REVIEW ARTICLE

Evaluation of Food Additives in Terms of Istihalah*

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Abstract

Some of food additives are obtained from animal sources. Resources of the food and the physical and chemical changing process in the production process determine their rulings in Islamic law. The substances obtained from non-halal (unlawful) sources may be considered halal (lawful) with the chemical changes causing a change in their properties that was undergone during the production is called istihalah. Physical changes do not cause to istihalah. In this article, the istihalah examples given in

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Islamic law are evaluated, interpreted and adapted to food additives. According to this, the following results were obtained: Every part of the swine is not allowed to use as a raw material in the production of food additives whether it was undergone to istihalah or not. Because everything belong to swine is accepted dirty (najis). Chemically, triglycerides are undergone istihalah if they are breakdown to glycerol and fatty acids. Proteins are undergone istihalah if they are totally breakdown to their amino acids. When glycerol, fatty acids and amino acids generated from these breakdowns are used to produce new substances, the new products are accepted as undergone to istihalah. Monoglycerides, diglycerides, phospholipids, nucleotides, gelatins and phosphatidic acids as metabolites are not accepted as undergone to istihalah. Because, they are not hydrolyzed to their subunits, so they do not lose their features. If these compounds are combined with new additives, the new component also are not accepted as undergone to istihalah.

Keywords: Istihalah, chemical changes, food additives.

1. Introduction

Most of the food additives are obtained from plants but some of them from animal sources (El-Samragy, 2016, pp. 239-240; Laganà et al., 2017; Kara&Bor, 2019, pp. 40-47). Depending on the animal source obtained, it may not be permissible to consume these additives. In addition, some plant and animal resources that are not permissible to be consumed may undergo chemical change (istihalah) and become permissible (*jaiz*) to be consumed. Alcohol and alcoholic products of plant origin are predominant for being unlawful (*haram*) and dirty (*najis*), similarly, other toxic, drugs and health-hazardous substances are prohibited. The transformation of alcohol, which is produced by using herbal sources and which is forbidden (*haram* to drink), to vinegar, (which is a halal foodstuff), is the most well-known example of istihalah. However, when it comes to animal resources; it should be noted in particular that the swine cannot be used as a raw material in the production of any food additives since everything from that is dirty (*najis*). Because such an idea means that it is appropriate to breed the pig and use its products, which are obtained by putting them in process of istihalah, in foods. However, the pig is a test of this ummah; it is unallowable to be used under any circumstances.

2. Istihalah and Food Additives

Istihalah as a term of Islamic law (*fiqh*), is the cleanliness of a dirty (*najis*) substance by changing its structure. In other words, it is the transformation of a substance from *haram* to *halal* through the change in its chemical structure and its feature. This may not always be the case. In some cases, it has been accepted that *haram* substances become *halal* after being processed with istihalah. Today, this issue comes up with food additives mostly obtained from animal sources (Okur, 2016, p. 674).

Today, some studies have identified istihalah with the chemical reaction resulting from the separation of matter from a compound or the addition of matter to an object. However, when we look at the examples given in the sources of classical Islamic law (*fiqh*), it is clear that not every chemical reaction can be considered a religiously viable istihalah activity. Because these transformations are in terms of quality change. In addition, for a valid istihalah, there are authors who require that the resulting substance should have been altered to the extent that it does not allow the determination of its source (el-Hatîb, 2003, pp. 183-233; Gündüz, 2009, p. 81; Jamaludin&Ramli, 2012, pp. 118-122; Çayıroğlu, 2013, pp. 209-212; Şenol, 2014, p. 115; Boran, 2016, pp. 157-158; Okur, 2016). In this article, it is stated that the product after istihalah should be completely different in quality from the substance before conversion; it has also been recognized that a valid istihalah can be achieved by a process by which a molecule is separated into its elements or chemical origins. In addition, some physical changes, such as evaporation, are counted as istihalah; emphasis was placed on changing properties.

The classical fiqh literature, the Hanafi jurists (*fuqaha*) focuses on two different changes in istihalah:

Changes of Chemical Structure: With such a change, the dirty (*najis*) substances become clean. Some examples of such processes are mentioned in classical sources of fiqh. For example, the conversion of wine into vinegar, pork or donkey being completely decomposed or disappeared in salt in the lake, the burning of the fertilizer into ash, the conversion of olive oil which became dirty by a substance falling into it, into soap are among the examples given frequently. In such cases, the substances that have emerged as a result of istihalah have gained a completely different nature so they became clean in Islam (Okur, 2016; Şimşek, 2019). These transformations can be explained by events such as physical changes, chemical destruction, synthesis, oxidation and reduction.

