improvements to treating

modern-day public (mental health included) health issues and environmental challenges. New ideas and perspectives are necessary, particularly considering the current ecological challenges created in part by the food industry.

In the context of psychoactive fungi in food products, this project aims to create innovative products and ideas that go beyond conventional norms fostered by industry, shifting how we think about food and its potential effects on mental and emotional well-being. Through “unconventional” foods, we can modify a person's experience by creating “food products” that also function as adjunctive medicine by enhancing psychological states, thought processes, and experiences.

It is crucial to advocate for a stronger emphasis on public health within food science rather than limiting it solely to the domain of nutrition and medical programs. Our dietary choices and the available food products brought to us by the food industry significantly influence our health and mental well-being from an epigenetic standpoint (Zhang 2018), (Ortega et al 2022). This matter requires serious attention at every institution housing food science departments, including Cornell, as food scientists share responsibility for the health and well-being of billions of individuals through the food ingredients and foods we formulate.

Addressing the concept of "product" when considering the use of psychoactive fungi is essential, recognizing that our current political and economic structures tend to monetize such notions. However, the primary goal of this project remains centered on

bringing the benefits of these fungi to others in an understandable and accessible manner. Though the project scope may be limited, the potential for ideas and benefits offered by these fungi is extensive.

2. BRIEF LITERATURE REVIEW ON MACRODOSE (CLINICAL DOSE) USE OF PSYCHOACTIVE FUNGI

Although not comprehensive, it is essential to provide a brief literature review of the current status of research on psychedelics, specifically psilocybin-containing psychoactive fungi.

The first study referenced here, albeit small in its sample size, showed significant and long-lasting effects on participants. In a randomized clinical trial on the impact of psilocybin-assisted therapy, patients showed sustained effects on major depressive disorder (Davis A.K, 2021) The clinician authors provide a clear argument about the burden of major depressive disorder (MDD) as a significant public health challenge.

Twenty-four participants completed the study of the original twenty-seven. Follow-up with participants showed that at least four weeks post-treatment, patients had sustained antidepressant effects. Additionally, an essential point to highlight is that some participants correlated the "mystical experience" effects with reducing symptoms of depression. One might wonder how these results compared to standard interventions and psilocybin therapy, produced sustained antidepressant effects compared to psychotherapy and psychopharmacological treatment. The authors discuss that an essential aspect of psilocybin-assisted therapy is the lack of addiction associated with this treatment, and the limited adverse side effects are important to highlight as well.

The authors of the previously mentioned paper, as well as all of the ones included in this brief literature review acknowledge that there are limitations to the data provided and further research is needed, and it is quite clear that more extensive and diverse sample sizes should be included. This will likely become easier as regulation shifts and universities become more open to working with this substance. The follow-up should focus on more extended periods in future studies.

In another study, fifty-one cancer patients were studied on the effects of psilocybin on life-threatening cancer diagnosis with depression and anxiety, with significant and sustained reductions¹ in symptoms noted. This study is critical because cancer patients with life-threatening illnesses may be limited to typical allopathic treatments and, due to their conditions, may be particularly vulnerable to side effects. The authors reiterate that no serious adverse events attributed to psilocybin administration occurred. Adverse events during psilocybin sessions were generally mild and transient, including increased blood pressure, nausea or vomiting, physical discomfort, and psychological distress.

The positive effects described were noted six months post-administration and initial follow-up. This therapy resulted in statistically significant reductions in clinician-rated measures of anxiety, depression, and mood disturbances while also increasing of quality of life, meaning and purpose, death acceptance, and optimism measurements. It was evident that the mystical-type experiences during psilocybin sessions were

associated with enduring positive changes in attitudes, mood, behavior, and spirituality. The authors expressed limitations of the sample size and diversity and indicated that future studies should address this.

This leads the discussion to other evidence to support the use of clinical doses of psilocybin in therapeutic environments. Spending time on a systematic review and meta-analysis focusing on end-of-life anxiety studies in palliative settings is essential. A systematic review examined five studies focusing on anxiety in patients with terminal diagnoses (Griffiths, R.R., 2016). The five studies were chosen based on a set of criteria from an original of forty-five.

In this paper by Griffiths et al, researchers found psilocybin therapy to be effective in treating state and trait anxiety. These studies were also necessary because they addressed people with chronic anxiety and anxiety related to specific tasks or experiences. And most importantly, for relevance to the participants of this study, individuals with end-of-life anxiety exhibited robust effectiveness against their anxiety compared to placebo. These were significant reductions measured one day and one month after treatment. Upon further follow-up, the studies showed that the effectiveness of psilocybin therapy in managing trait anxiety persisted for up to 6 months after one treatment session.

Additionally, as noted earlier in the previous paper, no serious adverse events were documented by clinicians. There was a temporary effect on systolic and diastolic blood

pressure. However, these effects were limited and did not require medical intervention. Psilocybin was well-tolerated overall, but quick changes in blood pressure should be monitored, particularly in patients with underlying cardiovascular conditions. The possibility of abuse should be considered, although psilocybin is not associated with dependence or withdrawal.

The authors discuss how trait anxiety has significant long-term effects and may be improved with psilocybin therapy, potentially enhancing stress-coping strategies in patients with life-threatening illnesses. Due to the safety of psilocybin therapy, treatment may benefit patients receiving multiple medications, reducing the risk of intolerance and contraindications.

As has been noted in neurological research on the subject, the anxiolytic effects of psilocybin may be attributed to its agonistic effects on 5-HT_{2A} receptors, and the compound modulating brain networks involved in anxiety.

As with all studies, this systematic review has limitations, including the small number of trials, heterogeneity in the effectiveness of psilocybin, and the inclusion of studies combining psychotherapy with psilocybin. Clinicians generally recommend combining integration psychotherapy with psilocybin therapy to have full beneficial effects. Thus, future large-scale randomized controlled trials are needed to further validate any efficacy, as well as potential long-term outcomes of psilocybin therapy as a treatment for end-of-life anxiety symptoms.

Looking further into the aspects of substance use and psilocybin the following paper focuses on alcohol specifically and the percentage of heavy drinking days post-psilocybin-assisted psychotherapy (Bogenschutz, M. P et al, 2022).

The study aimed to evaluate the effectiveness of high-dose psilocybin combined with psychotherapy in treating alcohol use disorder (AUD) compared to diphenhydramine (used as a placebo). The trial involved 95 participants with AUD who underwent 12 weeks of psychotherapy with two psilocybin administration sessions.

