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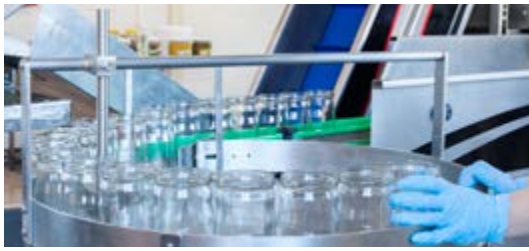

Reassessing the Risks Involved in Vegan and Vegetarian Food Production

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Are Vegetarian and Vegan Food Producers "Better" Risks?

The vegetarian and vegan food market is booming, leading to a proportionate growth in the number of production facilities around the world. It would be nice to think that such alternative food factories are less risky from a property underwriting point of view. However, the available data doesn't show a marked difference in risk profile.

The Federal Statistical Office of Germany reported an increase of 37% in the production of meat substitutes for the first quarter of 2020. Compared with meat products with an estimated value of EUR 40.1 billion, meat substitutes worth EUR 0.27 billion were sold in 2019.[1]

This nutritional trend is creating a market with enormous growth potential for many food companies.[2] The global vegetarian and vegan market's turnover currently stands at USD 14 billion, which represents just 1% of the global turnover of meat products. However, the share of vegetarian and vegan foods is expected to grow to USD140 billion by 2029. According to data from Statista based on the U.S. Census data and Simmons National Consumer Survey (NHCS), 79.82 million Americans used meat alternatives in 2020.[3]

In the future, the food industry will rely heavily on artificial meat. It is expected that artificial meat production will increase strongly. By 2040, the artificial meat market is expected to be worth USD 630 billion globally, representing a 60% share of the meat product food market.

This article will examine whether manufacturers of vegetarian and vegan foods have a lower fire risk.

Usually, people only differentiate between vegetarian and vegan nutrition. The main difference is that vegan food is produced completely without products from animals, while vegetarian food may contain certain products from living animals, namely milk, eggs, and even bee products such as honey.

Content

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Insurance Issues provides an in-depth look at timely and important topics on property/casualty insurance industry issues.

Forms of vegetarians/vegans

The exploration of vegetarian and vegan food should begin with a look at the innumerable different forms of vegetarians and vegans that exist. The wide spectrum of preferences represents a challenge for food (and ingredient) manufacturers who want to count vegetarians and vegans among their customers, e.g.,

- Flexitarians – Occasionally choose to forgo meat and other foodstuffs derived from animals.
- Semi-vegetarians – Eat a largely plant-based diet, occasionally containing meat, seafood and other animal products.
- Pescatarians – Eat a vegetarian diet that includes fish.
- Pollotarians – Eat a vegetarian diet that includes poultry.
- Ovo-lacto – A meat-free diet, including products from live animals such as milk, cream, cheese, eggs, and honey.
- Lacto-vegetarians – Eat a vegetarian diet that includes dairy but not eggs.
- Ovo-vegetarians – Eat a vegetarian diet without dairy products but include eggs.
- So-called "pudding vegetarians" – Largely eat processed foods or ready meals.
- Raw/Strict vegetarians – Only eat uncooked/non-processed foods, e.g., fruits, vegetables, nuts, seed fruits, as well as sprouted grains and legumes.
- Macrobiotic diet – Contains mainly cereals, legumes, vegetables, and small amounts of fruits, nuts, seeds, and fish.
- Vegans – Eat a plant-based diet that does not include any foods from animals (including fish, dairy products and honey).
- Fruitarians – Eat a plant-based diet consisting of products that do not damage the plant itself. This includes fruit, nuts and seeds. (Carrots are incompatible as eating them involves the destruction of the plant. Apples are included as eating them does not damage the apple tree itself).

These specifications apply to all ingredients (including additives, carriers, flavourings, and enzymes), but also processing aids used in production. A characteristic feature of meat substitute products is that the ingredients (namely meat and/or other components from the slaughtered animal such as offal and bacon) are replaced during production with soya or wheat protein or other vegetable foodstuffs. In the case of vegetarian products, milk and egg products are also used.