Change of Attribute: This type of change does not make the substance, which is dirty (*najis*) in religion, clean. Because there is no structural change. For example, the transformation of grape juice into molasses, sesame seeds into sesame butter by grinding, wheat into flour, flour into bread and milk into cheese, are such cases that there is a change of attribute, not a chemical change of structure (Okur, 2016; Şimşek, 2019). These cases can be defined as physical change.

Academicians specializing in fiqh and science took part in the execution of these studies and in decision-making. Based on the data to be revealed by the positive sciences based on these examples, determining which kind of transformations are structural (chemical) and which are attributive (physical) and basing the distinction upon a scientific foundation is emphasized. In this article, the scientific explanations and determinations made by the scientific committee mentioned are summarized below. Firstly, the information about food additives of animal origin and then the examples of istihalah in Islamic law (*fiqh*) are given. The jurisprudence provisions are detailed in terms of additives and their sources and evaluated in terms of the phenomenon of istihalah.

2.1. Animal Sources from which Food Additives are Obtained

It is possible to group the animal sources from which food additives are obtained and the additives produced into two groups:

First Group: The animal sources whose content is accurately known:

In this group, the sources and the additives obtained are:

- Honey combs: Wax (E901) is obtained.
- *Dactylopius coccus* Costa, an insect species: Carminic acid (E120) is obtained.
- Lactose which is milk sugar: Lactitol (E966) is obtained.
- The white of chicken egg: Lysozyme (E1105) is obtained.
- The secretion of *Laccifer lacca*, an insect species: Shellac (E904) is obtained.

The additives listed in this group are not included in this article. There is no legal (fiqhi) problem in the consumption of Wax (E901), Lactitol (E966) and Lysozyme (E1105) when their sources are halal. However, Carminic acid (E120) and Shellac (E904) are controversial. Based on the ijtihad of the Maliki sect Carminic acid (E120) legally (fiqhi) approved. Shellac (E904) is obtained from a secretion of the insect rather than directly from itself. Therefore, it might be considered permissible by comparing with the honey which is a kind of secretion of bee that is also kind of insect.

Second Group: The animal sources whose content is not accurately known:

The Animal sources in this group are as follows: Pig, cattle and sheep, poultry and fish. The tissues of these animals such as meat, bone, skin, fat and blood, and their hair can be used in the production of some additives. The additives in this group can be obtained from plant sources as well as from animal sources. Some of them may also be synthetically produced by microbial biotechnology (fermentation)

or by synthesis. The additives that can be obtained from these animal sources can be sorted and grouped as follows;

2.2. Food Additives from Animal Sources

Considering the production processes of animal-based additives, they can be evaluated in two groups. These can be summarized as those obtained by the breakdown of large molecules and those of the breakdown products used in the synthesis of other molecules.

The Ones Obtained by Disintegration of Large Molecules

This group is produced by breaking down and separating high molecular weight compounds into their base units by acid, base or enzymatic pathways. To give example:

- The ones obtained by animal fats: Monoglyceride, diglyceride, glycerol, and fatty acids.
- The ones obtained from various tissues of animals: Lecithin (Phospholipid) (JECFA, 1993).
- The ones obtained from animal skin and bones: Collagen → Gelatin.
  The ones obtained from Gelatin which is obtained from animals' skin and bones: Glycine (NIIR Board of Consultants & Engineers, 2005).
- The ones obtained from hair of animals: L-cysteine (NIIR Board of Consultants & Engineers, 2005).

The Ones Obtained from Large Molecules and Used in the Synthesis of Another Molecule

These are synthetic products obtained by reacting pure chemical compounds separated after destruction with different compounds. For example;

- The ones produced using fatty acids from animal fats: e.g, stearate and Sorbitan monostearate.
- The ones produced using monoglycerides or diglycerides derived from animal fats: For example: acetic acid esters of mono and diglycerides of fatty acids, lactic acid esters of mono and diglycerides of fatty acids (JECFA, 1973).
- The ones produced using phosphatidic acid from various tissues of animals: For example: Ammonium phosphatides (JECFA, 2000).
- The ones produced using glycerol from animal fats: For example: Glyceryl diacetate (diacetin), Glycerol esters of wood resin.
- The ones obtained from animal sources and converted into salts of that molecule, for example: Fatty acids → Magnesium salt of fatty acids

