INTRODUCTION

The safety or risk evaluation of food additives, residues of pesticides and veterinary drugs, and food contaminants is based on hazard identification, hazard characterization and assessment of exposure (Kuiper et al., 2001). FAO/WHO and the International Program on Chemical Safety (IPCS) have developed strategies for the safety evaluation of these types of chemicals which may be present in food (WHO, 1987; WHO, 1990). The concept of food safety excluded elements of nutrition, such as: anti-nutrients, toxicants, contaminants and other potentially dangerous elements (dioxin, E.coli) components that are known risk factors for certain chronic diseases (FAO, 2005c) and nutrients in the form of additives, functional foods and supplements. After that, requests have been made at international forums to include these elements in risk and safety activities (FAO/WHO, 2006; Burlingame B., 2001b).

Within the EU, food additives are divided into many functional classes, depending on their function in food: sweeteners, colorants, preserving agents, antioxidants, carriers, acids, acidity regulators, anticaking agents, antifoaming agents, bulking agents, emulsifiers, emulsifying salts, firming agents, flavor enhancers, foaming agents, gelling agents, glazing agents, humectants, modified starches, packaging gases, propellants, raising agents, sequestrants, stabilizers, thickeners, and flour treatment agents (Council Regulation (EC) 1333/2008).

The Codex Alimentarius defines a food additive as "any substance not normally consumed as a food itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a..."
technological (including organoleptic) purpose in the manufacture, processing, preparation treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result, (directly or indirectly) in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods. The term does not include contaminants, or substances added to food for maintaining or improving nutritional qualities, or sodium chloride” (Codex Alimentarius; Motarjemi et al., 2014; Carocho et al., 2015).

Since 2010, European Commission Regulation and EFSA have started a program to re-evaluate all the existing approved food additives (Carocho et al., 2014). The 1st evaluation includes colorants and preservatives (including antimicrobials and antioxidants), which has to be concluded before 2015. The 2nd group to be evaluated, comprising texturizing agents (including emulsifiers, stabilizers and gelling agents) by 2018, and the last group, sweeteners, to be revised until 2020 (Lodi et al., 2011).

Other research demonstrated that factors such as whether the risk is perceived to be involuntary, unnatural or potentially catastrophic, and whether the risk may affect health rather than the environment, drive public risk perception (Gaskell, 2005; Siegrist et al., 2007b; Rollin et al., 2011). Acceptance of a technology is also partly driven by perception of the potential benefits (Ronteltap et al., 2007). A lack of perceived benefits leads the majority of people to question the need for, and usefulness of, novel food technologies, and may even accentuate perceived risks and moral concerns (Gaskell, 2005).

Despite the various classes of additives, Carocho et al. mentioned in 2014 that the additives can be divided in four fundamental groups with regard to their origin and manufacture: natural additives (obtained directly from animals and plants); similar to natural additives (produced synthetically imitating natural ones); modified from natural (natural additives that are then modified chemically) and finally artificial additives (synthetic compounds).

This bibliographic study aims to present a brief review of the most important scientific findings and research regarding risks and benefits of certain classes of food additives.

**PRESERVATIVES**

European Food Safety Authority (EFSA) has issued a scientific opinion on the safety of: ascorbyl palmitate (E304), tocopherol-rich extract (E306), α-tocopherol (E307), γ-tocopherol (E308), δ-tocopherol (E309), lecithins (E322), when used as food additive for some food categories like infants below 16 weeks of age, and now the European Commission has asked EFSA to re-evaluate these additives. The E numbers of the preservatives range from E200 to E399. The antimicrobials are added to food for two purposes: to control natural spoilage of food and/or to avoid/control contamination by microorganisms, including pathogenic ones (of food safety concern) (Tajkarimi et al., 2010). Among the most used antimicrobial additives are benzoic acid and benzoates (E210-E219; ADI 5 mg/kg bw), sorbic acid and sorbates (E200-E209; ADI 25 mg/kg bw); propionic acid and propionates (E280-E289; quantum satis), nitrates (potassium nitrite E249; ADI 0.07 mg/kg bw, sodium nitrate E250; ADI 0.1 mg/kg bw), nitrites (sodium nitrate E251 and potassium nitrate E252; both with ADI 3.7 mg/kg bw), and parabens (E214-E219; ADI 10 mg/kg bw) table 1 (Carocho et al., 2014).