Participants who received psilocybin showed a significant decrease in days of alcohol consumption compared to those who received diphenhydramine. Previous studies have shown that adverse events associated with psilocybin administration were limited.

One of the limitations of this study included a small sample size (although more extensive than previously mentioned), and the design didn't allow for the evaluation of psychotherapy alone or the interaction between psychotherapy and medication. Although this interaction may be complex to assess, it is essential to note that, as with other studies, psilocybin therapy has shown to be very helpful with substance use disorders, and for safety reasons alone, combining any psilocybin use with treatment is recommended. The authors note that further research is needed to explore the longer-term effects, varied dosages, and why this substance significantly impacts AUD and other substance-use disorders.

In a recent systematic review focused on the effect of psilocybin on addiction (Van der Meer P.B. et al, 2023), there were consequential results from the four studies included in the review. A limitation of this systematic review that is important to note is that the two substances reviewed were alcohol and tobacco. At the same time, no studies were included reviewing opioids, cocaine, amphetamines or their derivatives, hypnotics, benzodiazepines, hallucinogens, cannabinoids, ketamine, caffeine compounds, inhalants, or other unknown substances, as well as non-chemical addictions like gambling, gaming, or internet related. Although addiction has some overlapping psychological, physiological, and genetic factors, the lack of studies on these substances and topics provides limited information. It provides an argument for more research on addiction and these other substances. The authors do mention that there are ongoing trials covering some of these subjects.

Three trials focused on alcohol use disorder and one on tobacco use disorder. One trial was a randomized, double-blind, placebo-controlled trial. In contrast, the others focused on single-arm pilot studies that had a substantial risk of bias. All four trials combined psychotherapy with psilocybin. Van der Meer's group showed a significant positive effect in using psilocybin-assisted therapy for patients with alcohol or tobacco-use disorder. They highlight the absence of trials examining psilocybin in cannabis use disorder, despite its high prevalence. They also propose that biological and psychological factors influence the efficacy of psychedelics in improving substance use disorder.

They also indicate that several clinical trials, primarily focused on alcohol use disorder, are currently registered to assess the efficacy of psilocybin in substance use. The need for future studies will contribute to a better understanding of the potential of psilocybin in treating substance use are needed.

Finally, it is essential to share a paper addressing psilocybin therapy for treating tobacco use or smoking cessation (Johnson, M. W. et al, 2017). According to one report (Cornelius, M. E. et al, 2023) more than 11% of Americans smoke. Smoking is another public health issue that medical professionals could address through psilocybin therapy. In this 12-month follow-up study, 67% of patients were assessed for smoking and confirmed to be abstinent. 80% of the participants completed the follow-up. Additionally, in the long-term follow-up, a mean of 30 months post-treatment, 60% of participants were confirmed as smoking abstinent. With participants who continued to smoke, there were significant reductions in self-reported daily smoking.

Participants reported more positive persisting effects than adverse effects from psilocybin sessions. An additional benefit was that participants reported highly personally meaningful and spiritually significant experiences. This paper also highlights the role of spirituality in smoking cessation and substance dependence recovery warrants further investigation. Reductions in smoking were correlated with ratings of personal meaning and mystical effects of psilocybin sessions. Psilocybin-

facilitated treatment may be a feasible adjunct to smoking cessation, but further research is needed to establish efficacy.

The authors recommend that more extensive controlled studies with diverse samples are necessary to determine the effectiveness of psilocybin in smoking cessation. 5-HT_{2A}R agonists, such as psilocybin, hold therapeutic potential for treating substance use disorders in structured treatment programs. The emphasis on structured treatment has been a cohesive factor in these papers.

The subjective experience described in this paper is vital as these experiences with significant reductions in mood disorder and substance use measures based on the literature reviewed. More research is needed to explore the psychedelic-facilitated addiction treatment and its underlying neurobiological mechanisms.

Albeit brief and informal, this literature review introduces the potential benefits of psilocybin in combination with psychotherapy for treating drug-resistant depression, depression in cancer patients, end-of-life and palliative care, and substance use. The summaries of these papers provide an introduction to the topic of psychedelics in the clinical setting. However, readers are encouraged to seek further information and guidance from licensed professionals and researchers.

3. BRIEF LITERATURE REVIEW ON SUBPERCEPTUAL MICRODOSE USE OF PSYCHOACTIVE FUNGI

What follows is a brief and non-exhaustive literature review on microdosing. It is important to note that there needs to be more research on this topic for several reasons, including funding, federal regulatory hurdles, stigma, and a broad misunderstanding of psychoactive fungi. The literature cited here is for introductory purposes and should not be used as an all-encompassing assessment.

As rapidly growing evidence has suggested, there are significant benefits to macro, but not ever-increasing doses of psilocybin-containing fungi or isolated psilocybin. However, micro-dosing has shown both direct benefits and purported placebo effects. Sample sizes tend to be smaller or survey-based, and limited research is available in clinical trials.

One paper recruited participants via social media and online circles and found statistically significant beneficial results in reduced dysfunctional attitudes, negative emotional states, improved mood, and increased open-mindedness (Anderson, T., 2019). It is important to note that only 28% of reported users used psilocybin-containing mushrooms. In contrast, the majority used LSD or other substances for their micro-dosing.

Another study explored the effects of micro-dosing psilocybin-containing truffles on creativity (Prochazkova, L. et al, 2018), specifically creative problem-solving tasks. It

found that two types of creative thinking, divergent and convergent, were improved. However, fluid intelligence did not show improvement. The study assessed convergent thinking pre- and post-assessments, indicating significantly higher scores after micro-dosing. The authors suggest that psilocybin may support creative intelligence at the sub-perceptual level. However, the study lacked a control group, and there may have been expectation bias from participants in reporting improved scores. Apart from the lack of control (placebo), this study had other limitations, including the absence of a laboratory setting or controlled environment. Correlational evidence shows that "openness" increases among those who use psychedelics, which may explain some of the creative intelligence results. Additionally, a positive mood or the absence of depression can enhance creativity and intelligence scores, which researchers should consider in future studies.

Another double-blind, placebo-controlled clinical trial focused on micro-dosing highlighted a lack of improvement and even impairment in cognitive functioning (Cavanna, F, et al, 2022). The authors acknowledged the variation of psilocybin content in *Psilocybe cubensis* and used 0.5g of dried fungi in this study. They found no significant impact on creativity in convergent and divergent thinking, and some tasks showed impairment.

