Mushrooms traded as food

Nordic questionnaire, including guidance list on edible mushrooms suitable and not suitable for marketing. For industry, trade and food inspection

Oyster Mushroom (Pleurotus ostreatus)


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Jørn Gry (consultant), Denmark, Christer Andersson, National Food Administration, Sweden, Lulu Krüger, Danish Veterinary and Food Administration, Birgitte Lyrån and Laila Jensvoll, Norwegian Food Safety Authority, Niina Matilainen and Annika Nurttila, Finnish Food Safety Authority Evira, Finland, Grímur Olafsson, Public Health Authority of Hafnarfjörður and Kópavogur, Iceland and Bente Fabech, Danish Veterinary and Food Administration (chairperson)

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Content

1. Introduction

Mushrooms are traditionally used as foodstuffs, both commercially and privately. Some edible mushrooms are cultivated like Oyster Mushroom and Button Mushroom, while others like Chanterelle and Cep are growing wild and collected in the nature. Both the cultivated and the wild mushrooms are commercially available.

Mushrooms are sold fresh or as products like dried, edible fungi (including freeze-dried fungi, fungus grits, fungus powder), pickled fungi, salted fungi, fermented fungi, fungi in vegetable oils, quick frozen fungi, sterilized fungi, fungus extract, fungus concentrate and dried fungus concentrate or as ingredients of foods ready-to-eat.

This project is focusing on mushrooms sold commercially as food. It is the aim to give guidance on edible mushrooms to industry and trade and to the public food inspection.[1]

The guiding tools are a questionnaire and as support, guidance lists on mushrooms, based on risk assessments of published scientific research (Volume I).

More background information is available in the background report: Volume II, section 1 and 2.

Volume II, section 1 has also more details on mushrooms, contaminants, intoxications and legislation.

Volume II, section 2 covers the risk assessments on more than 100 individual species in the four lists with scientific references on which the assessments are based. Pictures of the mushrooms in lists are also included.

The goal for the publication is to improve the in-house control and thereby the safety of traded mushrooms as food.

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[1] The questionnaire and the guidance lists are available in separate publications in Danish, Icelandic, Norwegian and Swedish as well as in English. The project group consists of the following persons:, Jørn Gry (consultant in food safety), Denmark; Christer Andersson, National Food Administration, Sweden; Lulu Krüger, Danish Veterinary and Food Administration, Birgitte Lyrån and Laila Jensvoll, Norwegian Food Safety Authority, Niina Matilainen and Annika Nuutilla, Finnish Food Safety Authority Evira, Finland; Grímur Olafsson, Public Health Authority of Hafnarfjörður and Kópavogur, Iceland and Bente Fabech, Danish Veterinary and Food Administration (chairperson). The Food inspectors and national mycological societies consulted are acknowledged in Volume II, section I, see www.norden.org

Edible mushrooms

Edible mushrooms mean fruit bodies of fungi, a group of organisms different from plants and animals.

In general, mushrooms sold as edible should not harm the consumer, neither immediately nor with short-term or long-term adverse effects. This is the common ground in the EU legislation on food.

The European Food Law, Regulation (EC) No 178/2002 defines "food" (or "foodstuff") as "any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans." Many mushroom species are only suitable for use as food after processing.

Knowledge of "what is edible" is essential and so is correct identification of mushrooms traded as food. Knowledge has to be updated as the available information of adverse effects after ingestion of some mushroom species is developing. Furthermore, the number of species sold as edible mushrooms seems to in-crease.

Advice on safe use of mushrooms

- Eat only mushrooms which you are 100% sure that you can recognize
- Eat only mushrooms, which are generally recognized as edible
- Do not eat mushrooms raw, as many mushrooms may cause discomfort, e.g. stomach pain if eaten raw
- Do not eat spoiled mushrooms
- When eating a new species of a mushroom for the first time, always start up with a small portion in order to minimize the possible risk for allergy or other hypersensitivity reactions

Poisonous mushrooms

Mushrooms cover both edible species, like *Boletus* species (e.g. Cep), and acutely or even deadly poisonous species like Deathcap (*Amanita phalloides*). Other species of mushrooms contain compounds, which may have long-term effects (e.g. induce tumours), or toxins that cause intoxications of less serious outcome. More common effects are nausea, stomach pain, and hypersensitivity reactions to mention a few effects.

Thus, it is important to have a good overview of the local mushroom market. As the global interchange of foods is increasing, new mushroom species might appear on the Nordic market. All these issues require guidance for responsible in-house control in trade and industry as well as in the public food inspection in order to ensure food safety.

Whether food items are safe to eat or not is to large extent based on knowledge gathered during centuries. However, the assessment of food safety should be based on a modern approach to risk assessment based on data available in the scientific literature.

In Europe, foods that are new on the European market are covered by the Novel Food regulation. A short overview of relevant legislation is in Annex I.

2. Questionnaire and guidance lists on mushrooms suitable and not suitable as food in trade and industry

The questionnaire and the guidance lists are tools for business operators, who have the responsibility to ensure both identification and safety of traded mushrooms. The lists are also meant to be a tool for the food inspection in guidance of in-house control.

Questionnaire

The questionnaire is to be used in the in-house control in trade and industry and by the public food inspection.

Guidance lists

The guidance lists 1 and 2 comprise edible mushrooms which are regarded as suitable for commercial marketing covering the most commonly traded mushrooms in most Nordic countries, and the guidance lists 3 and 4 comprise mushrooms that might be edible or have been reported as edible, but which are not considered as suitable for marketing, either because they may cause adverse effects or they are easily mistaken for poisonous mushrooms ("look-alikes").

All mushroom species listed in the guidance lists have been risk assessed taking into consideration published scientific information and other data available. These referenced risk assessments are available for each individual mushroom species in the background report (Volume II, section 2). To facilitate the use of these guiding lists appropriate pictures of the various mushroom species listed have been included in the list 1. However, the appearance of a mushroom differs, so more tools should be used for safe identification.

The lists 1 and 2 cover mushrooms that are or may be traded in most Nordic countries, but the lists are not exhaustive. Mushrooms which are

not on the lists 1 and 2 might be traded legally, if in compliance with the Food Regulation, but food inspectors should in these cases require risk assessment from the responsible business operators. Such risk assessments should cover scientific documentation equivalent to the guidance in Volume II or to the requirements in the Novel Food regulation.

Finland has national legislation[2] on edible mushrooms suitable for marketing. All mushrooms collected or grown and mushroom products produced in Finland have to meet the requirements. There are about 24 different mushroom species on the list. In Finland it is only allowed to collect those mushrooms mentioned on the list for marketing purposes only. The legislation is not applicable for imported mushrooms.

[2] Decree on Marketing of Mushrooms (489/2006) given by the Ministry on Trade and Industry. Based on this decree the Finnish Food Safety Authority Evira has given an Order "List of Mushrooms Suitable for Marketing" (3/2007).

3. Identification

A correct identification of a mushroom species is a cornerstone in the risk assessment as it implies an evaluation of whether a specific mushroom is an edible species, a toxic species or maybe a "look-alike" to poisonous mushroom species.

Industry and trade responsible for selling mushrooms as foods must be able to clearly identify the species sold. For imported mushrooms, they have to have solid documentation from their suppliers in other countries, that the mushrooms sold are identified by people with appropriate knowledge. This is important also for all preparations of mushrooms, including the dried mushrooms. Identification requires special knowledge and expertise, especially the identification of dried mushrooms.