2.3. Examples of Istihalah in Islamic Law

The examples in fiqh sources related to istihalah are generally:

- If the wheat poured into the wine is not yet swollen, it is clean by washing it three times. However, it should be dried every time. As a result, if the taste, color and smell of the wine is absent, wheat is considered clean.
- If the alcohol is poured into flour to make a dough, it will not be cleaned by washing. However, when vinegar is poured into the dough and mixed again and the color, smell, and taste of alcohol becomes absent, the dough is now considered clean.
- If the soup is poured with alcohol then vinegar is added to it, if the soup is like vinegar in sourness, it becomes clean.

- If the pig or donkey fell into the salt lake and became salt there, according to Abu Hanifa and Imam Muhammad, this salt would be clean. Imam Abu Yusuf has the opposite opinion in Hanafi fiqh.
- If the blood of the musk reindeer turns into musk, they are cleaned.
- When a pile of fertilizer becomes soil when the dung is burnt out, when dirty soil is turned upside down, and when a bar of soap is made out of a *najis* (dirty) olive oil, they are all considered clean.
- If a lamb drinks donkey milk, pork milk or a *najis* (dirty) liquid or wine, the lamb's meat is not unlawful (*haram*). Because that dirty liquid is disturbed and destroyed in the living organism. (For examples look at (Es-Semerkandi, 1998, p. 222; Ibn Rushd, 1988, I, p. 155; *el-Fetâvâ'l-Hindiyye*, 1991, I, pp. 42-45, V, pp. 339; Bilmen, 1986, p. 59; Okur, 2009, pp. 36-39).

In fiqh collections, factors that make the (istihalah) possible include:

- Burning or combustion (Complete oxidation): Istihalah is achieved by burning something which is *najis* (dirty) until it becomes ash. For example, the burning of a piece of *najis* (dirty) wood, dung or waste.
- Falling into another substance and becoming a part of that substance and transforming into it.
- Petrification (Mineralisation): The mineralization (ie become soil) of an animal, who died spontaneously, over a long period of time with the natural effects.
- Self-conversion: The fermentation of grapes and some other juices into intoxicating substances (wine), followed by a different fermentation of wine an transformation into vinegar (İbn Ābidīn, 2003, pp. 519-520, 534; Bilmen, 1986, pp. 57-60).

In the sources, the examples of istihalah that cannot cleanse the najis, are*:*

a) A must or wine is not cleaned by making vinegar after any scum falls into and dissolves in it. It is also the same when a mouse falls into them.
b) Again, it is not clean by making cheese out of dirty milk, or by grinding dirty wheat or making bread from its flour and obtaining oil from dirty sesame. Because there is no change of chemical state (İbn Ābidīn, 2003, I, pp. 519-520, 534; Bilmen, 1986, pp. 57-60).

The following cases cannot be included in the istihalah provision:

a) Roasting on the fire
b) Grind and disintegrate
c) Change of structure. For example, making dough from flour.
d) Change of place. For example, the name changes due to the change of place (İbn Ābidīn, 2003, I, pp. 519-520, 534; Bilmen, 1986, pp. 57-60).

Evaporation, which is a physical event, was concluded by the scientific committee that it is a halal and clean process for water, which might be another example of istihalah. But the vapor of toxic material is toxic again after the evaporation and recondensation, like industrial acid rains that is forbidden to use. Also, vapor of the alcohol is also intoxicating alcohol, so it is not istihalah again.

3. General Evaluation

In this section, by examining the above-mentioned examples; The main idea in provisions of fiqh in decision-making will be examined according to scientific data and their istihalah states in terms of food additives will be discussed.

When a substance is decomposed into small pieces that form it and a new substance is obtained from these small pieces, both the small pieces formed, and the new substances formed by using these pieces

are considered to have undergone istihalah. What is decisive here is *the extent to which the fragmentation* occurs.

The food additives of animal origin which are evaluated are also obtained by the breakdown of large molecules and/or the use of broken products. When we look at these fragmentations closely, there are three levels of fragmentation. The disintegration products of these three levels of basic components are given in *Figure 1*.

