Gelatin in Halal Food Production

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Gelatin is used in many food products, including jellies, ice cream, confectionery, cookies, and cakes. It is also used in non-food products, including medical products and in veterinary applications (Schrieber and Gareis, 2007). Gelatin can be from halal or haram sources. Common sources of gelatin are pigskin, cattle hides, cattle bones, and, less frequently, fish skins and poultry skins. In general, a product label does not indicate the source of the gelatin (Chaudry, 1994; Cheng et al., 2012; Hermanto and Fatimah, 2013; Jaswir et al., 2009), so halal consumers normally avoid products containing gelatin unless they are certified halal. As Muslim countries have increased imports of food products, there has been growing awareness of the problem gelatin presents to Muslim consumers (Hermanto and Fatimah, 2013; Widyaninggar et al., 2012).

Malaysia, Indonesia, and several other Muslim countries now require that imported as well domestic products containing gelatin be produced with halal gelatin. Several gelatin manufacturers in Europe, India, and Pakistan produce halal gelatin.

STATUS OF GELATIN IN ISLAM

Gelatin is an animal by-product, the partially hydrolyzed collagen tissue from various animal parts. Its halal status depends on the nature of raw materials used in its
manufacture (Widyaninggar et al., 2012). Most gelatin is one of two types: (1) Type A gelatin is exclusively made from pork skins, hence haram for Muslims to use. (2) Type B gelatin is made either from cattle and calf skins or from demineralized cattle bones. Cattle and calf skins used in gelatin manufacture are usually from animals slaughtered by non-Muslims. Whether this type of gelatin is permitted or prohibited for Muslims is controversial. However, gelatin made from the bones of halal-slaughtered cattle is available (Cheng et al., 2012). Fish-skin gelatin is halal as long as it is free from contamination from other sources and is made from a fish species that is accepted by the Muslims who use the product (Chapter 10) (Gómez et al., 2009; Karim and Bhat, 2009). A food processor understands that a non-specific gelatin is highly questionable regarding its source, and must be suspected of containing pork gelatin. So its use is very strongly discouraged for Muslims (Hermanto and Fatimah, 2013; Sakr, 1999; Widyaninggar et al., 2012).

**SOURCES OF GELATIN**

For gelatin from cattle skins, cattle bones, poultry skins, or other permitted animals to be halal, the animals have to be slaughtered according to Islamic requirements, as explained in Chapter 3. Again, the slaughter of the animals must be acceptable to the targeted Muslim consumers.

In modern slaughterhouses, bones are sold to rendering companies, which turn fresh bones into dry bone chip used for gelatin (Hermanto and Fatimah, 2013; Jaswir et al., 2009). However, in many Asian and African countries, bones are discarded as waste and are subject to a natural degreasing process by microbes and other organisms. Without going into details of the degreasing process, it suffices to say that when collecting and selecting the bones for food-grade or pharmaceutical-grade halal gelatin, bones must be examined and segregated into bones from halal species (if acceptable even if not slaughtered halal) and those from non-halal species, which cannot be used. Bones from animals that have died without being properly slaughtered or that were used for religious ceremonies are also prohibited. So bones collected from cattle that died naturally are not permitted (Cheng et al., 2012).

**PRODUCTION OF HALAL GELATIN**

Gelatin is derived from collagen, an insoluble fibrous protein that occurs in vertebrates and is the principal constituent of connective tissues and bones. Gelatin is recovered from collagen by hydrolysis. There are several varieties of gelatin, the composition of which depends on the source of collagen and the hydrolytic treatment used.

**PREPARATION OF GELATIN**

The principal raw materials used in halal gelatin production currently are cattle bones and cattle hides. Non-collagen substances such as minerals (in the case of bones) and fats and proteins (in the case of hides) are removed by various treatments to prepare collagen for extraction (Cheng et al., 2012).
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- **Bones**: Fresh bones, also called green bones, from the halal-slaughtered cattle are cleaned, degreased, dried, sorted, and crushed to a particle size of ca. 1 to 2 cm. The pieces of bone are then treated with dilute hydrochloric acid to remove mineral salts. The resulting sponge-like material is called ossein.

- **Hides**: Cattle hides from halal-slaughtered animals are received from the trimming operations of leather production. These are of concern because of the chemicals used. Therefore, hides dedicated for gelatin are preferred. The hide pieces are usually de-haired chemically with a lime and sulfide solution, followed by a mechanical loosening.

For the production of halal gelatin, both ossein and cattle hide pieces are subjected to lengthy treatment with an alkali, usually lime and water, at ambient temperature. Depending on previous treatment, the nature of the material, size of the pieces, and exact temperature, and liming usually takes 8 to 12 weeks. The material is then thoroughly washed with cold water to remove excess lime, its pH adjusted with acid, and extracted with hot water to recover the soluble gelatin (Tasara et al., 2005).