Essential products

The production of vegetarian and vegan food involves a wide range of raw materials:

- Soya (protein-rich legume)
  Soya is used in various processed forms for the production of meat substitutes. A distinction is made between:
  - > Soy meat (textured soy)
    Soya is ground, pressed in several steps, degreased, and ground. Spices are added and then processed in an extruder under high pressure and sometimes with heat to produce a meat-like shape and texture. Vegetarian burgers, meatballs, minced steaks, as well as other minced products are made from it.
  - > Soy protein concentrate/soy protein isolate
    Soluble fractions are removed by extraction from soya flakes using a water-alcohol mixture of around 60%, leaving behind the poorly soluble proteins. By adding alkaline agents, the proteins are precipitated, centrifuged, washed, and dried in a multi-stage process. A protein concentrate with a protein content of around 90 % is obtained.
- Wheat/Wheat protein
  Seitan (food product with meat-like consistency) is produced by washing out starch and bran from wheat flour, cooking the remaining gluten with soy sauce, seaweed, and ginger. In some cases, ready-made wheat protein powder (a gluten by-product of starch production) and seasoned dry mixes are also used. Seitan is used for processing cold cuts, roasts, sausages, etc.
- Soy/Lupine Beans
  The inoculation of steamed and peeled soy/lupine beans with a special fungus and fermentation produces firm tempeh, which can be processed into sausages, schnitzels and gyros.

- Molds (fermented mycelium)
  The product known under the trade name Quorn is based on mushroom cultures. Mycoproteins created through fermentation, are processed into meat-like products such as minced meat or vegetarian schnitzels (not vegan, as some contain chicken protein).
- Pea Protein
  This is widely used in the production of burgers. Other ingredients are water and colour additives to achieve a meat-like colour (e.g., beetroot juice or plant blood obtained by genetic manipulation - a liquid derived from soy and yeast). The pulp of peas obtained in this way is treated by coagulation of the protein, mechanical processing (kneading), heating, and cooling under high pressure (extrusion) to produce a fleshy texture.
- Egg white
  The egg white obtained from eggs is dried and used as a basis for emulsions.
- Almond, hemp, oat, rice, coconut, and soy milk are used as milk and cheese substitutes.
- Agar-Agar (gelatine substitute)
  The thickening agent is produced from the cell walls of some types of algae (galactose polymer, a polysaccharide that can form jelly).
- Artificial Meat
  Stem cells are taken from animals and propagated in a nutrient solution to form muscle cells. The result is lumps of meat that can be processed, minced, or formed. Their production is currently still relatively expensive and, therefore, not yet marketable. It's predicted that artificial meat will be sold on a larger scale in two to three years.

The food industry has high hopes for products that imitate meat (in terms of taste and texture or that completely replaces it all together) so they can target the large flexitarian market.

Vegetable protein, protein concentrate, or protein isolate are processed to produce these products. A very precise control of temperature and time during the processing is necessary to achieve the desired texture and plumpness. Other ingredients and steps include, starches and vegetable hydrocolloids added to bind water and vegetable fat (e.g., sunflower or coconut oil) and carob, guar gum (or xanthan), and carrageenan added to emulsify the water.

Other additives include flavoring and coloring ingredients, such as spices, salt, inosinate's, dextrose (and similar sugars), yeast, flavors, beetroot, currant juice (or anthocyanins), and beta-carotene. Furthermore, ascorbic acids or acerola cherry are often added for color retention and red colouring, e.g., mineral iron oxide. Other additives that are often found are flavor enhancers, preservatives, binders, vitamins, minerals, thickeners, texturizers, emulsifiers, lipids, raising agents, stabilizers, and other colorants.