As some mushrooms are toxic, it is essential to know both the identity of the edible species and the none-edible "look-alikes" and other mushrooms.

Mushroom collectors in exporting countries and private collectors selling to restaurants must have the skills to identify the mushrooms and to distinguish them from not-edible or even poisonous mushrooms.[3] Mycological training is essential for the identification.

Up-to-date information on mushroom identification is found in new handbooks, electronic media etc. and not at least by consulting mycological experts. See also Volume II section 1.

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[3] This is given in the EU Hygiene Regulation (ref. Regulation (EC) No 852/2004; Annex 1, point 5d).

4. Legislation and in-house control and documentation

A short overview on relevant EU and national legislation and a short introduction to in-house control in trade and industry are given in Annex I.

More detailed information and risk assessments of mushrooms in the four lists are in Volume II, see www.norden.org

Questionnaire for the control by industry, trade and the food inspection

Company name and address _____
Person responsible for the control _____
Date for the control _____

No	Check points	Answers	Comments
1	**Name of the product**		
2	**Name and address of the supplier to the company** (traceability)		
3	**Authorisation, status**: Does the national legislation request authorisation/approval? Is the supplier[4] authorized/approved by the food control authority?		
4	**Country of origin** (Only a legal requirement for cultivated, fresh mushrooms However, country of origin must always be labelled if needed – e.g. if there is doubt of the country of origin)		
5	**Traceability** (Clear connection between the product and its documentation)		
6	**Labelling** Specific name in national language, including the ingredient list for mixed mushrooms (Information: See the guidance lists)		
7	Is (are) the mushroom(s) included in the Nordic lists 1 or 2 on edible mushrooms and documentation for identity available?[5]	If, yes, – go to point 9 and 10. If, no – go to point 8.	

[4] *The supplier* can be a producer or an importer/intercommunity trade. Private collectors are normally not requested to be registered, as they often only have a small business. However, they have to comply with the Food Law, article 14.

[5] *Finland* has national legislation in force for mushrooms collected or grown in Finland.

No	Check points	Answers	Comments
8	Is (are) the mushroom(s) on the Nordic lists of mushrooms not suitable for marketing (lists 3 or 4)?	If yes = not acceptable for commercial use If no – Documentation for identity and the assessment of the status as edible (Compliance with article 14, EU Food Law) *If the documentation is accepted*, then go to point 9 and 10	
9	**Chemical contaminants, including radioactivity** (Documentation on compliance with maximum limits in the legislation)		
10	**Instructions of use** (If needed)		
11	**Conclusion on the questionnaire**	(accepted/ not accepted)	

5. Guidance lists

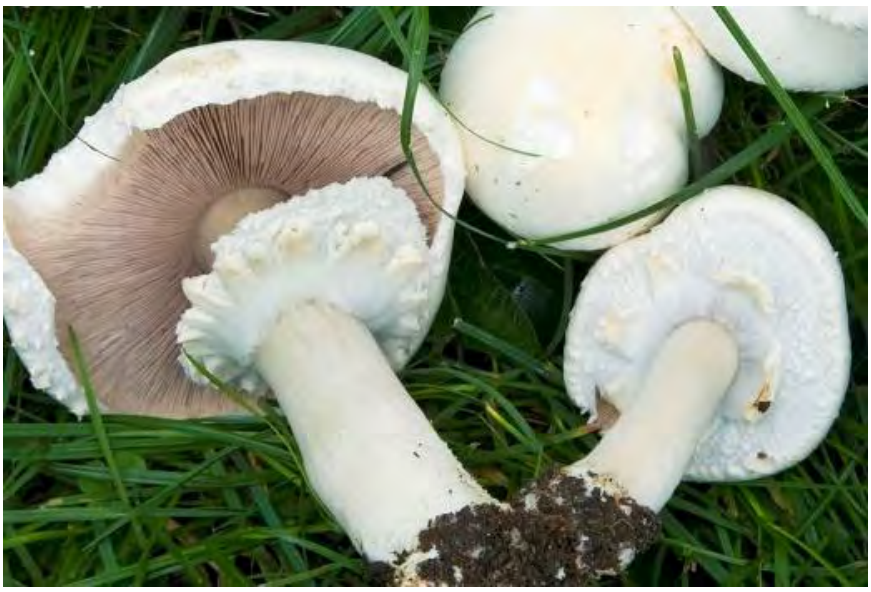
The names of the mushrooms in the Guidance lists are the preferred scientific names (common scientific synonyms in brackets).

When available, the preferred English name is given, whereas common English synonyms and trade names (with hyphens) are given in brackets. The nomenclature used is further explained in Volume II, section 2.

List 1

Edible mushrooms suitable for commercial marketing (cultivated and/or wild)

1–01 Agaricus arvensi (Horse Mushroom)



As Horse Mushroom efficiently bioaccumulates cadmium, the content of this toxic and carcinogenic metal should be regularly controlled

Due to the potentially high levels of phenylhydrazine derivatives and cadmium, Horse Mushroom should not be eaten in larger amounts (see *A. bisporus* (Button Mushroom) risk assessment).

The wild Horse Mushroom is in list 2.

1–02 Agaricus bisporus (A. hortensis, A. brunnescens) (Cultivated Mushroom (Button Mushroom))

As it is concluded from animal and in vitro studies that the phenylhydrazine derivatives occuring in Button Mushroom (*A. bisporus*) as well as the mushroom itself may be genotoxic and carcinogenic, a carcinogenic risk for humans cannot be excluded.

It is therefore recommended not to eat Button Mushroom in larger amounts. A significantly higher intake than 2 kg/year (average consumption in Denmark, Iceland, Norway and Sweden) is regarded as "larger amounts". Proper processing of the fresh mushroom reduces the amounts of potentially carcinogenic constituents. The fried, microwave-heated, boiled (especially if boiling water is discarded), and canned mushrooms contain significantly less of the potentially carcinogenic phenylhydrazines. Also ordinary freezing and subsequent thawing (but not freeze-drying) will reduce the content of phenylhydrazine in the mushroom.

It is therefore recommended to process/cook Button Mushroom before consumption.

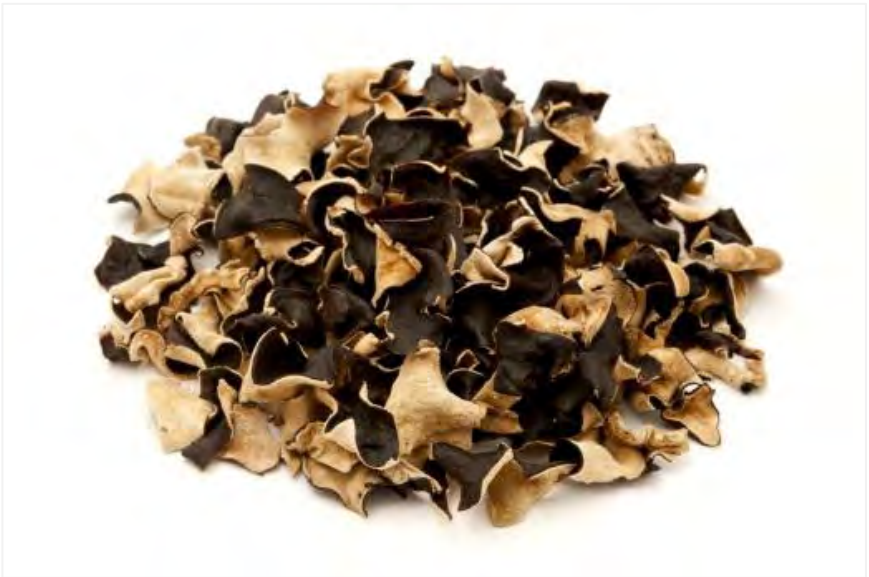
1–03 Albatrellus ovinus (Forest Lamb)