The authors also acknowledged extensive anecdotal evidence of improvements from micro-dosing, and these results might be attributed to placebo. However, due to the small sample size and limited research, this clinical trial cannot definitively state that

micro-dosing has no benefits. Additionally, the study did not assess micro-dosing over a period of time and possible cumulative effects. It is important to note that most evidence supports large clinical doses of psilocybin, and the mixed results from micro-dosing need further exploration.

In a paper discussing two studies (Polito, V., 2019), including a systematic observational study of microdosers and a second study on beliefs and expectations of those with limited or extensive micro dosing experience, mixed results were evident. The first study showed a reduction in mind wandering among those taking sub-perceptual doses, and daily ratings indicated increased psychological functioning compared to baseline scores. However, participants consistently maintained these improvements in the days following dosing.

The long-term questionnaires revealed improvements in mental health and changes in attention-related processes during the micro-dosing period. Depression and stress ratings decreased significantly, providing support to the idea that micro-dosing benefits general mental well-being. Participants reported reduced mind wandering, which could lead to benefits such as reduced distractibility and increased focus.

As mentioned, absorption, characterized by deep involvement with subjective experiences, increased among participants and was linked to the capacity to experience altered states of consciousness. Microdosers often associate this experience when using psychedelic substances. Micro-dosing may increase

individuals' capacity for absorption, potentially enhancing their responsiveness to future consciousness alterations.

There was a slight increase in trait neuroticism, possibly due to the heightened intensity of emotions experienced during micro-dosing. However, researchers and clinicians should interpret this data cautiously, as the paper's authors did not conduct the research in a laboratory or clinical trial setting. Several domains of psychological functioning, including mystical experience, mindfulness, optimism, creativity, sense of agency, and overall quality of life, did not show significant changes during the six weeks of micro-dosing.

The second study focused on understanding how popular expectations, as presented in the media, influenced the expectations of those choosing to microdose psychedelics. It is important to note that expectations can affect study results, and participants' expectations must be accounted for when interpreting results. Participants in the first study, recruited from online communities, likely had specific expectations from micro-dosing, potentially biasing the results. Participants expected neuroticism to decrease in the second study, contradicting the increase observed in the first study.

Micro-dosing may lead to subtle changes, including improvements in mental stability, sustained attention, and intense imaginative experiences. However, neuroticism appeared to increase, contradicting participants' expectations. It is important to note

that micro-dosing may not benefit everyone, and some individuals may have negative experiences. Nevertheless, this is common with any intervention, medicine, therapy, or nutraceutical.

The study designs had significant limitations, such as self-reporting, sampling bias from online forums, and potential placebo effects. Further studies with controlled doses and placebos are needed. Researchers should explore the role of expectations and the impact of frequency and dosage. The authors recommend that future research focuses on the effects of micro-dosing on mental health, attentional capabilities, and neuroticism.

4. LIMITATIONS TO PRESENTED LITERATURE

It is essential to acknowledge the potential issues with the cited literature and its presentation:

- There is a limited amount of research and data presented due to the constraints of this project. As mentioned, this serves as merely an introduction to finding additional information about psychoactive fungi. More clinical data would be helpful from more trials is necessary even though the research clearly points to the benefits of psilocybin at clinical dose levels.
- Small sample sizes and potential study design issues with the cited literature exist. The challenges here are partially due to funding limitations on this subject area and the limits of this project, and more literature needs review.
- With the limitations present in this project, there needs to be an analysis of more of the available literature on this subject available in the public domain. Although some meta-analyses like that of Kwonmok Ko, 2023, Sicignano, D., 2023, Leger, R.F., 2021 and others came out over the last few years, more meta-analyses need to be done and for the context of this project, reviews done focusing on psilocybin would be very helpful.

- There are other studies and papers on the subject and extensive ongoing research happening at the time of this project's writing, and these will provide additional nuanced information on psychedelics broadly and psychoactive fungi specifically.

5. POTENTIAL RISKS AND ADVERSE EFFECTS

Considering any psychoactive substance's potential risks and adverse effects is crucial. Although the literature indicates that the consumption of psychoactive fungi is safe, especially under the facilitation and support of trained practitioners, it is essential to acknowledge that some risk still exists, particularly with improper harm reduction strategies in place. Additionally, it is essential to note that these risks are not associated with microdose or sub-perceptual doses. Moreover, it's important to highlight that due to specific disparities that the Nixon administration created in the 60s and 70s and in many ways continue to exist in U.S. drug policy from the that era and those that were codified in the 80s and 90s targeting specific marginalized groups, many regulatory authorities have shown to be ignorant and willfully avoidant of de-scheduling psychoactive substances that have been shown to help individuals struggling with mental health. Further studies have shown that, under specific conditions, the benefits of psychoactive fungi use far outweigh the adverse effects.

Concerning psychological effects, higher doses of psychoactive fungi can induce altered states of consciousness and lead to intense emotional experiences, including anxiety, panic, and confusion. A study (Kopra, et al. 2022) demonstrated the safety of psychoactive fungi use by analyzing over nine-thousand users of psilocybin-containing fungi, with only 19 individuals experiencing adverse effects that required emergency services. Although the safety is relative to the to the sample diversity, the sample size is quite extensive and provides a more thorough assessment of risk than other studies. The authors attributed these effects to age, improper harm-reduction

strategies, and a lack of trained support. Additionally, it is essential to understand that these effects are rare and short-lasting.

Some users may experience hallucinations at higher doses, which can be challenging for some individuals, while others may find them beneficial. A negative psychoactive experience colloquially known as a "bad trip" may occur when the environment and state of mind or "set and setting" is not ideal, leading to frightening or uncomfortable hallucinations causing distress. However, proper harm reduction strategies and guidance from trained practitioners (Palmer, M. et al, 2022) can significantly mitigate these effects. Additionally, a negative psychoactive experience can often be integrated in psychotherapy and viewed in a positive light in hindsight (Gashi, L. et al, 2021; Carbonaro TM. et al, 2016).

As indicated in the provided sources, while physical manifestations of nausea, vomiting, dizziness, and fluctuations in heart rate and blood pressure may be present during treatment, their duration is usually brief. Within a clinical context, measures will be implemented to ensure the physical well-being of patients throughout the treatment process. This is a part of the training undertaken by facilitators and clinicians.

Moreover, it is important for individuals who intend to partake in the consumption of psychoactive fungi independently to recognize the potential for compromised coordination and impaired judgment resulting from such consumption. Harm reduction strategies need to be implemented prior to and during use. Some of these strategies

are provided in the supporting literature discussed earlier. Additional information can be found through The Multidisciplinary Association for Psychedelic Studies (MAPS) safety site <https://maps.org/safety/>.