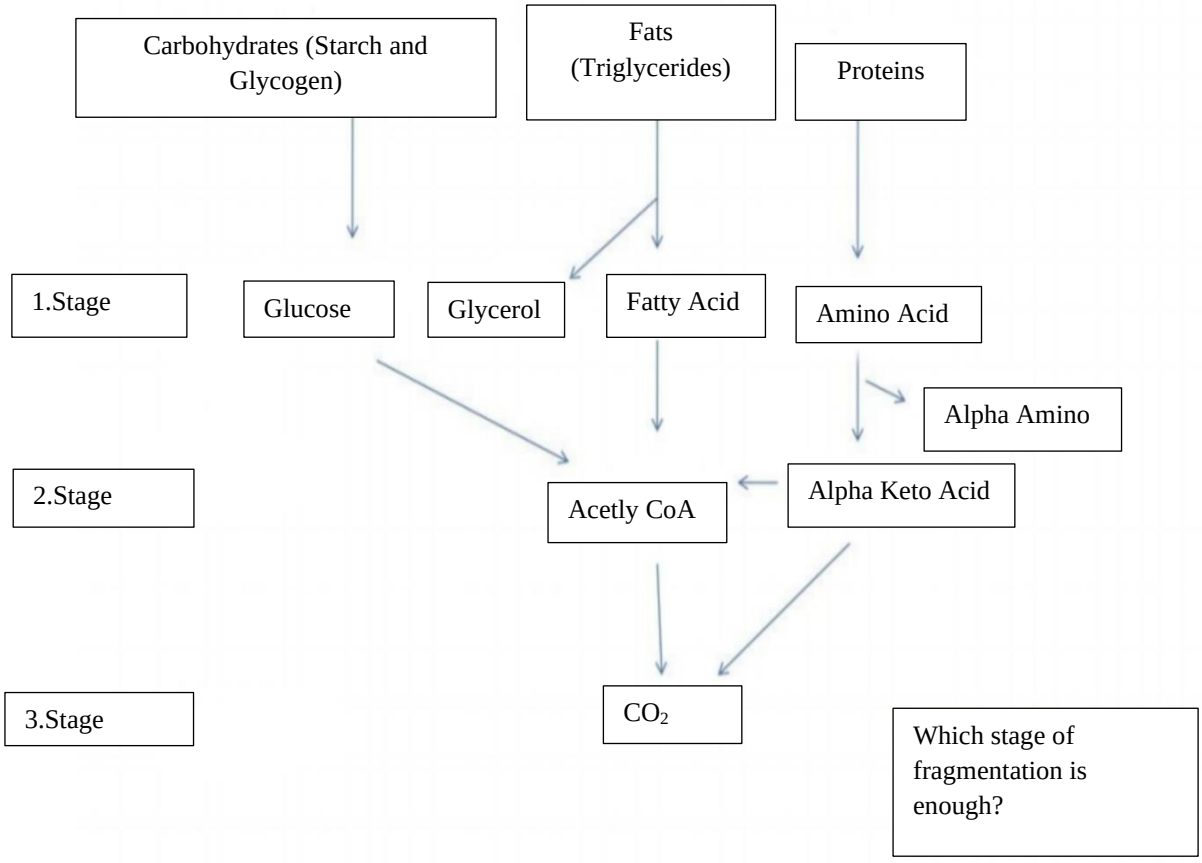

Figure 1. Products of Three Basic Food Components of Organic Substances Formed at Three Levels of Decomposition (Murray et al., 2019, pp. 129-140).

While examining the istihalah examples given in fiqh sources, we will examine the chemical changes they have undergone. However, it may be misleading to approach only by considering changes in chemical formulas. Because, while giving examples in classical fiqh literature, chemical formulas are not known or taken into account. It is important to understand the purpose for which the samples are given. In our opinion, *the important* thing is that *the feature changes*. First of all, it is important to note that some of the examples in the classical literature do not conform the currently available information. For example;

- From the istihalah examples, the information that the pig or donkey falls into salt lake and becomes a salt there, and that fish and salt are thrown into the wine to make jams is hypothetical and does not exist. That means “suppose that a donkey falls into a salt lake and becomes a salt”. Indeed, it does not contain any information as to whether this will be the case. Especially in the Hanafi fiqh literature, it is known that such hypothetical examples are mentioned in order to

give fiqh proficiency to those studying fiqh. As mentioned above, the main emphasis is on changes in such examples. Donkey meat does not become salt in salt lake, or jam does not turn into wine by throwing salt and fish into it; however, assuming this is the case, the conversion of meat into salt, and the conversion of wine into jam, is considered istihalah.