Industrial-scale processing technologies

The manufacture of vegetarian and vegan food products requires extensive fine-tuning and high-performance equipment to reproduce the taste, texture, appearance, and cooking function of animal products on an industrial scale. In principle, the technologies used do not differ significantly from those used in the meat industry. The following technologies are commonly used:

- Cutters and similar machines to produce vegetable masses.
- Intensive mixers to combine structure-forming ingredients and other substances during the water phase, with the addition of vegetable fat, spices, and other additives.
- Vacuum filler to avoid air inclusions.
- Cooking and heating equipment to achieve the functionality of ingredients and additives plus microbiological safety.
- Extruders to produce fibrous soya meat or textured soya protein (isolated and defatted protein is broken down by twin screws under high pressure and temperatures, forming coarse-pored dry extrudates). Wet extruders are used to produce products with a less spongy microstructure.
- Additional plants and rooms that are prototypical or for cooling.
- Transport aids made of plastic.

Vegetarian or vegan food production processes can be described as follows:

- Physical-mechanical (for removal of dirt, crushing, enrichment, changing of texture).
  - > Mixing, kneading, foaming
  - > Crushing, e.g., cutting, chopping, grating, grinding, etc.
  - > Separation, e.g., by sieving, filtering
  - > Enriching
- Physical-thermal (for shelf life, destruction of toxic substances, digestibility, formation of aromatic substances, browning).
  - > Heating, e.g., roasting, cooking, pasteurizing, sterilizing, blanching
  - > Frying
  - > Smoking
  - > Cooling, freezing
  - > Drying, irradiation
  - > Distillation
- Biological (for conversion of substances for taste, smell, texture, enjoyment).
  - > Alcoholic fermentation
  - > lactic acid fermentation
  - > Acetic acid fermentation
- Chemical (for taste, texture, shelf life, color).
  - > Protein coagulation
  - > Addition of chemical food additives

Statistical damage experience

Statistics relating to the manufacturing food industry for vegetarian as well as vegan food are difficult to come by, making it hard to discuss the frequency and severity of material damage. However, as the buildings, mechanisms and technologies involved in the production of vegetarian and vegan food do not differ substantially from the traditional food industry, no major differences are to be expected.

Observable industry trends

Many of the large companies and corporations investing in the production of vegetarian and vegan food, sometimes do so at the same location as their traditional food products using the existing plant and machinery. According to their statements, strict separation is made to avoid the contamination of vegetarian or vegan food from those containing meat. .

Due to the increase in demand for alternative foods, smaller artisan and commercial enterprises are being replaced by larger companies and production facilities. This results in a higher degree of automation of production processes (although the production of alternative products is much more difficult to automate overall due to the enormous variety of recipes and the requirement to avoid animal ingredients) and a greater need for large warehouses, cold and deep-freeze stores.

Similar to traditional food production, alternative food production is also increasingly regulated, e.g., tightening of regulations for hygiene, production, packaging, etc. as well as trade restrictions, which lead to increased requirements and rising costs. Also, consumer awareness is increasing so the demand and expectation for new products are growing. As a consequence, one can expect that, similar to traditional food production, there will be no or low investment in preventive and averting fire and explosion protection measures, as they also entail a considerable cost burden.

Fire protection measures

In the food industry, buildings and facilities usually form a coherent complex. Therefore, there is a risk that in the event of a fire, fire and smoke could spread unhindered within the buildings and rooms and lead to a major loss. Companies that are geared towards the production of alternative foods have a similar configuration, as can be found, for example, when entering the addresses of these companies in the “Google Earth” application.

Looking at inspection reports, complex separations and fire compartments are usually not present or if they are,

their effectiveness is limited by breakthroughs that are not protected by fire protection technology.

If you look at fire damage in the food industry, similar causes always arise, regardless whether vegetarian, vegan, or meat-containing food is produced. Typical causes and increased extent of damage include:

