

Proceeding Paper

Dietary Consumption of Edible Mushrooms for Disease Prevention: A Literature Overview [†]

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Abstract: Edible mushrooms have played a significant role in dietary habits, culinary traditions, folk medicine, myths and culture since ancient times. This study aims to understand if regular consumption of edible mushrooms as a part of a balanced diet can have some specific beneficial effects on health, especially in preventive medicine. PubMed and Google Scholar were screened for relevant literature reviews, and five articles were included in this work. Overall, mushroom dietary intake was associated with reduced neoplasm incidence, particularly breast cancer, improved glucose, lipid, and vitamin D levels. However, changes in cholesterol levels were not detected in all studies, and no significant effect was shown for modifications in blood pressure and body weight. In conclusion, the evidence available suggests that a balanced diet including a serving of edible mushrooms at least two-to-three times a week may decrease cancer and metabolic risk in the long run, thus contributing to reducing all-cause mortality risk. The quality of mushrooms and their nutritional characteristics is fundamental to ensure consumer product safety. Further studies should investigate in more depth the effects on health of different mushroom species consumed regularly and the exact minimum amount associated with significant benefits.

Keywords: nutrition; diet; mushrooms; preventive medicine; public health; review

1. Introduction

Edible mushrooms have played a significant role in dietary habits, culinary traditions, folk medicine, myths and culture since ancient times [1]. In particular, mushrooms are neither plants, nor animals, but fungi, thus belonging to a separated biological kingdom, and some of them can be used for nutritional purposes, since they are rich in nutrients and bioactive compounds, including essential amino-acids, glucans, vitamins (thiamine, riboflavin, niacin, tocopherol, vitamin D), minerals (P, K, Na, Ca, Mg, Fe, Mn, Zn, Cu), and fiber [2]. For this reason, edible mushrooms (Figure 1) can be considered de facto as functional foods [3], and some of them (*Ganoderma lucidum*, *Lentinula edodes*, *Coriolus versicolor*, etc.) have recently been studied to create dietary supplements and extracts with medicinal properties (a field of study sometimes referred to as “myco-therapy”) [4]. However, the specific effects on health of mushroom regular consumption and whether this dietary habit can help prevent any diseases have been investigated less extensively, but it could play a useful role in clinical nutrition if some beneficial properties were confirmed.

This study aims to understand if regular consumption of edible mushrooms as a part of a balanced diet can have some specific beneficial effects on health, especially in preventive medicine.

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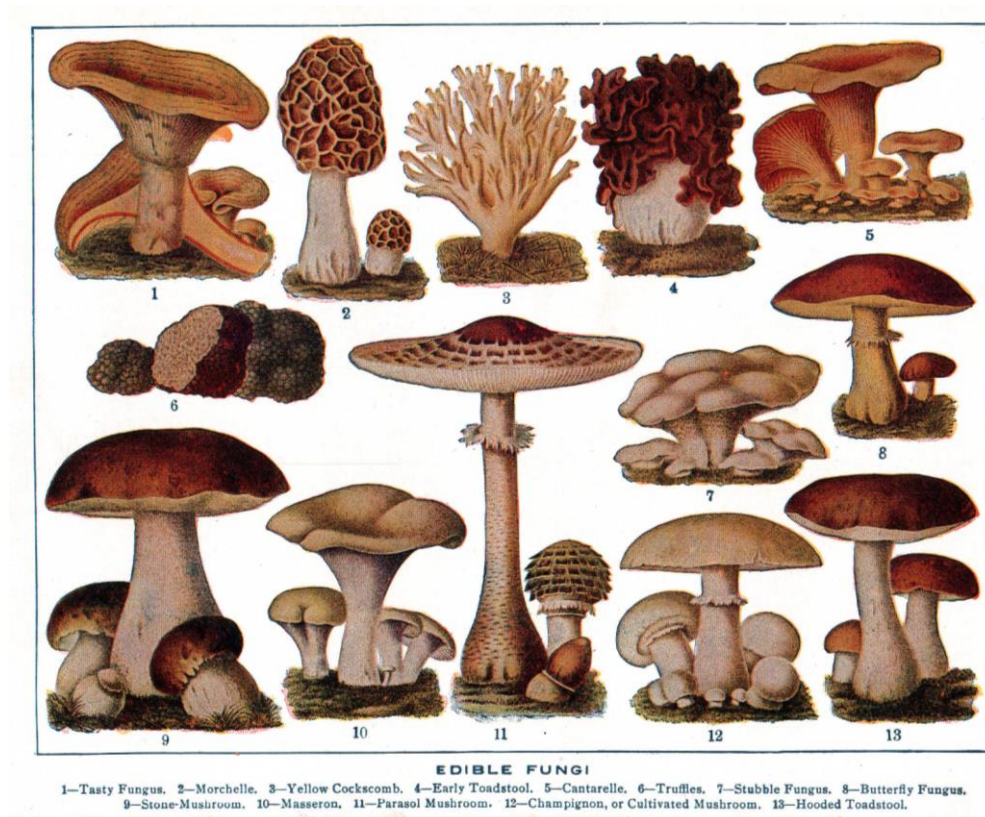