- In the case of wine conversion to vinegar, the ethyl alcohol in the wine is oxidized to acetic acid and vinegar is formed. In this example, we do not need to evaluate the ethyl alcohol and acetic acid molecules and the differences between these molecules. It is important to note that the intoxicating properties of the substance have changed. The intoxicating ethyl alcohol has been converted into nonintoxicating acetic acid, which is a nutrient as well, by a chemical reaction, small amounts of residual alcohol were not taken into account. What kind of change on the molecule was not seen as important, the malady was taken into consideration.
- There is no change in the examples of pouring liquor into flour and soup then adding vinegar to them. Since the conversion elements are not active in the environment, the liquor does not convert to vinegar, i.e. ethyl alcohol to acetic acid. Features such as color, smell, and taste arising from the liquor in the dough or soup are no longer dominant and the features of the vinegar become dominant. Therefore, despite the absence of any chemical transformation in these two examples, the provision has changed since the dominant or felt characteristic changes. This issue is probably more concerned with the issue of istihalah rather than the istihalah.
- The petrification (i.e. becoming soil by mineralization) of an animal, who died spontaneously, over a long period of time with the natural effects; the conversion of the blood of the musk reindeer into musk by a metabolic pathway, are examples which require fragmentation up to levels 2 and 3. The example of combustion of a substance until it becomes ash (when dung is burnt out) requires fragmentation up to level 3. The conversion of the oil into soap also requires a fragmentation up to level 1 and requires a new reaction of the parts (*Figure 1*).
- The expression "falling into another substance and becoming a part of that substance and turning into that substance" in the fiqh works is a general expression. It is difficult to comment on it as it is not exemplified. However, depending on the nature of the substance to be formed, a fragmentation at the 2nd or 3rd level may be required, at least at the 1st level. Looking at this situation from a scientific point of view; salty settings, brine or folding in salt are a form of storage. The idea of decomposition of organic material can be misleading. This provision may have been made within the concept of consumption (*Figure 1*).
- It is accepted that there is no change of chemical state, i.e., no istihalah, in the transformation of dirty milk into cheese. The main changes in milk to cheese is that the proteins in milk are denatured. In this process, proteins lose their three-dimensional structure, long polypeptide chains are cut from some places and turn into smaller polypeptides. Here, since at least some of the polypeptides are not broken down into amino acids, amino acid strings are conserved in these polypeptides. Therefore, even up to level 1, a fragmentation does not occur. While the casein retains its original form as caseinate by precipitation and maturation processes, other components can only be partially broken down (*Figure 1*).

As can be seen in the examples, it is not possible to find a change formula that can be adapted to all examples.

- As in the example of pouring alcohol into the soup, there are examples where there is no change, as well as in cases where fragmentation occurs in all three levels, such as mineralization in the soil and metabolic transformation in living things. Therefore, although we take into account the level of fragmentation when evaluating in terms of istihalah, the main decision-making point will be the change of the feature.

- As seen in the example of lamb fed with dirty food, it is accepted that a dirty food consumed is cleaned by going through istihalah while being absorbed from the intestines. Based on this rule, we can see the level of disintegration small enough to be absorbed from our intestines as one of the necessary conditions for the istihalah. To what level is there fragmentation in this acceptance?

In the digestive system, proteins are digested and broken down into amino acids that are absorbed from the intestines and passed into the blood. Triglycerides (oils and fats) are broken down into approximately 78% monoglycerides and two fatty acids and 22% glycerol and three fatty acids and absorbed from the intestines (Dodwell, et al., 2019, p. 552). In order for phospholipids to be absorbed, they must first separate the two fatty acids in their structure, and then undergo further destruction (Harvey & Champe, 2007, p. 173). From the nucleotides, phosphates are first absorbed by being removed. Nucleosides, which are formed by the breaking of phosphate from the nucleotides, are absorbed either in this state or separated into ribose and bases (Harvey & Champe, 2007, p. 296).

According to these examples, we can say that:

Up to amino acids in proteins; up to fatty acids and glycerol in triglycerides; up to fatty acids, glycerol, phosphate and side groups in phospholipids; In nucleotides, phosphate, ribose and bases are sufficient for absorption.