Nitrites and nitrates are widely used as preservatives in processed meats (eg. frankfurters, salami). These agents have not been associated with hypersensitivity reactions, but can provoke vascular headache; their metabolic products (nitrosamines) are known carcinogens (Simon, 2003).

Sodium benzoate is a closely related substance and may cross-react with other parabens. There has been only one subject reported in the medical literature to be benzoate sensitive, in a double-blind, placebo-controlled study of additive-provoked asthma (Flynn et al., 1992); this patient was not aspirin-sensitive and did not experience amelioration of asthma symptoms while on a benzoate-free diet (Simon, 2003).

Benzoic acid produced by oxidation of toluene, is a widespread antimicrobial agent, employed against yeast, bacteria and fungi. It acts through membrane disruption and inhibition of metabolic reactions, stress and accumulation of toxic aninons inside the microbial cell (Brul and Coote, 1999; Carocho et al., 2014).

Some in vitro studies have related the conjugated double bonds present in sorbic acid’s structure as being prone to nucleophilic attack, turning
it into mutagenic compound. The interaction between sorbic acid and various amines was tested by Ferrand et al. (2000) for mutagenic and genotoxic activities on HeLa cells and plasmid DNA, resulting in negative values, while another study found sodium sorbate toxic toward human peripheral blood lymphocytes at 400 and 800 µg/ml (Mamur et al., 2012)

There are not many studies regarding the toxicity of propionic acids or its salts, (sodium propionate, E281), calcium propionate (E282) and potassium propionate (E283), although it has been considered to suppress, in a dose-dependent manner, Th1-type immune response in human peripheral blood mononuclear cells in vitro. Sodium propionate has been stated as inducing abnormalities on the root tips of onion, while calcium propionate has been related to irritability, restlessness, inattention, and sleep disturbance in some children (Dengate and Ruben, 2002; Turkoglu, 2008; Maier et al., 2010; Carocho et al., 2014).

Table 1. Antimicrobial food additives with their ADI quantities (mg/kg bw) (Carocho et al., 2014)

<table>
<thead>
<tr>
<th>Name</th>
<th>E number</th>
<th>ADI</th>
<th>Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzoic acid</td>
<td>E210</td>
<td>5 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.184.1021 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sodium benzoate</td>
<td>E211</td>
<td>5 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.184.1733 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Ethyl-p-hydroxybenzoate (paraben)</td>
<td>E214</td>
<td>10 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.175.105 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sodium ethyl p-hydroxybenzoate (parabens)</td>
<td>E215</td>
<td>10 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.175.105 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Methyl p-hydroxybenzoate (parabens)</td>
<td>E218</td>
<td>10 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.150.141 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sodium methyl p-hydroxybenzoate (paraben)</td>
<td>E219</td>
<td>10 mg/kg bw</td>
<td>Banned in the United States EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sorbic acid</td>
<td>E200</td>
<td>25 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.182.3089 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sodium sorbate</td>
<td>E201</td>
<td>25 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.182.3089 Not approved in the EU</td>
</tr>
<tr>
<td>Potassium sorbate</td>
<td>E202</td>
<td>25 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.182.3640 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sulfites</td>
<td>E220-E228</td>
<td>0.7 mg/kg</td>
<td>Code of Federal Regulations 21 Sec.182.3616, 3637, 3739, 3766, 3798 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Potassium nitrite</td>
<td>E249</td>
<td>0.7 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.172.160 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sodium nitrate</td>
<td>E250</td>
<td>0.1 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.172.175 EU Regulation No. 1129/2011</td>
</tr>
</tbody>
</table>

Note: ADI=acceptable daily intake
It has recently been determined that phosphate additives in food may harm the health of persons with normal renal function (Sullivan et al., 2009). This judgment has been made on the basis of large-scale epidemiological studies and is supported by the latest findings of basic research. It was first recognized in patients with renal disease that a high serum phosphate concentration is a major risk factor for elevated cardiovascular and overall mortality (Block et al., 2004; Kestenbaum et al., 2005).