Figure 1. Examples of edible mushrooms. **Legends:** Picture distributed under the CC0 Public Domain Licence and freely accessible at https://eml.wikipedia.org/wiki/File:Edible_Fungi.jpg (access date: 24 February 2023).

2. Methods

In order to answer our research question, the scientific literature was screened up until February 2023. In particular, PubMed and Google Scholar were searched for relevant review articles describing the effects on health of dietary consumption of edible mushrooms. The keywords used to search the two databases were “mushroom”, “diet”, “nutrition”, and “review”. The following PICOS criteria were applied for study inclusion and exclusion:

P (Population): healthy subjects or patients with a disease diagnosed in accordance with internationally recognized clinical standards.

I (Intervention): regular consumption of specific edible mushrooms as a part of a balanced diet (studies only assessing the clinical efficacy of mushroom extracts or mushroom-based supplements were excluded from this umbrella review, as the main focus was placed on nutritional habits).

C (Comparison): preferably no (or very low) consumption of edible mushrooms.

O (Outcomes): any health-related outcomes, with a keen focus on epidemiologically relevant disorders (cardiovascular diseases, cancer, mental illnesses, etc.).

S (Study design): systematic literature reviews coupled or not with a meta-analysis (narrative reviews were only included if the search strategy was sufficiently wide and comprehensive). The methodological quality of all reviews was evaluated on the basis of their compliance with the PRISMA guidelines [5].

The available scientific evidence was briefly summarized and critically discussed in this review of secondary studies.

3. Results

After the scientific literature search, five reviews were included in this work [6–10]. The most relevant characteristics of the reviews included are summarized in Table 1.

Table 1. Systematic literature reviews about the effects of mushroom consumption on different health outcomes.

Population	Intervention	Comparison	Follow-up period	Health-Related Outcomes	SD	RM	Cit.
Healthy adults	Dietary intake of any edible mushrooms at least two-to-three times a week	Less than one serving of mushrooms per week	5–26 years	↓ Breast cancer incidence RR = 0.65 [95% CI: 0.52; 0.81] ↓ Non-breast cancer incidence RR = 0.80 [95% CI: 0.66; 0.97]	SR + MA (17 studies)	PRISM A	[6]
Adults interviewed about their nutritional habits	Dietary intake of any edible mushrooms	No mushroom consumption	6–27 years	↓ All-cause mortality risk RR = 0.94 [95% CI: 0.91; 0.98]	SR + MA (4 studies)	PRISM A	[7]
Healthy adults or patients with cardiometabolic risk factors	Oyster mushroom (<i>Pleurotus ostreatus</i>) 10–200 g/day (lyophilized or fresh)	No mushroom consumption	7 days–1 year	↓ Fasting plasma glucose (6–22%) ↓ Total cholesterol (8–24%) ↓ Triglycerides (20–36%) ↔ HDL cholesterol ↔ Blood pressure ↔ Body weight	SR (7 studies)	PRISM A	[8]
Adults interviewed about their nutritional habits	Dietary intake of any edible mushrooms	No mushroom consumption	Mostly 3–24 weeks	↓ Total cholesterol ↓ Triglycerides ? Blood pressure ↔ Fasting plasma glucose	SR (7 studies)	-	[9]
Healthy adults	Dietary intake of any edible mushrooms	Vitamin D supplementation	~1 month	↑ Vitamin D levels (as much as with vitamin D supplementation)	NR	-	[10]

Legends: MA = Meta-Analysis; NR = Narrative Review; SD = Study Design; RM = Review Methodology; SR = Systematic Review.