Practitioners and clinicians typically advise against consuming psychoactive fungi or psychedelics broadly for individuals with pre-existing mental health conditions, such as severe disorders like bipolar disorder or schizophrenia. These recommendations seem to be based on previous research (Vollenweider FX, 1998) and it is inconclusive, particularly with the data available today.

In other words, these are precautions thought to promote maximum safety and discourage people who may be at higher risk of semi-permanent or permanent psychosis. However, there seems to be conflation between other substances and psilocybin. Although psilocybin is very safe for use clinically among a wide population, it is understandable why these recommendations for illnesses that have psychotic symptoms would require more caution. These individuals may be at a higher risk of adverse effects. However, this is an area where the research is inconclusive (Wolf, G. et al, 2022). Unfortunately, this project's scope does not assess the potential for treating these conditions with psychoactive fungi or other medications. Patients should seek to work with clinicians specializing in this area in such cases.

There is a possibility of psychedelic substances interacting with other substances like herbs and medications. Therefore, consulting an appropriately trained clinician before

combining prescription medications or herbal preparations is essential to check for potential contraindications.

Lastly, psychoactive fungi are scheduled substances and, as such, pose legal risks depending on one's jurisdiction. The possession, sale, or distribution of these substances is illegal in most states, which could result in legal consequences for individuals involved in their use or distribution. Understanding local city, state, and federal regulations is crucial before using or purchasing these substances, whether in their whole form or a food matrix. The following section addresses the legality of psilocybin-containing fungi in the U.S.

6. CURRENT CITY, STATE, AND FEDERAL REGULATIONS

The current status of decriminalization and legalization is quite varied in the U.S., not to mention globally. What follows focuses on the current state of affairs regarding this topic in the U.S. and limited to the present time. Psychedelic policy is a rapidly evolving legislative conundrum, and this limits the information contained herein; the environment will hopefully be different in the near future.

Although regulations are shifting rapidly and the following list is not comprehensive; as of now, some of the current city, state, and federal regulations are as follows:

New York: State bill #A3581, which “Relates to medical use of psilocybin; establishes a psilocybin assisted therapy grant program; makes an appropriation therefor.” It is in committee waiting to be brought to the state senate and assembly (New York State Senate, 2023).

Federal U.S.: Illegal

State:

1. Oregon: In November 2020, Oregon passed Measure 109, which allows for the regulated medical use of psilocybin in therapeutic settings. Starting 2023, residents of Oregon can access government-approved medical psilocybin therapy.

2. Colorado: Psilocybin-containing fungi are decriminalized for personal use and possession for individuals 21 and older (Colorado General Assembly, 2021). Medical access to psilocybin-treatment will be available in treatment centers beginning 2024.
3. Oregon: In November 2020, Oregon passed Measure 109, which allows for the regulated medical use of psilocybin in therapeutic settings. Starting 2023, residents of Oregon can access government-approved medical psilocybin therapy.
4. California: Decriminalization initiative started (California State Attorney General, 2023).

Additionally, at the state level there is active legislation with bills introduced happening in the following states: California, Montana, Nevada, Utah, Arizona, New Mexico, Kansas, Oklahoma, Michigan, Missouri, Iowa, Minnesota, Illinois, Kentucky, North Carolina, Virginia, North Carolina, Vermont, Massachusetts, Maine, as well as working groups in other states (Psychedelic Alpha, 2023).

Cities:

1. Seattle, Washington: Psilocybin-containing fungi are decriminalized for personal use and possession (City of Seattle, 2022).
2. Oakland, California: Psilocybin-containing fungi are decriminalized for personal use and possession (Associated Press, 2019).

3. Santa Cruz, California: Psilocybin-containing fungi are decriminalized for personal use and possession (Chacruna, 2020; City of Santa Cruz, 2021).
4. Ann Arbor, Michigan: Psilocybin-containing fungi are decriminalized for personal use and possession (Washtenaw County, 2021).
5. Somerville, Massachusetts: Psilocybin-containing fungi are decriminalized for personal use and possession (City of Somerville, 2021).
6. Cambridge, Massachusetts: Psilocybin-containing fungi are decriminalized for personal use and possession (Cambridge City, 2021).
7. Washington, D.C.: Using and possessing psilocybin mushrooms is considered a low law enforcement priority (DC Board of Elections, 2021).

Spores: Illegal in Georgia and Idaho; California status is unclear. Since spores do not contain psilocybin, the law is vague in this state (California Legislative Info., 2023), (CFR, 1970), (CSA, 2023).

Since the regulatory arena for psilocybin-containing fungi is rapidly shifting, it is difficult to predict the future of access. In addition, within the context of pharmaceuticals and the medicalization of isolated psilocybin, there will likely be additional regulatory variations in the next decade.

7. CONCEPTS

Although widely used in traditional consumption methods through eating fresh or dried mushrooms in their natural form or decoctions, extracts, and other forms, I propose several additional consumption methods for this project. As previously mentioned, the goal has always been to promote the use of psychoactive fungi for various purposes, including but not limited to improving chronic mental health difficulties. The research provided ongoing studies highlighting the benefits of specific conditions. As research grows, additional benefits will likely come to light. The concepts highlighted here are quite different in their application. I did this purposefully to highlight the difference between low and high doses and their potential uses. It is essential to highlight that within the low to high range, a "mid-level" dose will also vary from person to person. And, in this mid-level dose, there may be other uses for the fungi. Some have postulated and experimented with the possibility of a "creative dose" above a microdose but far below a macro dose. This creative dose will vary but would still technically be considered "sub-perceptual" and would not cause hallucinatory effects. The complexity here is that every individual will respond differently to various doses, depending on the strain of *cubensis* used. Some anecdotal accounts have shown that some people perform creative tasks at a mildly perceptual dose (above microdose).

Additionally, some researchers use genetic engineering (Empyrean bio, 2023) and cultivation methods to express other secondary metabolites in higher levels other than

psilocybin for their potential health benefits or use in different capacities. as well as exploring producing psilocybin via other microorganisms like yeast (Milne et al, 2020)

Understanding the audience and their preferred methods of information intake or, in this case, nutrition can be a helpful pathway for introducing new perspectives. This project presents several "unique" ways of consumption aimed at harnessing the beneficial properties of these fungi. Within this project's scope, two concepts (one for clinical use and one for non-clinical use) have been developed and will be shared.