The mushroom is redlisted as regionally extinct in Denmark.
Should only be marketed in the Nordic countries, if it is from countries where it is cultivated or not red-listed

1–04 Amanita caesarea (Caesar's Mushroom (Caesar's Amanita))

1–05 Auricularia auricula-judae. (A. auricula)
(Jelly Ear(Jew's Ear, Judas's Ear Fungus))

1–06 Auricularia cornea (A. polytricha) and other Auricularia species
(Ear species)

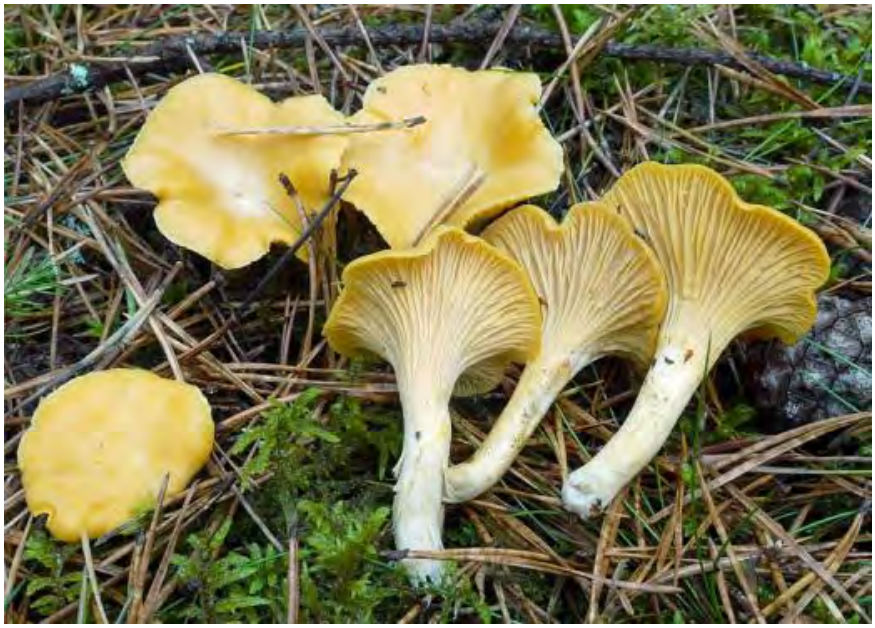


1–07 Boletus edulis (Penny Bun, Cep)

1–08 Boletus pinophilus (B. pinicola) (Pine Bolete("Pine Cep"))

1–09 Boletus reticulatus (B. aestivalis) (Summer Bolete("Summer Cep"))

1–10 Cantharellus cibarius (Chanterelle ("Girolle"))



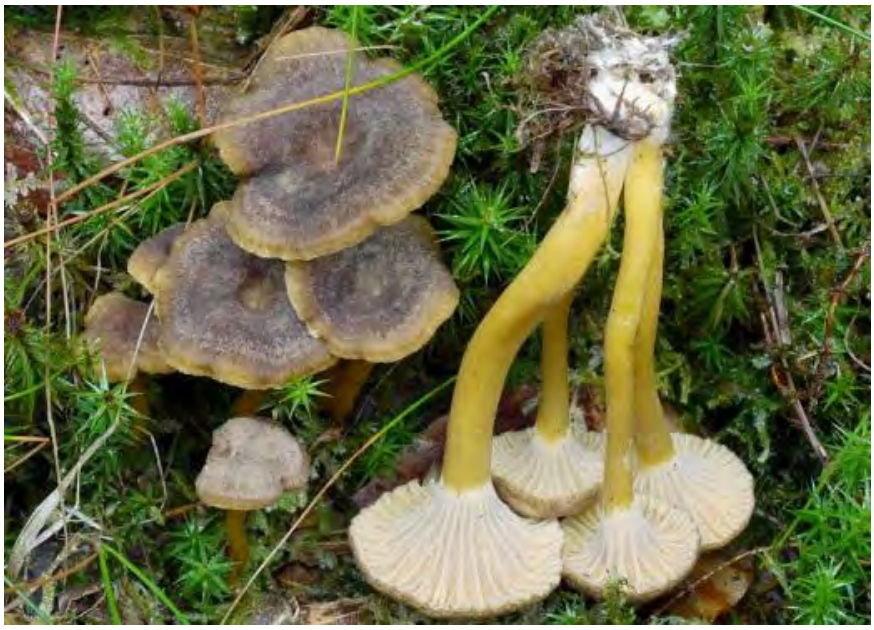
1–11 Cantharellus pallens (No English name)

1–12 Craterellus cornucopioides (Cantharellus cornucopioides)
(Horn of Plenty (Black Chanterelle, Black Trumpet))

1–13 Craterellus lutescens (Cantharellus lutescens)
(Golden Chanterelle ("Chanterelle Jaune", "Autumn Chanterelle"))

May form weak mutagenic compounds if injured.

1–14 Craterellus tubaeformis (Cantharellus tubaeformis)
(Trumpet Chantarelle ("Chanterelle gris","Winter Chanterelle"))



May form weak mutagenic compounds if injured.

1–15 Flammulina velutipes (Velvet Shank ("Enoki-take", "Golden Needle Mushroom"))

The wild Velvet Shank is in list 2.

1–16 Grifola frondosa (Hen of the Woods)

Red-listed in Denmark, Norway and Sweden as near threatened.
Should only be marketed in the Nordic countries, if it is from countries, where it is cultivated or not red-listed

1–17 Hericium coralloides (Coral Tooth)

Red-listed in Denmark, Norway and Sweden as near threatened.
Should only be marketed in the Nordic countries, if it is from countries, where it is cultivated or not red-listed

1–18 Hericium erinaceus (Bearded Tooth)
("Lion's Mane"," Mushroom","Pom Pom")

Redlisted in Denmark, Sweden and Norway as critically endangered.
Should only be marketed in the Nordic countries, if it is from countries where it is cultivated or not red-listed.

1–19 Hydnum repandum (Wood Hedgehog)
("Pied de Mouton", "Hedgehog")

1–20 Hydnum rufescens (Terracotta Hedgehog)

1–21 Hypsizygus spp (Elm Leech) (Brown Beech Mushroom, White Beech Mushroom("Brown Shimeji","White Shimeji"))

1–22 Lentinula edodes (Lentinus edodes) (Shii-take)

1–23 Lepista nuda (Tricholoma nudum)(Wood Blewit)

The wild Wood Blewit is in list 2.

1–24 Macrolepiota procera (Parasol)

1–25 Morchella conica. (M. elata)(Black Morel ("Morel","Pointed Morel", "Ribbed Morel"))

Black Morel *(M. conica* and the closely related Morel (*M. esculenta*): Should never be eaten raw and should be cooked for at least 10 minutes
Intake of higher amount (more than 100 g per meal) of cooked, fresh – or corresponding amounts of dried morels – may occasionally, beyond gastro-intestinal disturbances, give rise to neurological effects like ataxia, dizziness and visual disturbances and should accordingly be avoided.