Can this level of fragmentation be considered a limit for istihalah? If we accept the fragmentation that is enough to be absorbed from the intestines as a limit for istihalah, do the properties change here? Let's consider each group of items for the answer to this question:

Proteins are broken down to amino acids. These amino acids do not show the properties of proteins. Different proteins can be synthesized using amino acids that result from the breakdown of proteins. Amino acids are not specific to a particular animal or human. The same amino acid can be found in plants, animals and humans as the basic building block. For example, the amino acid glycine cannot be called a plant, human or animal amino acid. Because they are all the same as a chemical structure. However, the collagen proteins from which glycine preparations are obtained differ in every living thing. By analyzing a collagen molecule, it can be determined from which animal source it comes from.

Triglycerides are broken down into fatty acids and glycerol. Fatty acids and glycerol are not molecules specific to living species. Plant, animal or human glycerol is the same molecule. Fatty acids are the same. Today it is not possible to determine the source of a glycerol or a fatty acid if they are in its pure form.

Phospholipids also break down to fatty acids, phosphate and glycerol. If they are in pure form, as in triglycerides, it is not possible to determine from which animal source the fatty acids, glycerol and phosphate produced by the breakdown of phospholipids are obtained. Because they are all the same molecule.

Nucleotides must be broken down to phosphate, ribose and bases in order to be absorbed. The source of pure ribose, phosphate or bases cannot be determined. The molecules in all animals are the same molecules.

As we have seen, if we assume the level of absorption from the intestines a limit for istihalah (the condition of the monoglycerides is further evaluated below), the parts do not represent the whole. In other words, large molecules are divided into basic building blocks. Other molecules can be synthesized with these building blocks.

4. Istihalah and Food Additives

If the 1st level of degradation is considered to be sufficient for istihalah, the food additives that have not undergone istihalah that can be classified as follows:

4.1. Materials that have Undergone Istihalah

4.1.1. Fragmentation products of large molecules.

Fragmentation products of triglycerides and proteins: The food additives in this group are obtained by breaking down large molecules into small enough subunits to be absorbed from the intestine. The fragmentation products of triglycerides are fatty acids and glycerol, and the fragmentation products of proteins are amino acids. The additives in this group that can be used directly in foods are: *Glycerol, Fatty acids, Amino acids.*

4.1.2. Synthesis products produced using the products produced by the breakdown of large molecules.

Additives in which fatty acids are used: The food additives in this group are obtained by the fatty acids released by the breakdown of triglycerides, by combining with another molecule to form a new molecule. Since fatty acids are molecules small enough to be absorbed from the intestines, they are considered to have undergone istihalah. The new synthesis molecule formed by the combination of a molecule that had undergone istihalah and another substance is also considered to have undergone istihalah.

Examples of these additives are: *Magnesium salts of fatty acids, Calcium stearol-2-lactilate, etc.*

Additives in which glycerol is used: The food additives in this group are obtained by the breakdown of triglycerides and glycerol, an alcohol type, combined with another molecule to form a new molecule. Since glycerol is a molecule small enough to be absorbed from the intestines, it is considered to have undergone istihalah. The new synthesis molecule formed by the combination of a molecule that had undergone istihalah and another substance is also considered to have undergone istihalah.

Examples of these additives are: *Glycerol esters of wood resin, diacetin (glyceryl diacetate).*

Additives in which amino acids are used: The food additives in this group are obtained by the amino acids released by the breakdown of proteins, by combining with another substance to form a new molecule. Since amino acids are molecules that small enough to be absorbed from the intestines, but they are considered to have undergone istihalah. The new synthesis molecule formed by the combination of a molecule that had undergone istihalah and another substance is also considered to have undergone istihalah.

Examples of these additives are: *Sodium salt of glycine (glycine and sodium salt).*

4.2. Materials that does not Undergo Istihalah

4.2.1. Large molecules or their fragmentation products.

Food additives in this group remain as large molecules or, although partially fragmentize, they do not fragmentize enough to be absorbed from the intestines.