8. FUNGI FORMULATIONS IN NUTRITIVE AND PALATABLE FOOD MATRICES FOR CLINICAL USE

Concept 1: "Psilocybar" Food Bar

Background: The original intent of this formulation was to create a highly nutritive food that can be consumed in a clinical setting, incorporating psychoactive fungi. The goal is to enhance the overall therapeutic experience through improved "set and setting" in the clinical realm, facilitate spiritual growth, or allow for a sub-perceptual dosage (e.g., eating a small portion of a bar). The product involves specific ingredients and processing techniques to achieve these objectives. I have purposefully not provided exact ingredient quantities and processes, and anyone seeking support in replicating or creating the concept can contact me.

Ingredients and their purpose (see **Figure 3**):

1. Oats provide a source of complex carbohydrates, beta-glucan, fiber, and essential nutrients (Paudel, D. et al, 202; Rasane, P. et al, 2015).
2. Tapioca syrup is a "clean label" natural sweetener and binder that helps to hold the ingredients together and can work well with various sweetener additives depending on various processing and storage factors (Montagnac, J. A. et al, 2009; Zhang X., et al, 2017; Chisenga SM et al, 2019).
3. Peanuts add flavor, provide protein and fat to the granola bar, enhancing its taste and texture. Additionally, peanut consumption is associated with health

benefits (Luu HN et al, 2015; Arya SS. et al, 2016). *Due to allergenicity (ACAAI, 2022), this ingredient can be replaced with another or substituted with more oats.*

4. Hulled hemp hearts provide protein, omega-3 and omega-6 fatty acids, and additional texture to the bar (USDA, 2023; Cerino, P. et al, 2021)
5. Dates act as a lower glycemic sweetener (Alalwan TA et al, 2020), providing fiber (USDA, 2019; Dreher, ML, 2018) adding sweetness, and contributing to the texture of the granola bar.
6. Hemp protein offers additional protein (USDA, 2019) to the bar and is associated with anti-inflammatory properties (Zhang J et al, 2022; Rodriguez-Martin NM et al, 2020), contributing to its nutritional profile.
7. Ground cold-milled flax powder adds dietary fiber, omega-3 fatty acids, and a nutty flavor to the granola bar, as well as other functional properties (Kajla P. et al, 2015) and associated with positive cardiovascular measures (Parikh M, et al, 2018).
8. Lion's Mane (*Hericium erinaceus*) extract powder provides potential cognitive and neurological benefits (I-Chen, Li et al, 2018); Bing-Ji, Ma et al, 2010) as Lion's Mane is added to support brain health and cognitive function. Previous research has explored its beneficial properties (Friedman, M., 2015).

The addition of Hericium erinaceus is credited to Paul Stamets extensive discussions and writings on this fungus. Although this formulation does not use the “Stamets Stack” (Stamets, E.P., 2018) patented (Patent No. US20180021326A1), Lion’s Mane on its own has been shown to be beneficial.

9. *Psilocybe cubensis* mushroom extract imparts beneficial cognitive properties. (de Vos CMH. et al, 2021; Daws, RE. et al, 2022). The brief literature provided earlier addresses some additional neurological and clinical benefits.
10. Sea salt enhances the flavor of the granola bar and provides essential electrolytes.

Equipment:

1. Mixing Equipment: A commercial-grade mixer combines the ingredients thoroughly and evenly.
2. Oven or similar Baking Equipment: An oven or baking equipment can be used to bake the granola bars to the desired texture and consistency.
3. Molding Equipment: Molds or trays should be used to shape and form the granola bars into their desired shape and size.
4. Cutting Equipment: A cutting machine or equipment to portion the baked granola bars into individual servings.
5. Cooling Equipment: Cooling racks or conveyors allow the granola bars to cool down after baking and before packaging.
6. Packaging Equipment: Custom packaging machinery and materials such as wrappers, bags, or boxes to package the granola bars for retail or distribution.
7. Labeling Equipment: Labeling machinery or tools to apply product labels with ingredient information, nutritional facts, and branding.

8. Storage Equipment: Shelving or storage units must be accessible to store raw ingredients, finished granola bars, and packaging materials in an organized manner.
9. Cleaning Equipment: Cleaning tools and equipment to maintain hygiene and sanitation in the manufacturing area.

Manufacturing (Small Scale) Process:

1. Ingredient Preparation: The first step in manufacturing is to prepare the ingredients. To remove impurities, clean and sort the oats, organic peanuts, hulled hemp hearts, and dates. Depending on the source, this process may have already been done before packaging.
2. Mixing: This step should be done once the ingredients are prepared. Set up a mixing bowl or mixer for the formulation process. Weigh and add the prepared oats, organic tapioca syrup, roasted peanuts, hulled hemp hearts, dates, organic hemp protein, organic ground flaxseed, organic lion's mane extract, pre-dried *psilocybe* mushroom powder, and sea salt into the mixing bowl or mixer. Mix the ingredients thoroughly. They should be thoroughly combined, and the mixture becomes sticky. This step ensures that all the components are evenly distributed and form a homogenous blend.
3. Shaping and Molding: Shape and mold the product after mixing. Take portions of the mixture and shape them into the desired product form. You can use your hands or small molds to achieve a consistent shape and size.

4. **Baking:** Place the shaped products on baking trays or racks and bake at 180°C (350°F) for 15 minutes. Baking times and temperatures may vary due to oven and altitude differences. In addition to enhancing the flavor and texture of the product, the baking step functions as a Critical Control Point (CCP) for pathogens.
5. **Cooling and Packaging:** Once the bars are baked, remove them from the oven. It is essential to allow them to cool completely to room temperature quickly in order to limit any further degradation of the active compound. This step helps in achieving the desired texture and consistency. After cooling, package the products in suitable wrappers or bags to maintain freshness and extend shelf life. Consider adding labels or branding materials to the packaging to enhance product identification and appeal.
6. **Quality Control:** Quality control is a necessary and crucial aspect of the manufacturing process. Implement measures to ensure product consistency and safety. Regularly inspect the ingredients for any signs of contamination or defects. Monitor the production process closely to maintain adherence to specifications. Conduct periodic product testing, including nutritional analysis and sensory evaluation, to verify the quality and taste of the final product. Establish quality control checkpoints throughout manufacturing to identify and rectify deviations from the desired standards.
7. **Cleaning and Sanitation:** Establish a cleaning and sanitation routine to maintain cleanliness and prevent contamination. Regularly clean and sanitize all equipment, surfaces, and utensils used in manufacturing. Follow good

- manufacturing practices (GMP) to ensure a hygienic production environment. Proper cleaning procedures help minimize the risk of cross-contamination and ensure product safety and integrity.
8. Storage and Distribution: After packaging, store the finished products in a clean and dry area with suitable temperature and humidity conditions. Ensure the storage area is free from pests and other potential contaminants. Any distribution strategy involving scheduled substances should not only align with a manufacturer's goals for growth but focus and give back to the community where the product is manufactured.
 9. Distribution and sales will require key industry partnerships and a thorough understanding of local, state, and federal laws due to the potential legal problems resulting from improperly distributing a controlled substance. Any manufacturer should seek legal counsel for any product involving psychoactive fungi.