The antioxidants are another subgroup of the preservatives; they prevent the oxidation of molecules by donating a hydrogen atom or an electron, becoming themselves reduced, in the radical form, but contrary to other radicals, antioxidants when in radical form are more stable and do not allow further reactions to take place, therefore preserving the status quo of the system (Carocho and Ferreira, 2013a,b). The most commonly used antioxidants with quantum satis status are: ascorbic acid (E300), sodium ascorbate (E301), calcium ascorbate (E302), fatty acid esters of ascorbic acid (E304), tocopherols (E306), α-tocopherol (E307), γ-tocopherol (E308), δ-tocopherol (E309), lecithins (E322), sodium lactate (E325), potassium lactate (E326), calcium lactate (E327), citric acid (E330), sodium citrate (E331), potassium citrate (E332), calcium citrate (E333), tartaric acid (E334), sodium potassium tartrate (E337), sodium malate (E350), potassium malate (E351), calcium malate (E352), calcium tartrate (E354) and triammonium citrate (E380); Table 2 (Carocho et al., 2014).

They are known to reduce the risk of cancer, heart disease, and diabetes; to inhibit plasma platelet aggregation, cyclooxygenase (COX) activity, and histamine release, as well as to exert antibacterial, antiviral, anti-inflammatory, and anti-allergic activities (Shahidi and Ambigaipalan, 2015). The benefits towards many of these conditions arise in part through the antioxidant characteristic of phenolics; therefore, it is important to quantify, identify and evaluate their antioxidant activities (Cevallos-Casals and Cisneros-Zevallos, 2010).

Ethoxyquin is a quinolone-based antioxidant that is not permitted to be added to human food, only used in domestic and farm animal feed. This compound has been reported to induce dermatitis in animals and humans, as well as being a promoter of certain types of cancer. (Blaszczyk et al., 2013; EFSA, 2013a,b). BHA and BHT are antioxidants commonly used in break-fast cereals and other grain producys to maintain crispness and prevent rancidity. There is one well-documented report of chronic urticarial, confirmed by double-blind, placebo-controlled challenges, exacerbated by these agents (Goodman, 1990; Simon, 2003).

TBHQ is commercially available as a beige coloured powder and may be used alone or in combination with BHA or BHT at a maximum

### Table 2. Antioxidant food additives with their ADI quantities (mg/kg bw) (Carocho et al., 2014)

<table>
<thead>
<tr>
<th>Name</th>
<th>E number</th>
<th>ADI</th>
<th>Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propyl galate (PG)</td>
<td>E310</td>
<td>1.4 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.184.1660</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>tert-butylhydroquinone (TBHQ)</td>
<td>E319</td>
<td>0.7 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.172185</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Butylated hydroxyanisole (BHA)</td>
<td>E320</td>
<td>0.5 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.175.110</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Butylated hydroxytoluene (BHT)</td>
<td>E321</td>
<td>0.05 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.175.115</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Ethoxyquin (EQ)</td>
<td>E224</td>
<td>0.005 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.172.140</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EU Regulation No. 1129/2011</td>
</tr>
</tbody>
</table>

Note: ADI = acceptable daily intake
concentration of 0.02% or 200 ppm, based on the fat content of foods, including essential oils (Shahidi and Naczk, 2004). Khan and Shahidi (2001) reported that amongst synthetic antioxidants, TBHQ was more effective than BHA and BHT and served as the strongest antioxidant in borage and evening primrose oil triacylglycerols (TAG). Another studies have shown that TBHQ causes DNA cleavage in vitro and the formation of 8-hydroxydeoxyguanosine in calf thymus DNA due to the generation of ROS such as superoxide radical anion and hydrogen peroxide (Shahidi and Ambigaipalan, 2015). In 2009, Han and Park demonstrated that PG inhibits the growth of microorganisms by inhibiting respiration and nucleic acid synthesis; it also decreases hepatic microsomal hydroxalase and demethylease activities and inhibits the activity of some redox enzymes. So, in 2015 studies shown that the antioxidative and cytoprotective properties of propyl gallate may change to prooxidative, cytotoxic and genotoxic in the presence of Cu(II).