Additives in this group are: *Monoglyceride, Diglyceride, Lecithin (Phospholipid), Gelâtin, Guanilic acid (GMP), Inosinic acid (IMP).*

Triglycerides: Triglycerides turn into diglyceres when one fatty acid is separated from it and monoglycerides when two fatty acids are separated. Diglyceride cannot be absorbed from the intestine. Monoglyceride can be absorbed from the intestine. Although monoglycerides can be absorbed from the

intestine, it has been assumed that they do not undergo istihalah. Because the main determining factor for the realization of the istihalah is the *change of the feature*. We think that the breakdown of triglycerides up to monoglycerides in the intestines will not be sufficient for istihalah. For example, since the proteins are broken down to amino acids, the protein feature is lost. Phospholipids and nucleotides also lose their properties when they break down into their constituent elements. We think that although approximately ¾ of the monoglycerides that are produced by the breakdown of triglycerides can be absorbed from the intestine, similar to triglyceride and diglyceride they still retain their fat properties. In addition, approximately ¼ of the monoglycerides, which are produced by the breakdown of triglycerides, are absorbed by being broken down into glycerol and fatty acid. In addition, when considering the metabolism of fats in the body that is synthesis, and degradation, the idea outweighs that the level of breakdown of triglycerides to fatty acid and glycerol rather than to monoglycerides is more suitable for istihalah.

Phospholipids: Phospholipids need to be broken down in order to be absorbed from the intestine.

Gelatin: Gelatin is derived from collagen protein. Although it loses some amino acid and carbohydrate structures during the production phase, it largely protects the amino acid sequence of collagen. It needs to be broken down to amino acids in order to be absorbed from the intestines. It is useful to remind one point about the gelatin. Gelatin is not considered a food additive according to the Turkish Food Codex but is considered a food ingredient. So, there is no E number.

Nucleotides: GMP and IMP, which are in the structure of nucleotides, need to be broken down in order to be absorbed from the intestine.

4.2.2. The ones produced by using products produced by the breakdown of large molecules.

Additives in which monoglycerides and diglycerides are used: The food additives in this group are obtained by diglyceride, a molecule that cannot be absorbed from the intestine, which is formed when triglycerides lose one fatty acid and by monoglyceride which is formed when triglycerides lose two fatty acids, combining with another molecule to form a new molecule. Since Monoglyceride and Diglyceride are considered to have not undergone istihalah, the additives in this group obtained from a molecule that did not undergo istihalah are also accepted to have not undergone istihalah.

Examples of these additives are: *tartaric acid esters of mono and diglycerides of fatty acids, lactic acid esters of mono and diglycerides of fatty acids.*

Additives in which phosphatidic acid is used: Additives in this group are obtained by combining phosphatidic acid with another molecule. Phosphatidic acid is a molecule derived from fats and is too large to be absorbed from the intestines. It needs to be broken down in order to be absorbed. Therefore, it has been accepted that it has not undergone istihalah. Since Phosphatidic Acid is considered to have not undergone istihalah, the additives in this group obtained from a molecule that did not undergo istihalah are also accepted to have not undergone istihalah.

An example of these additives is: *Ammonium phosphatides*.

Additives in which nucleotides are used: Additives in this group are obtained by combining nucleotides with another molecule. Nucleotides need to be broken down in order to be absorbed from the intestines. Therefore, they have been accepted that they have not undergone istihalah. Since Nucleotides are considered to have not undergone istihalah, the additives in this group obtained from a molecule that did not undergo istihalah are also accepted to have not undergone istihalah.

Examples of these additives are: *Dipotassium guanylate, Calcium inosinate.*

Enzymes used in cheese making: Enzymes are protein. They act as a catalyst in the coagulation of cheese. Coagulation is a physical change. The enzymes used do not undergo istihalah since the cheese does not completely break down into amino acids. This approach is compatible with the approach of no change of state in the conversion of dirty milk into cheese.

5. Conclusion

In order for a food to be absorbed from the human intestines, level 1 fragmentation is needed (*Figure 1*). It is considered that the fragmentation products at this level do not have the characteristics of the parent molecule.

The istihalah must be taken place before the foodstuff reaches to the mouth. If it can be ensured that the digestion process, which is meant to be expressed here, in order to absorb the food from the intestines, can be realized in the laboratory or production environment, the products obtained can be considered to have undergone istihalah.

In addition, the degree of purity of the additives obtained should also be taken into account. For example, if glycerol was obtained as the degradation product of triglyceride, this product has theoretically undergone istihalah. However, commercially, this product may contain monoglycerides or diglycerides, or even triglycerides, which are considered not had undergone to istihalah to a certain extent. Therefore, the subject should be evaluated separately.

In particular, it should be noted again that it does not matter whether an additive obtained from the pig has undergone istihalah or not, it is not halal. Since pig's everything is *najis*, it cannot be used as a raw material in food additive production and processing.

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