A variation of this product is feasible where the dried psilocybin powder is sprayed onto the bars once they are cooled to room temperature and “sandwiched” together. This would be done to limit the degradation of the active psilocybin in the powder. Heat and duration post harvesting has been shown to denature (Gotvaldová, K et al, 2021) psilocybin especially if not consumed in a timely manner after heating; however, shelf-stability testing has not been done of the fully baked product or the powder added post baking version. This testing would need to be done in order to verify dosages

and create a standardized product, especially if used for clinical purposes. The two variables of heat and time will vary depending on multiple factors.

Due to the limitations of the current regulatory environment, all processes were either done in a small non-commercial kitchen (not at any Cornell facility), or I have provided a sample scaling-up process for those who seek to provide such a product to the clinical consumer. Although the product is "proprietary," I do not seek to own or condone the owning of this material, as it should be accessible to all those who seek it. The process listed is generalized for food product manufacturing broadly. A manufacturer of food products with psychoactive fungi would need to ensure they follow local, state, and federal laws. Additionally, although it may not be a legal requirement, it would be important for manufacturers to have necessary security measures in place as a facility working with controlled substances.

Processing, Safety, and Critical Control Points

*(Flow Chart and Preventive Controls), as well as the Nutrition Label, are available in the **Figures** section.*

9. PSYCHOACTIVE FUNGI FORMULATION IN NUTRITIVE AND PALATABLE FOOD MATRIX FOR NON-CLINICAL USE

Concept 2: “Shroom-Chi” Endurance Gel

The present concept relates to endurance-enhancing products, more specifically, an energy gel formulation containing low-dose psilocybin derived from the whole fruiting body, including the stem and cap, of fungi belonging to the genus *Psilocybe*. This gel is designed to be consumed self-directedly in non-clinical settings to improve physical and mental endurance during sustained activity.

Background: Endurance and performance-enhancing products are widely used during various sports and physical endurance activities. These products provide individuals with the energy, focus, and stamina necessary to excel in demanding physical and mental tasks. Traditional energy gels often rely on ingredients like electrolytes, carbohydrates, and caffeine to achieve these effects. However, there is a growing interest in exploring alternative compounds to enhance endurance and optimize human performance.

Psilocybin, a naturally occurring psychoactive compound found in various species of mushrooms, has gained attention for its potential effects on mental well-being, creativity, and cognitive performance particularly from anecdotal accounts, as well as motivational reasons and benefits (Lea, T et al, 2020). These accounts and some research (Rootman, J.M. et al, 2022; Anderson, T. et al, 2019) suggests that low doses

of psilocybin may improve focus, mood, and reduce fatigue, making it a possible and intriguing candidate for inclusion in endurance-enhancing products based on some evidence from endurance athletes seeking support from psychedelics (Walton C, Liknaitzky P, 2022). It is important to point out that at the microdose level, there are no published works on the benefits of psilocybin for increasing endurance, yet anecdotal accounts and some research has been focused on the creativity or focus (Prochazkova, L. et al, 2018; Anderson, T., 2019) benefits from psilocybin, which can be significantly helpful for athletes in endurance sports as focus, and often creativity, are necessary.

To summarize, this endurance gel formulation combines the benefits of low-dose psilocybin from the whole fruiting body of *Psilocybe* fungi with other performance-enhancing ingredients. The formulator's intent for this product is for self-directed consumption in non-clinical settings. It is formulated to improve physical and mental endurance.

The gel formulation provides individuals with the necessary energy, electrolytes, low-dose psilocybin, caffeine, and other supportive ingredients to enhance physical and mental endurance during prolonged activities. Maple syrup works as a natural sweetener and a source of easily digestible carbohydrates, supplying quick energy to the body while enhancing the gel's taste.

The gel formulation can be prepared by measuring and mixing the ingredients in appropriate proportions, ensuring proper blending and homogeneity. The gel can then be packaged in suitable containers or pouches, maintaining the necessary storage conditions to preserve its quality and efficacy.

Ingredients:

Specific amounts have not been provided for proprietary purposes; however, the general formula is provided for those seeking to create a version of this product independently or at a small-scale manufacturing facility that already produces endurance gel products.

1. Maple Syrup: Used as a sweetener and a source of easily digestible carbohydrates (Saraiva, A. et al, 2022; Ball, D. W., 2007), supplying quick energy to the body and enhancing the gel's taste.
 2. Maltodextrin is a complex carbohydrate source, offering sustained energy release during physical exertion (Malfatti C., et al, 2011; Takeiti, C. et al, 2010).
- *While maltodextrin is commonly utilized in endurance gels, drinks, and various other products, certain consumers do not consider it a clean label product due to its processing methods (BeMiller, J. N., 2019) and its relatively high glycemic index (GI) data, resulting in an approximate glycemic load of 94-95. However, during endurance activities, the impact of this high glycemic load would likely*

be minimal, as the simple carbohydrates are primarily utilized for energy expenditure.

3. Purified Water: Serves as a base for the gel, ensuring proper texture and consistency.
4. Ground *Psilocybe* fungi: Obtained from the whole fruiting body, including the stem and cap, of fungi belonging to the genus *Psilocybe*. It provides low-dose psilocybin, which may enhance mental focus and mood and reduce fatigue during physical and mental activities.
1. Caffeine: Enhances alertness, reduces perceived effort, and improves endurance by stimulating the central nervous system (Venier S. et al, 2019; Guest, N.S. et al, 2021; Kreutzer, A. et al, 2022; Wang Z. et al, 2022)
5. Potassium Citrate: An electrolyte that supports hydration and helps maintain proper muscle function during exercise (D'Elia, L. et al, 2023)
6. Magnesium Citrate: electrolyte that aids in muscle relaxation, reduces muscle cramps and supports energy production (Zhang, Y. et al, 2017)
7. Sodium-Chloride: Provides essential electrolytes, including sodium, to replenish those lost through sweat during physical exertion (Veniamakis E. et al, 2022).
8. Natural Flavors: Enhance the taste and palatability of the gel.