Dilute halal gelatin solutions from the various hot water extractions are filtered, deionized, and concentrated using cross-flow membrane filtration or vacuum evaporation, or both. The vacuum evaporator can be cleaned to permit it to be used for halal production while the membrane filters generally cannot be cleaned sufficiently to be used for both halal and non-halal production. Halal gelatin solutions are then chilled and either cut into ribbons or extruded as noodles, and the gelled material is deposited as a bed onto an endless, open-weave stainless steel belt. The belt is passed through a drying chamber. If this equipment has been used for non-halal gelatin, it will require an extensive and complicated cleaning. After drying, it is broken into pieces that are ground to the required particle size. Again the grinder requires cleaning if it was previously used for non-halal purposes (Tasara et al., 2005).

Where halal gelatin is not available, food manufacturers can use plant substitutes. However, currently gelatin is the only material that melts below body temperature and is reversible, that is, can be melted and gelled more than once at low temperatures, so the these substitutes are not a complete replacement. A process of gelation processing is shown in Figure 14.1

### VEGETABLE SUBSTITUTES FOR GELATIN

- **Agar**: Also called agar-agar, gelose, Chinese isinglass, Japanese isinglass, Bengal isinglass, or Ceylon isinglass.
- **Carrageenan**: A polysaccharide extracted from red seaweed.
- **Pectin**: A polysaccharide substance present in cell walls of all plants.
- **Xanthan gum**: A polysaccharide gum produced by bacteria. The bacterial medium must be halal for the product to be halal.
- **Modified corn starch**.
- **Cellulose gum**.
SOME PRODUCTS THAT USE HALAL GELATIN

GELATIN IN FOODS

Halal gelatin can be used for gelatin desserts; dairy products such as yogurt, sour cream, and cottage cheese; and other dairy and imitation dairy foods. It is also widely used in frozen desserts such as ice cream, cream pies, and cheesecakes. Gelatin is the primary ingredient in marshmallows. It is used in some other confections. In the meat industry,
Gelatin is used in luncheon meats, jellied beef, and corned beef loaves. Gelatin is also used as a processing aid in the food industry for the clarification of cider and fruit juices (Al-Mazeedi et al., 2013; Blech, 2008; Regenstein 2012; Regenstein et al., 2003).

HALAL GELATIN IN PHARMACEUTICALS AND COSMETICS

The major use of halal gelatin in the pharmaceutical industry is in the manufacture of capsules. Both soft and two-piece hard capsules as well as enteric capsules contain gelatin as the main ingredient.

Halal gelatin is also used in tablets, lozenges, and cough drops. It has been used for the external application of drugs to treat various skin disorders and as an adhesive to hold bandages and dressings together. Other pharmaceutical uses of gelatin include as a glycerinated base for suppositories and a carrier for certain dietary supplements.

Gelatin is frequently used in creams and wave-set lotions, and may be the protein used in “protein” shampoos and hair conditioners. The use of halal gelatin in any of these products will increase the market for these products in Muslim countries.

MEDICINAL, DIETETIC, AND THERAPEUTIC USES

Gelatin in various forms may be used by medical professionals as absorbable sponges to arrest hemorrhage and as a dusting powder for surgical gloves. Gelatin can be used in open wounds. Gelatin is an excellent dietetic and therapeutic agent for the prevention of obesity. Low-sugar gelatin desserts require more calories to digest than they contain. Gelatin (when properly supplemented) has been used as a protein food in malnutrition and infant feeding. Other therapeutic uses include treatment of digestive disorders, peptic ulcers, muscular disorders, and brittle fingernails. Gelatin is commonly used as a plasma extender for the treatment of shock. However, although not desirable, when these non-halal products are used in life-saving applications they are acceptable. But under less compelling circumstances, Muslim consumers may reject the product or treatment. Thus, pharmaceutical and drug industries should start using halal gelatin rather than just gelatin to cater to the Muslim market. Halal gelatin, which has the same functional properties as regular gelatin and might only be slightly more expensive, opens up many new markets.

CONTROL POINTS IN HALAL GELATIN PRODUCTION

The most important issue in producing halal gelatin is obtaining the proper raw materials. Because pigskins cannot be used for halal gelatin production, plants that manufacture pigskin gelatin should not be considered for halal production. Halal raw materials, both bones and hides, are a limiting factor; hence, gelatin companies have to work upstream with their suppliers through tanneries and bone mills, all the way to halal slaughterhouses. Figure 14.2 shows halal control points (HCPs) in gelation processing.

HCP1: RAW MATERIALS

All sources, hides, and bone chips should be approved and constantly monitored. Gelatin factories normally receive pieces of hide and bone chips. Gelatin
manufacturers must execute controls at their supplier’s plants to make sure raw materials are properly segregated throughout the entire process.

**HCP2: EQUIPMENT**

All equipment used in the production of halal gelatin must either be dedicated equipment or cleaned consistent with the halal requirements of the halal certifying agency. If cleaning is used, it must be fully documented.

**HCP3: CHEMICALS AND INGREDIENTS**

Although most of the chemicals and ingredients used in gelatin production are non-organic chemicals, the source and production of all of them must be determined to be sure they are made under conditions that do not compromise their halal status. This also covers all packaging material.
REFERENCES


Regenstein, J. M. (2012). The politics of religious slaughter-how science can be misused. In 65th Annual Reciprocal Meat Conference at North Dakota State University in Fargo, ND.