1–26 Morchella esculenta (Morel)

Morel (*M. esculenta*) and the closely related Black Morel (*M. conica*): Should never be eaten raw and should be cooked for at least 10 minutes.
Intake of higher amounts (more than 100 g per meal) of cooked, fresh – or corresponding amounts of dried morel – may occasionally, beyond gastro-intestinal disturbances, give rise to neurological effects like ataxia, dizziness and visual disturbances and should accordingly be avoided.

1–27 Pholiota nameko ("Pholiote", "Nameko")

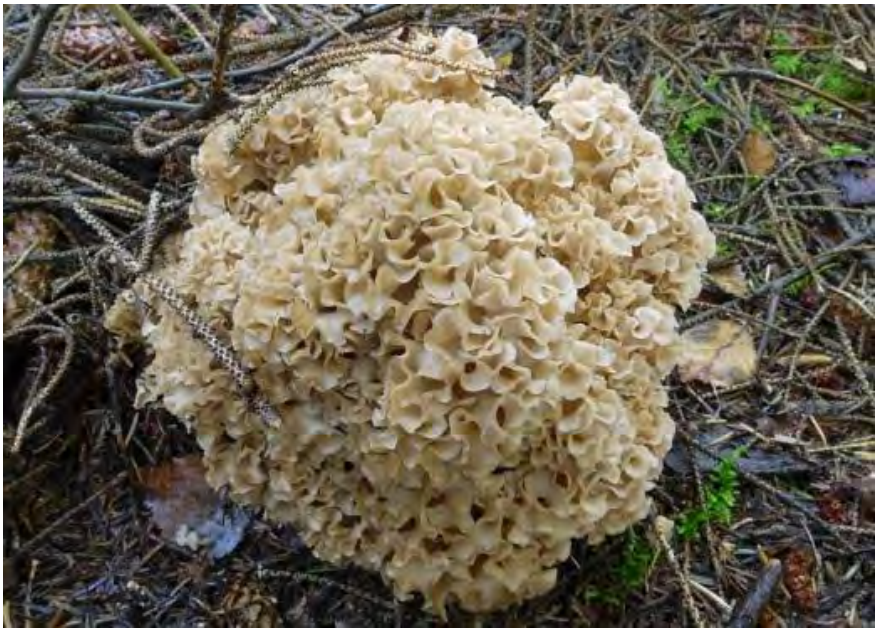
1–28 Pleurotus citrinopileatus (The Golden Oyster Mushroom)

1–29 Pleurotus djamor (Pink Oyster Mushroom)

1–30 Pleurotus eryngii (French Horn Mushroom, King Trumpet Mushroom ("King Oyster"))

1–31 Pleurotus ostreatus (Oyster Mushroom)

1–32 Sparassis crispa (Wood Cauliflower)



1–33 Suillus luteus (Slippery Jack)

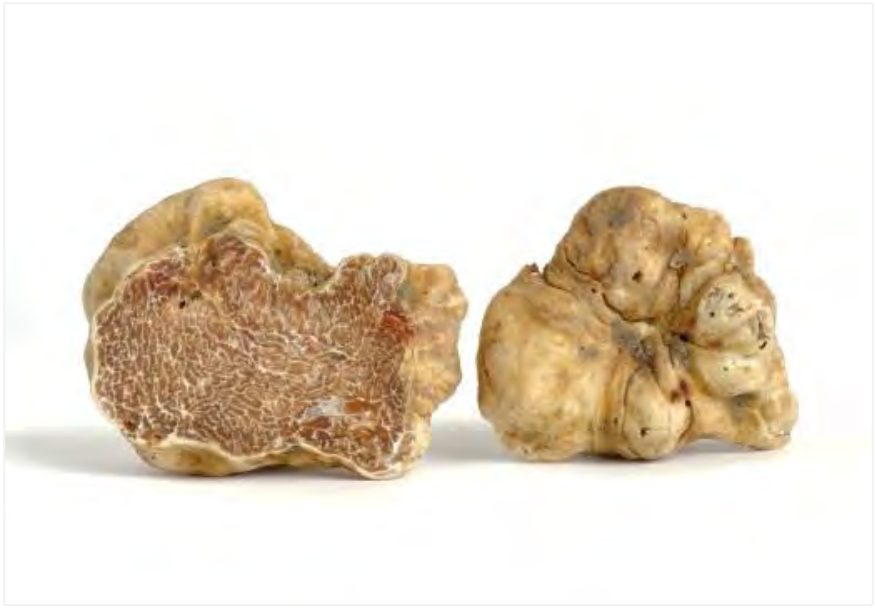
1–34 Tricholoma matsutake (T. nauseosum) (Spicy Knight("Matsu-take"))

Is red-listed in Denmark and Norway as near threatened.
Should only be marketed in the Nordic countries, if it is from countries, where it is not red-listed.

1–35 Tuber aestivum (Summer Truffle)

Red-listed in Denmark as near threatened.
Should only be marketed in the Nordic countries, if it is from countries, where it isnot red-listed.

1–36 Tuber magnatum (“White Truffle”,“Alba Truffle”)



1–37 Tuber melanosporum (“Black Truffle”,“Black Winter Truffle”)

1–38 Tuber sinense ("Chinese truffle" (Tuber indicum))

Picture missing

1–39 Volvariella volvacea (Volvaria volvacea)("Paddy Straw Mushroom", "Straw Mushroom")

In the following lists, pictures are not included. Pictures of these mushrooms are in Volume II, section 2, see www.norden.org

List 2

Wild edible mushrooms, where the identity has to be documented by recognised experts, to be suitable for commercial marketing

No.	Scientific name	English name	Comments
2–01	*Agaricus arvensis*	Horse Mushroom	As Horse Mushroom efficiently bioaccumulates cadmium, the content of this toxic and carcinogenic metal should be regularly controlled. Due to the potentially high levels of phenylhydrazine derivatives and cadmium, Horse Mushroom should not be eaten in larger amounts (see *A. bisporus* (Button Mushroom) risk assessment). The cultivated Horse Mushroom is in list 1.
2–02	*Agaricus augustus*	The Prince	As The Prince efficiently bioaccumulates cadmium, the content of this toxic and carcinogenic metal should be regularly controlled. Due to the potentially high levels of phenylhydrazine derivatives and cadmium, The Prince should not be eaten in larger amounts (see *A. bisporus* (Button Mushroom) risk assessment).
2–03	*Agaricus bitorquis*	Pavement Mushroom	Due to the potentially high levels of phenylhydrazine derivatives, Pavement Mushroom should not be eaten in larger amounts (see *A. bisporus* (Button Mushroom) risk assessment).
2–04	*Agaricus campestris*	Field Mushroom	Due to the potentially high levels of phenylhydrazine derivatives, Field Mushroom should not be eaten in larger amounts (see *A. bisporus* (Button Mushroom) risk assessment).
2–05	*Agaricus* species, other not yellowing e.g. *A. langei* (*A. haemorrhoidarius*) and *A. sylvaticus*	Agaricus species, other not yellowing e.g. Scaly Wood Mushroom and Blushing Wood Mushroom	Due to the potentially high levels of phenylhydrazine derivatives, other not yellowing *Agaricus* species (e.g. Scaly Wood Mushroom and Blushing Wood Mushroom) should not be eaten in larger amounts (see *A. bisporus* (Button Mushroom) risk assessment).
2–06	*Agaricus* species, other yellowing e.g. *A. sylvicola* (*A. abruptibulbus*) and *A. urinascens* (*A. excellens, A. macrosporus*)	Agaricus species, other yellowing e.g. Wood Mushroom and Macro Mushroom	As yellowing, edible *Agaricus* species e.g. Wood Mushroom and Macro Mushroom efficiently bioaccumulate cadmium, the content of this toxic and carcinogenic metal should be regularly controlled Due to their potential high levels of phenylhydrazine derivatives, yellowing, edible *Agaricus* species should not be eaten in larger amounts (see *A. bisporus* (Button Mushroom) risk assessment).
2–07	*Calocybe gambosa* (*Lyophyllum gambosum*) (*Tricholoma gambosum*, *T. georgii*)	St. George's Mushroom	