Equipment and Materials Needed:

1. Mixing vessels (or mixer for specific scale)
2. Weighing scale
3. Stirring utensils
4. Measuring tools (graduated cylinders, spoons)
5. Gel packaging containers
6. Custom labels
7. Cleaning supplies for sanitation
8. Personal protective equipment (PPE) as required (e.g., hairnets, masks, gloves etc.)

Manufacturing Procedure (small-mid scale):

It is important to note that the shelf stability of psilocybin will vary in any manufacturing process, and specific amounts of the compound need to be verified to provide consumers with accurate numbers. Unfortunately, the described manufacturing process cannot accurately state the amount of available psilocybin, even with ingredient formulations seeking to optimize stability. Due to microbiological kill steps that may cause the breakdown of psilocybin, the active compound in this product may vary, particularly as product shelf time varies.

1. **Ingredient Preparation:** The manufacturing process must begin by verifying the quality of all ingredients and supplier certifications. Ensure the desired amounts of each component listed in the formulation are available. (For this project, specific amounts have not been provided). If necessary, prepare and grind the *Psilocybe* mushroom to achieve the required quantity for the gel formulation. There are several methods available to achieve specific μm size. An ethanol extraction process is also possible, but with all processes, stability of psilocybin will vary, and it is important to conduct necessary tests to verify dosage and potency in any final product.
2. **Gel Preparation:** In a mixing vessel, combine the Maple Syrup, Maltodextrin, and Purified Water. Stir the mixture thoroughly until the ingredients fully dissolve, resulting in a homogeneous gel consistency. The consistency of the blend will significantly enhance the mouthfeel. *If preferred, flavors are an option for this product concept; however, these were not added in this specific formulation.*
3. **Incorporating Active Ingredients:** Once the gel preparation is complete, gradually add the Ground *Psilocybe* Mushroom, ensuring an even distribution within the gel mixture. Next, add the caffeine, potassium citrate, magnesium citrate, sea salt, and ascorbic acid to the gel mixture. Stir the mixture continuously to ensure proper incorporation of the active ingredients.
4. **Quality Control:** Implement quality control measures to ensure consistent product quality and safety. Regularly test raw materials for contaminants and verify their compliance with quality standards. Conduct periodic batch testing

to ensure the final product's content uniformity, including the active ingredients and nutritional values. As part of the quality control process, samples of the retorted gel packs are periodically taken and tested to verify the effectiveness of the retorting process. This testing ensures that the desired temperature and pressure conditions have been achieved, ensuring the product is safe for consumption.

5. Packaging: Fill labeled gel packs using appropriate equipment while maintaining proper aseptic measures to avoid contamination during packaging.
6. Retorting Process: The retorting process comes into play once the gel packs are filled and sealed. Manufacturers could also use other aseptic sterilizing techniques in the manufacturing process. For simplicity, I provide one standard method. The sealed gel packs are subjected to high heat in a retort machine to destroy harmful microorganisms and enzymes. This thermal processing ensures the safety and shelf-stability of the product. The retorting process is a critical control point to guarantee that the gel packs are correctly sterilized and free from any potential contaminants that could compromise the product's quality and safety.
7. Cleaning and Sanitation: Maintain a clean and sanitary production environment to ensure product integrity and safety. Regularly clean and sanitize all equipment, utensils, and surfaces used in manufacturing to prevent contamination.
8. Storage and Distribution: After packaging and retorting, store the products in a cool and dry area to preserve their quality and shelf life. Develop a distribution

strategy that aligns ethically and doesn't solely focus on business goals but also community partnerships. Implement proper inventory management practices to track stock levels.

*It is important to note that the manufacturing process for both concepts that are described does not include the mycelial and fruiting growth process. Inoculation, substrate, growth parameters, standardization, extraction were also not included. Although a unique fruiting process was used for this project, it is not included as a precaution. The process for growing psychoactive fungi can be simple, but at the mid-level manufacturing scale, it does get more complicated as microbiological challenges can become a safety concern, as the product would be intended for mass consumption. The limitation of this capstone does not allow for the full manufacturing process to be included. With that, if someone would like to replicate this process with a supplier of dried *Psilocybe* fungi or its extracts, all the necessary testing and certification will need to be done in order to verify potency and standardize the final product that is incorporated into food matrices.*

Due to a myriad of food, pharmaceutical, and scheduled substance regulations, additional constraints will likely exist, including security for employees working with a scheduled substance. As with the first concept presented, the process listed is generalized for product manufacturing. Manufacturers should observe all local, state, and federal regulations.

See the **Figures** section for Nutrition Label.

9. CONCLUSION: LIMITATIONS AND OPPORTUNITIES

Research on and regulation of psychoactive fungi and psychedelics is complex and rapidly evolving. It is essential to acknowledge that due to political and historical suppression of the use and benefits of psychoactive substances, along with regulatory constraints on psilocybin-containing fungi, significantly more research is needed on this topic. Despite these limitations, researchers have made significant strides in uncovering the benefits of psilocybin-containing fungi concerning mental health and neuroplasticity. Due to their efforts, we now have valuable data that provides strong evidence for their therapeutic use.

The practical implementation issues that exist today are vast. Integrating psychoactive fungi or isolated psilocybin into our healthcare system is still years away, not to mention using these substances in food. The need for more training and education on psychoactive fungi is evident. Although efforts to mitigate this are ongoing, we still need more clinicians and experts trained in using psychedelics. Moreover, the legal and regulatory issues that limit the study and use of these psychoactive fungi constitute a significant challenge.

While this project primarily focuses on the psychoactive properties of fungi and their potential benefits in mental health and clinical settings, it is crucial to acknowledge that these fungi offer a wide array of other uses and applications beyond their use as psychoactive substances. The primary and secondary metabolites and various

constituents of fungi hold promise beyond their psychoactive properties, including nutritive, medicinal, and bioremediation properties.

Another aspect relevant to using these fungi lies in exploring novel formulations and delivery methods. For instance, one possible direction is to consider delivering the benefits of these fungi not only through traditional food or edible forms but also by converting psilocybin to psilocin and administering it through alternative methods like intravenous, vaporized, or transdermal delivery of the active psilocin. These approaches open up new possibilities for harnessing the potential of psychoactive fungi beyond conventional consumption methods, allowing for diverse and innovative ways of utilizing their benefits. Even with the complexity of the physiological and biochemical processes involved in effective delivery methods, various administration strategies could open up opportunities for other uses and access to the beneficial effects. By exploring such unconventional delivery methods, we can further expand our understanding and application of these substances in clinical and non-clinical contexts.