**NATURAL ANTIMICROBIALS**

Natural antimicrobials that can be added to food (but are not considered additives in the sense of Codex Alimentarius definition) are mainly terpenes (carvacrol, thymol and menthol), peptides, polysaccharides, and phenolic compounds. Also in 2014, Abbaszadeh et al., used various compounds from essential oils as alternative agents to control the growth of food-relevant fungi. They shown that the MICs of thymol ranged from 100 to 500 mg/mL (mean value: 263.3 mg/mL) for different fungal isolates. The most growth inhibition was associated with Cladosporium spp., followed by Aspergillus spp., Fusarium oxysporum, Botrytis cinerea, Penicillium spp., Alternaria alternata and Rhizopus oryzae. For carvacrol the MICs ranged from 50 to 350 mg/mL (mean value: 154.5 mg/mL) for tested fungi, and growth inhibition of Aspergillus spp. was higher than that of other fungal isolates. Generally, the antifungal effect of thymol was higher than that of carvacrol according to some previous reports (Numpaque et al., 2011). Perez-Alfonso et al. (2012) indicated that both thymol and carvacrol were effective in inhibiting fungal growth, with the predominant efficacy by thymol. The World Health Organization (WHO) has stated that thymol and carvacrol residues in food are without danger to the consumer as long as they do not exceed 50 mg/kg (WHO, 2002; WHO, 2012).

Eugenol (C_{10}H_{12}O) is a clear to pale yellow oil extracted as a major component (approximately 85%) from buds and leaves of clove (Abbaszadeh et al., 2014). According to previous studies (Wang et al., 2005; Yen et al., 2008), eugenol has been demonstrated as an excellent fungicide against foodborne pathogens. Campaniello et al. (2011) found that eugenol at concentrations of 100—150 mg/mL is an effective antifungal compound against phytopathogenic Aspergillus, Penicillium, Emericella, and Fusarium species.

The most potent inhibitory activity of menthol was found for Cladosporium spp. and Aspergillus spp., followed by Fusarium oxysporum, Penicillium spp., Rhizopus oryzae, Botrytis cinerea and Alternaria alternata. MIC values for menthol (C_{10}H_{18}O) ranged from 100 to 450 mg/mL (mean value: 211.4 mg/mL) (Abbaszadeh et al., 2014).

In conclusion, the naturally occurring compounds, such as thymol, carvacrol, eugenol and menthol, showed toxic effects in vitro on fungal growth of all fungal species but different levels of potency.

**NATURAL ANTIOXIDANTS**

Antioxidants present in plants, algae, and mushrooms are excellent natural additives such as: α-tocopherol (E307), γ-tocopherol (E308), δ-tocopherol (E309), xanthan gum (E415), pectin (E440i) should be added to food stuffs for their iron on hydrogen donating, metal chelating, and chain breaking capabilities. Also, the most antioxidant natural molecules are vitamins, polyphenols, and carotenoids (Ferreira et al., 2009; Carocho et al., 2014). The main foods where antioxidants are used are meats, oils, fried foods, dressings, dairy products, baked goods and extruded snacks (Baines and Seal, 2012). Polyphenols are some of the most interesting groups of natural compounds in the vegetable kingdom, and due to their strong antioxidant capacity they display interesting effects towards human health, namely against cancer, osteoporosis, cataracts, cardiovascular dysfunctions, brain diseases, and immunological conditions (Carocho & Ferreira, 2013). In another study Carocho et al. (2015) reported that use carotenoids, ascorbic acid or vitamin E (tocopherols) are used to benefit from synergies. Carotene mixes and b-carotene have been reviewed by the EFSA’s
scientific panel and ruled out any toxicity arising from its consumption, whether from synthetic provenance or extraction from plants and fruits. Carotenoids are also known for their antioxidant potential as food additives, although their use is always limited by being very susceptibility to oxidation by light. In the same year, the EFSA gathered a scientific opinion regarding ascorbic acid and determined there was no risk in its consumption, not defining an ADI (Baines and Seal, 2012; EFSA, 2015a).