No.	Scientific name	English name	Comments
2–08	*Coprinus comatus*	Shaggy Inkcap, Lawyer's Wig, (Shaggy Mane)	
2–09	*Cortinarius caperatus* (*Rozites caperatus*)	The Gypsy	
2–10	*Flammulina velutipes*	Velvet Shank (Golden Needle Mushroom)	The cultivated Velvet Shank is in list 1.
2–11	*Gomphidius glutinosus*	Slimy Spike	
2–12	*Gomphus clavatus*	Pig's Ear	Red-listed in Denmark and in Sweden as vulnerable and in Norway as near threatened. Should only be marketed in the Nordic countries, if it is from countries, where it is not red-listed.
2–13	*Hygrocybe pratensis* (*Camarophyllus pratensis*)	Meadow Waxcap (Buffcap)	
2–14	*Hygrocybe punicea*	Crimson Waxcap	Red-listed as near threatened in Sweden and Denmark. Should only be marketed in the Nordic countries, if it is from countries, where it is not red-listed.
2–15	*Hygrophorus camarophyllus*	Arched Woodwax	Red-listed in Denmark as critically endangered. Should only be marketed in the Nordic countries, if it is from countries, where it is not red-listed.
2–16	*Hygrophorus hypothejus*	Herald of Winter	
2–17	*Lactarius deliciosus*	Saffron Milkcap	
2–18	*Lactarius deterrimus*	False Saffron Milkcap	
2–19	*Lactarius rufus*	Rufous Milkcap (Red Hot Milkcap)	Need to be pre-treated (salted/heat treated) to destroy the acrid substances in the mushroom. Cooking water should be discarded.
2–20	*Lactarius torminosus*	Woolly Milkcap	Need to be pre-treated (salted/heat treated) to destroy the acrid substances in the mushroom. Cooking water should be discarded.
2–21	*Lactarius trivialis*. (*L.s utilis*)	No English name	Need to be pre-treated (salted/heat treated) to destroy theacrid substances in the mushroom. Cooking water should be discarded. Red-listed as near threatened in Denmark. Should only be marketed in the Nordic countries, if it is from countries, where it is not red-listed.
2–22	*Lactarius volemus*	Fishy Milkcap (Weeping Milkcap)	Red-listed in Denmark Should only be marketed in the Nordic countries, if it is from countries, where it is not red-listed
2–23	Leccinum aurantiacum (L. albostipitatum, L. quercinum)	Orange Aspen Bolete (Orange Oak Bolete)	Thorough heat treatment is necessary as insufficiently cooked mushrooms can give intoxications.
2–24	*Leccinum* species, other e.g. *L. Scabrum*	Leccinum species, other species, e.g. Brown Birch Bolete	Thorough heat treatment is necessary as insufficiently cooked mushrooms can give intoxications.
2–25	*Leccinum versipelle*	Orange Birch Bolete	Thorough heat treatment is necessary as insufficiently cooked mushrooms can give intoxications.
2–26	*Leccinum vulpinum*	Foxy Bolete	Thorough heat treatment is necessary as insufficiently cooked mushrooms can give intoxications.

No.	Scientific name	English name	Comments
2–27	*Lepista nuda* (*Tricholoma nudum*)	Wood Blewit	The cultivated Wood Blewit is in list 1.
2–28	*Lepista saeva* (*L.personata, Tricholoma personatum*)	Field Blewit	
2–29	*Russula claroflava* (*R. flava*)	Yellow Swamp Brittlegill	
2–30	*Russula decolorans*	Copper Brittlegill	
2–31	*Russula integra*	Nutty Brittlegill	
2–32	*Russula paludosa*	(“Tall Brittlegill”)	
2–33	*Russula vesca*	The Flirt (Bare-toothed Russula)	
2–34	*Russula vinosa* (*R. obscura*)	Darkening Brittlegill	
2–35	*Russula xerampelina*	Crab Brittlegill (Shrimp Mushroom)	There are more species, closely related to Crab Brittlegill. Like this mushroom, they smell of cooked shellfish and are edible, but they are not common in the Nordic countries.
2–36	*Suillus granulatus*	Weeping Bolete (Granulated Bolete)	
2–37	*Suillus grevillei*	Larch Bolete (Greville’s Bolete)	
2–38	*Suillus variegatus*	Velvet Bolete (Variegated Bolete, “Swedish Jack”)	
2–39	*Tricholoma portentosum*	Charbonnier (“The Coalman”)	
2–40	*Xerocomus badius* (*Boletus badius*)	Bay Bolete	

List 3

Wild mushrooms, which may easily be mistaken for poisonous look-alikes and therefore are not regarded as suitable for commercial marketing

No.	Scientific name	English name	Comments
3–01	*Amanita fulva*	Tawny Grisette (Orange-Brown Ringless Amanita)	Immature Tawny Grisette (especially when it looks like "small hen's eggs") may be mistaken for the deadly poisonous Deathcap (*A. phalloides*) or Destroying Angel (*A. virosa*) which also may look like "small hen's eggs", when they are very young).
3–02	*Amanita rubescens*	Blusher	The Blusher resembles Panthercap (*A. pantherina*), which is very poisonous.
3–03	*Armillaria borealis*	No English name	The "Honey Fungus species" should never be eaten raw, should be thoroughly cooked, and should only be eaten in small amounts, when eaten for the first time, However, "Honey Fungus species"are very difficult to distinguish from the toxic Dark Honey Fungus (*A. ostoyae*), and should therefore not be used for marketing. For the time being (June 2012) *Armillaria* species are leagally marketed in Finland, but the status is subject to change.
3–04	*Armillaria cepistipes* (*Armillariella cepistipes*)	No English name	
3–05	*Armillaria lutea* (*Armillaria gallica*)	Bulbous Honey Fungus	
3–06	*Armillaria mellea* (*Armillariella mellea*)	Honey Fungus	
3–07	*Boletus luridiformis*	Scarletina Bolete (Dotted-Stemmed Bolete)	Resembles Devils Bolete (*B. satanas*) and *B. legaliae* which are both poisonous.
3–08	*Boletus luridus.*	Lurid Bolete	Resembles Devils Bolete (*B. satanas*) and *B. legaliae* which are both poisonous.
3–09	*Chlorophyllum olivieri* (*Lepiota olivieri, Macrolepiota olivieri*)	No English name	Resembles *Chlorophyllum brunneum* which is suspected to be poisonous.
3–10	*Chlorophyllum rachodes* (*Macrolepiota rachodes, Lepiota*)	Shaggy Parasol	Resembles *Chlorophyllum brunneum* which is suspected to be poisonous.
3–11	*Clitopilus prunulus*	The Miller	Resembles some small Funnel species (*Clitocybe* species) like Fools Funnel (*Clitocybe rivulosa*) which are very poisonous.
3–12	*Cortinarius spp*. e.g. *Cortinarius armillatus*	Webcap species e.g. Red Banded Webcap	Many webcaps (*Cortinarius* species) are difficult to identify, and some of them are deadly poisonous, e.g., Deadly Webcap (*Cortinarius rubellus*).
3–13	*Hypholoma capnoides*	Conifer Tuft	Conifer Tuft (*Hypholoma capnoides*) resembles Sulphur Tuft (*Hypholoma fasciculare*) which is poisonous.
3–14	*Kuehneromyces mutabilis* (*Pholiota mutabilis*)	Sheathed Woodtuft ("Two-tone Pholiote")	Sheathed Woodtuft (*Kuehneromyces mutabilis*) resembles Funeral Bell (*Galerina marginata*) which is deadly poisonous.
3–15	*Russula aeruginea* and other glaucous green *Russula* species, e.g. *Russula cyanoxantha* *Russula grisea* *Russula ionochlora* *Russula parazurea* *Russula virescens*.	Green Brittlegill and other Brittlegill species e.g. Charcoal Burner No English name Oilslick Brittlegill Powdery Brittlegill Greencracked Brittlegill	Green Brittlegill (*Russula aeruginea*) and other glaucous green Brittlegill species resemble Deathcap (*Amanita phalloides*) which is deadly poisonous.