By addressing the limitations and stating the potential opportunities and reiterating the need for funding and supportive research, we can continue to advance the understanding and integration of psychoactive fungi responsibly for the broader benefit of society. Coupling this with open dialogue and a commitment to sound scientific investigation is essential to realizing the promise these substances hold for improving public mental health and other systemic challenges.

10. LIST OF FIGURES

Figure 1

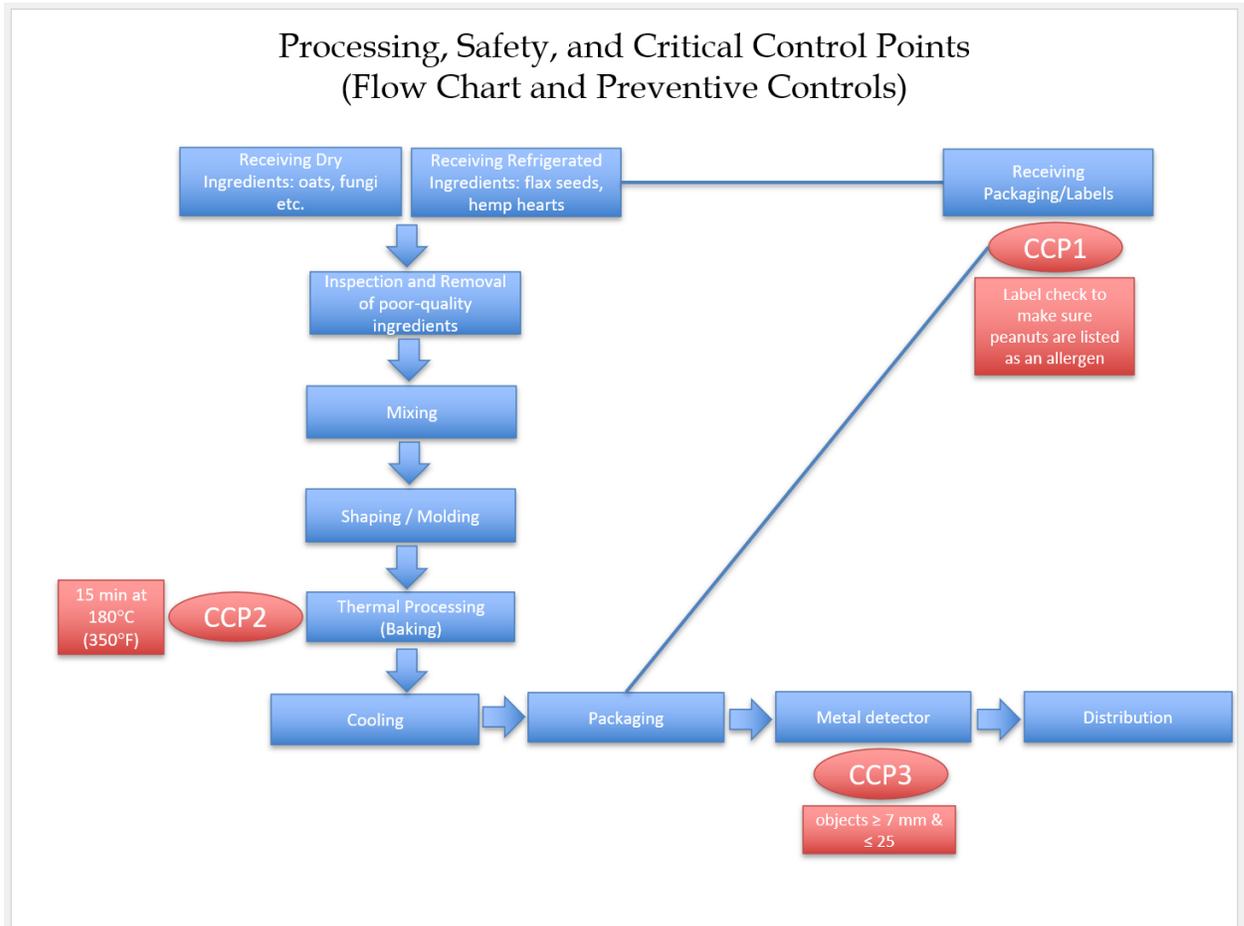


Figure 2

Sample Product and Nutrition Label:



Shroom-Chi Endurance Gel

Nutrition Facts

1 serving per container	
Serving size	
1 gel packet (35g)	
Amount Per Serving	
Calories	110
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 60mg	3%
Total Carbohydrate 28g	10%
Dietary Fiber 0g	0%
Total Sugars 18g	
Includes 18g Added Sugars	36%
Protein 0g	
Vitamin D 0mcg	0%
Calcium 10mg	0%
Iron 0mg	0%
Potassium 290mg	6%
Vitamin C 50mg	60%
Magnesium 35mg	8%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

INGREDIENTS: ORGANIC MAPLE SYRUP, MALTODEXTRIN, PURIFIED WATER, PSILOCYBE MUSHROOM EXTRACT, YERBA MATE EXTRACT (CONTAINS CAFFEINE), POTASSIUM CITRATE, MAGNESIUM CITRATE, SEA SALT, ASCORBIC ACID

Figure 3

Sample Nutrition Label:

**Psilocybar - Breakfast
from Beyond**

Nutrition Facts	
1 serving per container	
Serving size	1 Bar (85g)
Amount Per Serving	
Calories	260
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1.5g	8%
<i>Trans Fat</i> 0g	
Cholesterol 0mg	0%
Sodium 60mg	3%
Total Carbohydrate 37g	13%
Dietary Fiber 8g	29%
Total Sugars 7g	
Includes 7g Added Sugars	14%
Protein 15g	
Vitamin D 0mcg	0%
Calcium 70mg	6%
Iron 3.9mg	20%
Potassium 2530mg	50%
<small>* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.</small>	

INGREDIENTS: OATS, ORGANIC TAPIOCA SYRUP, ORGANIC PEANUTS, ORGANIC HULLED HEMP HEARTS, DATES, ORGANIC HEMP PROTEIN, ORGANIC GROUND FLAXSEED (COLD MILLED), ORGANIC LION'S MANE EXTRACT, PSILOCYBE MUSHROOM EXTRACT, SEA SALT

CONTAINS: PEANUTS

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