All studies involved adult participants, mostly healthy or sub-healthy people, and mushroom intake was either compared with no or very little mushroom consumption [6–9], or with vitamin supplementation [10]. The follow-up period largely varied from as little as a few days in clinical trials to as much as several years in cohort studies (Table 1). The health outcomes analyzed were those regarding cardiovascular risk factors, metabolic indices, cancer incidence, all-cause mortality risk, and vitamin D levels. Three out of five

reviews were written in compliance with the PRISMA guidelines (Table 1), and one of them was focused on oyster mushroom (*Pleurotus ostreatus*) properties [8]. Overall, mushroom dietary intake was associated with reduced neoplasm incidence, especially breast cancer, improved glucose, lipid, and vitamin D levels. However, changes in cholesterol levels were not detected in all studies, and no significant effect was shown for modifications in blood pressure and body weight.

4. Discussion

The mechanism of action of mushroom-derived bioactive compounds has not been fully unraveled yet. Laboratory experiments indicate that many edible and medicinal mushrooms, such as the *Ascomycetes* and the *Basidiomycetes*, have antioxidant properties [11,12]. Recent studies have also reported that supplementation of extracts derived from medicinal mushrooms can help boost the immune defenses [13], exert a potential antiproliferative effect [14,15], reduce insulin resistance and lipid levels [16,17], show an anticarcinogenic action [18], improve mood in patients suffering from major depressive disorder [19], diminish disease-related fatigue [20], and ameliorate cognitive functions in subjects affected by pre-dementia [21]. Some of these therapeutic effects are likely owed to fungal beta-glucans, well known for their immune-modulating and prebiotic effects [22,23]. The relative abundance of polysaccharides, fiber, micronutrients, and, for some mushrooms, the presence of statin-like substances can explain the lipid and glucose lowering effects [24,25]. National surveys also confirm that mushroom regular consumption is usually associated with better nutrient intake and diet quality [26]. However, even though cooking does not seem to significantly reduce the amount of substances such as beta-glucans [27], dietary intake of edible mushrooms is likely to be associated with lower absorption of bioactive compounds if compared to supplementation with concentrated extracts obtained from specific medicinal mushrooms. As such, the effects on health of mushroom consumption are expected to be more limited than those of myco-therapy.

Considering nutritional safety, despite being well tolerated at relatively low doses, edible mushrooms can become toxic when consumed in high quantities [28]. Moreover, since mushrooms tend to concentrate heavy metals and radioactive substances in their body [29,30], strict controls over harvesting areas and food production should be ensured by public health authorities in order to prevent any harmful consequences for consumers. Specific allergies and food intolerances should be also taken into account by clinical nutritionists when prescribing a diet including (or excluding) some mushroom species.

Limitations

This literature overview has some limitations: first of all, this study is based on a bibliographic search and does not provide original findings; secondly, the number of primary studies on the topic (either interventional trials or observational experiments) is quite limited; thirdly, the study quality was not excellent in all instances and future research is warranted to confirm what observed and hypothesized so far.

5. Conclusions

In conclusion, the evidence available suggests that a balanced diet including a serving of edible mushrooms at least two-to-three times a week may decrease cancer and metabolic risk in the long run. The quality of mushrooms and their nutritional characteristics is fundamental to ensure consumer product safety. Further studies should investigate in more depth the effects on health of different mushroom species consumed regularly and the exact minimum amount associated with significant benefits. Despite the role of specific foods with beneficial properties, a varied and Mediterranean-style diet remains a key pillar in preventive nutrition.

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