List 4

Wild mushrooms earlier regarded as edible, but which are suspected to cause acute or long-time adverse effects after ingestion and therefore not regarded as suitable for commercial marketing

No.	Scientific Name	English name	Comments
4–01	*Armillaria ostoyae* (*Armillarialla ostroyae.*)	Dark Honey Fungus	May give rise to intoxications, even if thoroughly cooked and should therefore not be used in commercial trade. The toxicant is not known. For the time being (June 2012) "Honey Fungus species" (*Armillaria* species) are legally marketed in Finland, but the status is subject to change.
4–02	*Clitocybe connata* (*Lyophyllum connatum*)	White Domecap	
4–03	*Clitocybe nebularis* (*Lepista nebularis)*	Clouded Funnel	Gives rise to intoxincation in some people, even after thorough cooking. The toxicant is not known.
4–04	*Coprinopsis atramentaria* (*Coprinus atramentarius*)	Common Inkcap	Contains coprin, a toxin with "antabus"-like effects and with suspected reproductive toxic effects.
4–05	*Gyromitra esculenta*	False Morel (Turban, Brain Mushroom)	Should not be consumed as it even after months of drying or after repeated boiling and discarding of the water, still contains significant amounts of suspected genotoxic and carcinogenic hydrazinderivatives.[6]
4–06	*Laccaria amethystina*	Amethyst Deceiver	Accumulates arsenic, and contains organic arsenic compounds, especially dimethylarsinic acid, which cannot be excluded to be genotoxic and carcinogenic.
4–07	*Lactarius necator* (*L. plumbeus, L. turpis*)	Ugly Milkcap	Contains the heat stable necatorin which is suspected to be genotoxic.
4–08	*Paxillus involutus*	Brown Rollrim (Common Rollrim, Poison Pax)	Contains potent, but unknown toxicant(s), which are not efficiently destroyed after cooking, and which after repeated meals may give severe adverse reactions, in some cases deadly.
4–09	*Pholiota squarrosa*	Shaggy Scalycap	May occationally give rise to intoxications. The toxicant is unknown.
4–10	*Pleurocybella porrigens*	Angel's Wings	Contains pleurocybellaziridine which has given rise to several fatal intoxications.
4–11	*Tricholoma equestre* (*T. flavovirens, T. auratum*)	Yellow Knight (Man on Horseback, "Canary Mushroom")	Severe, also some fatal intoxicantions have been reported after consumption of repeated meals with substantial amounts of this mushroom.Yellow Knight should not be marketed before occurrence and identity of the toxicant(s) has been elucidated and not before the mecanism of the toxicity has been explaned. Due to the intoxications, some European countries have forbidden trade with Yellow Knight.

[6] May under specified conditions be marketed in Finland and Sweden, see risk assessment of False Morel (Gyromitra esculenta), Volume II, section 2.

6. Index to the lists

The numbers in the index are constructed as follows:

- Number 1–01 refers to list 1, mushroom no 01,
- Number 2–01 refers to list 2, mushroom no 01 etc.

Some of the mushrooms on the lists have not[7] a name in English, and are in the index under "No English names".

English name	Scientific name	No
Agaricus species, other not yellowing	*Agaricus species,* other not yellowing	2–05
Agaricus species other yellowing	*Agaricus species,* other yellowing	2–06
Alba Truffle	*Tuber magnatum*	1–36
Amethyst Deceiver	*Laccaria amethystina*	4–06
Angel's Wings	*Pleurocybella porringens*	4–10
Arched Woodwax	*Hygrophorus camarophyllus*	2–15
Autumn Chanterelle	*Craterellus lutescens*	1–13
Bare-toothed Russula	*Russula vesca*	2–33
Bay Bolete	*Xerocomus badius*	2–40
Bearded Tooth	*Hericium erinaceus*	1–18
Black Chanterelle	*Craterellus cornucopioides*	1–12
Black Morel	*Morchella conica*	1–25
Black Truffle	*Tuber melanosporum*	1–37
Black Trumpet	*Craterellus cornucopioides*	1–12
Black Winter Truffle	*Tuber melanosporum*	1–37
Blusher	*Amanita rubescens*	3–02
Blushing Wood Mushroom	*Agaricus sylvaticus*	2–05
Brain Mushroom	*Gyromitra esculenta.*	4–05
Brown Beech Mushroom	*Hypsizygus tessulatus*	1–24
Brown Birch Bolete	*Leccinum scabrum*	2–24
Brown Rollrim	*Paxillus involutus*	4–08
Brown Shimeji	*Hypsizygus spp.*	1–21
Buffcap	*Hygrocybe pratensis*	2–13
Bulbous Honey Fungus	*Armillaria lutea*	3–05
Button Mushroom	*Agaricus bisporus*	1–02
Caesar's Amanita	*Amanita caesarea*	1–04
Caesar's Mushroom	*Amanita caesarea*	1–04
Chanterelle Gris	*Craterllus cornucopoides*	1–14
Chanterelle Jaune	*Craterellus lutenscens*	1–13
Charbonnier	*Tricholoma portentosum*	2–39
Charcoal Burner	*Russula cyanoxantha*	2–15
Chinese truffle	*Tuber indicum*	1–38
Clouded Funnel	*Clitocybe nebularis*	4–03
Common Inkcap	*Coprinopsis atramentaria*	4–04

[7] April 2012.