- Human error during construction work, process defects in production facilities and equipment, e.g., deep-frying/smoking equipment, fans, electrical installations.
- Existing building structures and partition walls made of combustible materials/insulations due to necessary temperature and hygiene requirements (e.g., sandwich panels, insulation material made of polystyrene or polyurethane).
- High fire load due to organic foodstuffs, auxiliary materials (e.g., oils, fats), finished goods, packaging material, transport aids, and storage aids.
- High risk of ignition sources due to extensive electrical installations, high degree of automation as well as existing cooling, cooking, frying, baking, and smoking equipment in the production processes.
- Rapid-fire spread due to lack of structural subdivisions, high fire loads and insufficient preventive fire protection measures as well as large fire compartments with high-value loads. This also includes missing or insufficient fire-resistant separation of hazard-increasing facilities, e.g., smokehouse, cooking and frying, plants, thermal oil plants, and refrigeration compressor plants.
- Risk of explosion (e.g., due to flour and sugar dust, milk powder, and starch).
- High risk of smoke damage even in the case of small fires; even small damage to property can lead to sensitive interruptions in operation (e.g., by restoring hygiene requirements).
- Increasingly large cold storage and deep-freeze stores (concentration of values, fire load, fire hazards due to the cooling atmosphere).
- Low fire protection standard or lack of a risk-oriented fire protection concept (no sprinklers, no fire alarm system [BMA], no fire subdivisions, no programmed service, and maintenance).
- Difficulties for the fire department to fight a fire effectively (combustible building structures, missing or defective fire-technical subdivisions, high fire load, large extension of buildings, controlled burning, intrinsic safety).
- Low-risk awareness/misjudgement in the companies (e.g., the assumption that wet operations represent low risk).
- Limited possibilities of renovation of buildings and facilities due to hygiene regulations
- Additional requirements by authorities after a fire damage event with corresponding consequences for the interruption of operations.
- High Probable Maximum Loss/Maximum Foreseeable Loss (PML/MFL) (is usually 100% of the sums insured for business interruption).

It's my opinion that fire protection requirements are no different for the production of alternative food to those required for the traditional food industry.

Underwriting findings and recommendations

Given the development of losses in alternative food companies will not differ dramatically from those found in traditional food production, similar questions should be applied by the underwriter of such a risk.[4]

There are many reasons that support this proposition. For example, similar hygiene requirements mean that the fire load won't be reduced (use of combustible insulating materials in the building structure and partition walls, use of transport and storage aids, packaging material, etc.).

Also, processing procedures still require a large number of electrical and thermal systems, so that a large number of ignition sources are present in a plant. This also includes necessary repair and maintenance work.

Even relocating production after an incident could be problematic, since the production of alternative food requires considerable expertise and finely tuned production processes.

Looking ahead, the fast-growing market for alternative foods means that considerable changes in an insured business can be expected in the course of a year. Rising turnover, profit expectations, growing legal compliance, and consumer expectations could lead to more investment and expanded production. It follows that a regular adjustment of the sums insured, the scope of cover, and the insurance premium will be necessary.

Conclusion

The vegetarian and vegan food sector is set to keep on expanding. More food companies are producing alternative foods, attracted by healthy sales and profit expectations. However, actual profits will be reduced with an increasing number of producers and will have an impact on cost recovery. In addition, quality and hygiene requirements will continue to rise.

The industrial technologies and processes employed in the manufacture of alternative foods, as well as transport aids, packaging materials, and the like, do not differ significantly from those used in traditional food manufacture. The difference lies in the use of the ingredients. Therefore, significant changes are not expected in both the frequency and severity of material damage in the production of vegetarian and vegan food products, compared with the traditional food industry.

However, in the context of material damage, business interruption does represent a particular challenge. Product freshness (delivery and acceptance obligations) is crucial. Also, the relocation of production to other companies, e.g., contractors, is more complex and arguably more difficult to implement, due to a large number of recipes, the required quality of the products, and the necessary specialized knowledge.

As in the entire food industry, fire safety measures will only be encountered sporadically. When they are, improvements will undoubtedly be necessary since there is often an underdeveloped risk awareness and limited financial resources. It is to be expected that investments will tend to be made in new assets and tangible assets instead of fire prevention measures due to the dynamic market environment.

In addition, preventive construction measures (firewalls) are rarely feasible for reasons of process flow. Furthermore, building construction and partition walls can rarely be made of non-combustible materials due to hygiene regulations. Also, plant engineering protection measures, such as the installation of sprinkler systems, require considerable investment.

It is, therefore, highly questionable that the production of vegetarian and vegan food today should be viewed as lower risk by property underwriters active in the food industry.

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