English name	Scientific name	No
Common Rollrim	*Paxillus involutus*	4–08
Conifer Tuft	*Hypholoma capnoides*	3–13
Copper Brittlegill	*Russula decolorans*	2–30
Coral Tooth	*Hericium coralloides*	1–17
Cortinarius species	*Cortinarius spp.*	3–12
Crab Brittlegill	*Russula xerampelina*	2–35
Crimson Waxcap	*Hygrocybe punicea*	2–14
Cultivated Mushroom	*Agaricus bisporus*	1–02
Darkening Brittlegill	*Russula vinosa*	2–34
Dark Honey Fungus	*Armillaria ostoyae*	4–01
Dotted-Stemmed Bolete	*Boletus luridiformis*	3–07
Ear species	*Auricularia polytricha*	1–06
Elm Leech	*Hypsizygus spp.*	1–21
Enoki-take	*Flammulina velutipes*	1–15, 2–10
False Morel	*Gyromitra esculenta.*	4–04
False Saffron Milkcap	*Lactarius deterrimus*	2–16
Field Blewit	*Lepista saeva*	2–28
Field Mushroom	*Agaricus campestris*	2–04
Fishy Milkcap	*Lactarius volemus*	2–22
Foxy Bolete	*Leccinum vulpinum*	2–26
Forest Lamb	*Albatrellus ovinus*	1–03
French Horn Mushroom	*Pleurotus eryngii*	1–30
Girolle	*Cantharellus cibarius*	1–10
Golden Chanterelle	*Craterellus lutescens*	1–13
Golden Needle Mushroom	*Flammulina velutipes*	1–15, 2–10
Granulated Bolete	*Suillus granulatus*	2–36
Green Brittlegill	*Russula aeruginea*	3–15
Greencracked Brittlegill	*Russula virescens*	3–15
Greville's Bolete	*Suillus grevillei*	2–37
Hedgehog	*Hydnum repandum*	1–19
Hen of the Woods	*Grifola frondosa*	1–16
Herald of Winter	*Hygrophorus hypothejus*	2–16
Honey Fungus	*Armillaria mellea*	3–06
Horn of Plenty	*Craterellus cornucopioides*	1–12
Horse Mushroom	*Agaricus arvensis*	1–01, 2–01
Jelly ear	*Auricularia auricula-judae*	1–05
Jew's Ear	*Auricularia auricula-judae*	1–05
Judas's Ear Fungus	*Auricularia auricula-judae*	1–05
King Oyster	*Pleurotus eryngii*	1-30
King Trumpet Mushroom	*Pleurotus eryngii*	1–30
Larch Bolete	*Suillus grevillei*	2–37
Lawyer's Wig	*Coprinus comatus*	2–08
Leccinum species, other	*Leccinum species other*	2–24
Lion's Mane Mushroom	*Hericium erinaceus*	1–18
Lurid Bolete	*Boletus luridus*	3–08
Macro Mushroom	*Agaricus urinascens*	2–06
Man on Horseback	*Tricholoma equestre*	4–11
Matsu-take	*Tricholoma matsutake*	1–34
Meadow Waxcap	*Hygrocybe pratensis*	2–13
Morel	*Morchella conica*	1–25
Morel	*Morchella esculenta*	1–26
Nameko	*Pholiota nameko*	1–27
No English name	*Armillaria borealis*	3–03
No English name	*Armillaria cepistipes*	3–04
No English name	*Cantharellus pallens*	1–11
No English name	*Chlorophyllum olivieri*	3–09, 3–10
No English name	*Lactarius trivialis*	2–21
No English name	*Leccinum aurantiacum*	2–23
No English name	*Russula grisea*	3–15
Nutty Brittlegill	*Russula integra*	2–31
Oilslick Brittlegill	*Russula ionochlora*	3–15
Orange Aspen Bolete	*Leccinum aurantiacum*	2–23

English name	Scientific name	No
Orange Birch Bolete	*Leccinum versipelle*	2–25
Orange-Brown Ringless Amanita	*Amanita fulva*	3–01
Orange Oak Bolete	*Leccinum aurantiacum*	2–23
Oyster Mushroom	*Pleurotus ostreatus*	1–31
Paddy Straw Mushroom	*Volvariella volvacea*	1–39
Parasol	*Macrolepiota procera*	1–24
Pavement Mushroom	*Agaricus bitorquis*	2–03
Penny Bun	*Boletus edulis*	1–07
Pholiote	*Pholiota nameko*	1–27
Pied de Mouton	*Hydnum repandum*	1–19
Pig's Ear	*Gomphus clavatus*	2–11
Pine Bolete	*Boletus pinophilus*	1–08
Pine Cep	*Boletus pinophilus*	1–08
Pink Oyster Mushroom	*Pleurotus djamor*	1–29
Pointed Morel	*Morchella conica*	1–25
Poison Pax	*Paxillus involutus*	4–08
Pom Pom	*Hericium erinaceus*	1–18
Powdery Brittlegill	*Russula parazurea*	3–15
Red Banded Webcap	*Cortinarius spp*. e.g., *Cortinarius armillatus*	3–12
Red Hot Milkcap	*Lactarius rufus*	2–19
Ribbed Morel	*Morchella conica*	1–25
Powdery Brittlegill	*Russula parazurea*	3–15
Rufous Milkcap	*Lactarius rufus*	2–19
Saffron Milkcap	*Lactarius deliciosus*	2–17
Scaly Wood Mushroom	*Agaricus langei*	2–05
Scarletina Bolete	*Boletus luridiformis*	3–07
Shaggy Inkcap	*Coprinus comatus*	2–08
Shaggy Mane	*Coprinus comatus*	2–08
Shaggy Parasol	*Chlorophyllum rachodes*	3–10
Shaggy Scalycap	*Pholiota squarrosa*	4–09
Sheathed Woodtuft	*Kuehneromyces mutabilis*	3–14
Shii-take	*Lentinula edodes*	1–22
Shrimp Mushroom	*Russula xerampelina*	2–35
Slimy Spike	*Gomphidius glutinosus*	2–11
Slippery Jack	*Suillus luteus*	1–32
Spicy Knight	*Tricholoma matsutake*	1–34
St. George's Mushroom	*Calocybe gambosa*	2–07
Straw Mushroom	*Volvariella volvacea*	1–39
Summer Bolete	*Boletus reticulatus*	1–09
Summer Truffle	*Tuber aestivum*	1–35
Swedish Bolete	*Suillus variegatus*	2–38
Tall Brittlegill	*Russula paludosa*	2–32
Tawny Grisette	*Amanita fulva*	3–01
Terracotta Hedgehog	*Hydnum rufescens*	1–20
The coalman	*Tricholoma portentosum*	2–39
The Flirt	*Russula vesca*	2–33
The Golden Oyster Mushroom	*Pleurotus citrinopileatus*	1–28
The Gypsy	*Cortinarius caperatus*	2–09
The Miller	*Clitopilus prunulus*	3–11
The Prince	*Agaricus augustus*	2–02
Trumpet Chantarelle	*Craterellus tubaeformis*	1–14
Turban	*Gyromitra esculenta.*	4–05
Two Tone Pholiote	*Kuenhneromyces mutabilis*	3–14
Ugly Milkcap	*Lactarius necator*	4–07
Variegated Bolete	*Suillus variegatus*	2–38
Velvet Bolete	*Suillus variegatus*	2–38
Velvet Shank	*Flammulina velutipes*	1–15, 2–10
Webcap species	*Cortinarius spp.*	3–12
Weeping Bolete	*Suillus granulatus*	2–36
Weeping Milkcap	*Lactarius volemus*	2–20
White Beech Mushroom	*Hypsizygus tessulatus*	1–21
White Domecap	*Clitocybe connata*	4–02
White Shimeji	*Hypzysygus spp*.	1–21

English name	Scientific name	No
White Truffle	*Tuber magnatum*	1–36
Winter Chanterelle	*Craterellus cornucopoides*	1–14
Wood Blewit	*Lepista nuda*	1–23, 2–27
Wood Cauliflower	*Sparassis crispa*	1–33
Wood Hedgehog	*Hydnum repandum*	1–19
Wood Mushroom	*Agaricus sylvicola*	2–06
Woolly Milkcap	*Lactarius torminosus*	2–20
Yellow Foot	*Craterellus lutescens*	1–13
Yellow Knight	*Tricholoma equestre*	4–11
Yellow Swamp Brittlegill	*Russula claroflava*	2–29

Annex I – Overview on relevant EU and national legislation and in-house control

Legislation

Foodstuffs are covered by general requirements in the legislation as well as specific requirements e.g. on heavy metals and radioactivity.

The control and requests of documentation from the trade and industry are regulated in a number of EU regulations and directives:

- General Food Law
- Food Labelling
- Novel Food
- Fruit and vegetables
- Contaminants in food (metals, pesticides, radioactivity)
- Hygiene
- Control
- National legislation or guidance on bioactive components

General Food Law: Mushrooms traded as food have to comply with the generals requirements in the European Food Regulation, especially article 14, saying that food shall not be placed on the market if it is unsafe. Furthermore, the following should be taken into account when assessing whether any food may be "injurious to health":

- not only to the probable immediate and/or short-term and/or long-term effects of that food on the health of a person consuming it, but also on subsequent generations
- to the probable cumulative toxic effects
- to the particular health sensitivities of a specific category of consumers where the food is intended for that category of consumers

Novel Food Regulation: Regarding a growing market on mushroom species, it should be recognized, that in Europe, foods that are new on the European market are covered by the Novel Food regulation. This regulation states that foods that have not been consumed within the Community to a significant degree before 15 May 1997 should be considered a Novel Food. The Novel Foods have to be risk assessed before being allowed on the European market. It is a further complication that the intake of various mushroom species is not well documented.

National regulation on mushrooms: Some EU member states, like Sweden, Finland, Belgium, Poland and France have national legislation or guidance on edible mushrooms. The contents of inherent toxicants are not subject to harmonised legislation in the EU.

In-house control is defined as the systematic measures taken by the business operators to ensure that the requirements set out concerning edible mushrooms are fulfilled.

The basis for sustainable production or import is proper in-house control of mushrooms (and other types of foodstuffs) at the producers and importers. Control should be based on HACCP, through relevant documentation and proper identification of mushrooms, also when used in production of e.g. dried mushrooms or in ready-to-eat food.

In-house control and documentation

Establishing relevant documentation in the in-house control is an obligation in the trade and industry taking into account the legal requirements. Public food inspection can request it as part of their control.

Documentation can be described as:

- Declaration of compliance and
- Supporting background documentation

Declaration of compliance is normally the statement/certificate from a producer/exporter, while the *supporting documentation* would be the detailed information, e.g. on details of analysis like detection limits, methods, sampling or for mushrooms information on identification methods are qualification of experts involved in this. Furthermore, toxicological references could be part of the background documentation.

As such documentation is sometimes regarded as confidential, it should be assessable for public authority on request and used under normal confidentiality agreement.

Who should have in-house control?

All links in the production chain from the grower or importer to the processing food industry to the restaurant and other retailers should have in-house control and relevant documentation. The private collectors should have adequate knowledge, preferable certified.

The producer, user or importer is responsible for observing the legal requirements of mushrooms, including processed and pre-packed mushroom products.

Declarations of compliance and supporting background documentation

Compliance shall be documented as part of the in-house declarations of compliance in industry and trade.

The responsible companies shall have

- Relevant knowledge of which mushrooms are edible and identification of them
- Relevant knowledge about the legislation in order to be able to assess the reliability of the documentation
- The starting point for the check lists for the establishment of appropriate in-house documentation is that all links in the chain from the grower or collector of the mushrooms to the importers of dried mushrooms or the restaurants buying from private collectors take responsibility
- In-house documentation based on knowledge and trust between trade partners

In general, a declaration of compliance should as a starting point be regarded as adequate in-house documentation for mushrooms and mushroom products.

In this area of safe use of mushrooms as foods, the questionnaire is meant to be used to ensure valid documentation of the identity and safety of the mushrooms, and the lists are supporting this questionnaire.

Annex II – Addresses

Food Authorities in the Nordic countries

Danish Veterinary and Food Administration (Fødevarestyrelsen):
www.fvst.dk

Finnish Food Safety Authority Evira (Evira):
http://www.evira.fi

Icelandic Food and Veterinary Authority, MATIS (Matvælastofnun):
http://www.mast.is

Norwegian Food Safety Authority (Mattilsynet):
http://www.mattilsynet.no (information for trade an9d industry)
http://www.matportalen.no (information for the public)

Swedish National Food Agency (Livsmedelsverket):
http://www.slv.se

National Poison Information Centres in the Nordic Countries

In Denmark, Finland, Iceland and Sweden: Acute cases call 112, for *Norway Acute cases call 113*. In all countries**,** ask for poison information center in less severe cases contact the national poison information centre. See addresses and phone numbers below.

Denmark	Giftlinjen http://www.bispebjerghospital.dk/giftlinjen/forside/, Phone +45 82 12 12 12
Finland	Myrkytystietokeskus http://www.hus.fi/default.asp?path=1,28,824,2049,2265,2260 Giftinformationscentralen http://www.hus.fi/default.asp?path=58;373;19337;9738;7645 Poison Information Centre http://www.hus.fi/default.asp?path=59;403;19336;9739;9541 Phone + 358 9 47 19 77
Iceland	Eitrunarmiðstöð http://www.landspitali.is/eitrunarmidstod Phone +358 543 2222
Norway	Giftinformasjonen www.giftinfo.no Phone +47 22591300 *Note: Acute cases call 113*
Sweden	Giftinformation http://www.giftinformation.se/ Phone +46 (0)8 331231)

Nordic, national societies on mushrooms

Denmark	Danish Mycological Society www.svampe.dk
Finland	Mycological Society of Finland Suomen Sieniseura Ry, Unioninkatu 44 SF 00170, Helsinki 17, Finland http://www.funga.fi/
Island	The Icelandic Institute of Natural History Nátttúrufæðistofnun Íslands Urriðaholtsstræti 6–8 210 Garðabæ www.ni.is
Norway	Norwegian Association of Fungi and Useful Plants (Norges Sopp- og Nyttevekstforbund) http://www.soppognyttevekster.no/
Sweden	Sveriges Mykologisk Förening, Institutionen för växt- och miljövetenskaper Göteborgs universitet, Box 461 405 30 Göteborg, Sverige http://www.svampar.se/

Nordic Council of Ministers

Ved Stranden 18
DK-1061 Copenhagen K
www.norden.org

Mushrooms traded as food

Mushrooms recognised as edible have been collected and cultivated for many years. In the Nordic countries, the interest for eating mushrooms has increased.

In order to ensure that Nordic consumers will be supplied with safe and well characterised, edible mushrooms on the market, this publication aims at providing tools for the in-house control of actors producing and trading mushroom products.

The report is divided into two documents:

a. Volume I: “Mushrooms traded as food - Nordic questionnaire and guidance list for edible mushrooms suitable for commercial marketing
b. Volume II: Background information, with general information in section 1 and in section 2, risk assessments of more than 100 mushroom species

All mushrooms on the lists have been risk assessed regarding their safe use as food, in particular focusing on their potential content of inherent toxicants. The goal is food safety.

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