**ANTIBROWNING AGENTS**

Enzymatic browning of raw fruits and vegetables is a PPO-catalyzed oxidation reaction leading to the formation of polymerized dark-colored pigments from oxidation of \( \text{o-quinones} \), which can significantly affect the functional, nutritional, and organoleptic properties of the product (Mogol *et al.*, 2010). There are some chemical compounds for inhibiting PPO activity. The most widely studied compounds are halide salts, carboxylic, and other organic acids, as well as chelating agents that act on the enzyme. In addition, others are mainly reducing agents, including ascorbic acid and its derivatives, SH-compounds, and sulfites, which act on the reaction products through \( \text{o-quinones} \) reduction to \( \text{o-diphenols} \) (their precursors), and formation of colorless compounds by reacting with \( \text{o-quinones} \) (Billaud *et al.*, 2003; Nooshkam *et al.*, 2019).

The different mechanisms for antioxidant potency of MRPs like metal chelation, scavenging of free radicals, breakdown of hydrogen peroxide, and radical chains have been proposed by the

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**Table 3.** Azo-compounds and triarylmethane compounds of dyes with their ADI quantities (mg/kg bw) (Carocho *et al.*, 2014)

<table>
<thead>
<tr>
<th>Name</th>
<th>E number</th>
<th>ADI</th>
<th>Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tartrazine-FD&amp;C Yellow No.5.</td>
<td>E102</td>
<td>7.5 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.74.1705 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Sunset yellow-FD&amp;C Yellow No.6.</td>
<td>E110</td>
<td>2.5 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.74.1706 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Carmoisine</td>
<td>E122</td>
<td>4 mg/kg bw</td>
<td>No permission sought in the United States EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Amaranth</td>
<td>E123</td>
<td>0.8 mg/kg bw</td>
<td>Banned in the United States EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Allura red-FD&amp;C Red No.40</td>
<td>E129</td>
<td>7 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.74.340 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Patent blue</td>
<td>E131</td>
<td>15 mg/kg bw</td>
<td>Banned in the United States EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Brilliant blue-FD&amp;C Blue No.1.</td>
<td>E133</td>
<td>10 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.74.101 EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Brilliant green</td>
<td>E142</td>
<td>5 mg/kg bw</td>
<td>No permission sought in the United States EU Regulation No. 1129/2011</td>
</tr>
<tr>
<td>Fast green-FD&amp;C Green No.3.</td>
<td>E143</td>
<td>25 mg/kg bw</td>
<td>Code of Federal Regulations 21 Sec.74.203 Banned in the EU</td>
</tr>
<tr>
<td>Brilliant black</td>
<td>E151</td>
<td>5 mg/kg bw</td>
<td>No permission sought in the United States EU Regulation No. 1129/2011</td>
</tr>
</tbody>
</table>

Note: ADI = acceptable daily intake
common and available antioxidative assays. Additionally, these functional compounds have been successfully applied to improve the oxidative stability of diverse foods such as bakery, pasta, meat, oil, and dairy products. As well, they have potential to be used as antibrowning agents in place of sulfite compounds, to inhibit enzymatic browning in fruits and vegetables. Maillard-type conjugates have some functionality, including improved antioxidant, solubility, and heat stability of proteins over a wide range of temperatures, pH values, and ionic strengths. They also provide a continuous and viscoelastic layer around oil particles, which make them excellent foodgrade carriers for the controlled release of biologically active compounds (Nooshkam et al., 2019).

COLORING AGENTS

Coloring agents or food dyes are used to alter or confer colors to food, in order to increase its attractiveness toward consumers. There are 5 groups of coloring agents: the azo compounds, the chinophthalon derivatives of quinolone yellow, the triarylmethane group, xanthenes, and the indigo colorants (Sarikaya et al., 2012); Table 3. The only dye with quantum satis status is calcium carbonate (E170), which confers a white color to food and also, calcium carbonate (E170) need to be re-evaluated by the European Food Safety Authority (EFSA) intended to be used in foods for infants below 16 weeks of age. And also, calcium carbonate (E170) need to be re-evaluated by the European Food Safety Authority (EFSA) intended to be used in foods for infants below 16 weeks of age.

Some dyes, like amaranth (E123), carmosine (E122) and others are banned in some countries; for instance, both these compounds are banned in the United States and not in the EU, while fast green (FD&C Green No.3) is forbidden to be used within the EU and legally added to food in the United States (Carocho et al., 2014).

Furthermore, given the low rate of absorption, harm to human health is unlikely. However, in light of new findings, is it necessary to regularly assess potential toxicity of food colorants by regulatory authorities and consequently revise guidelines for their use (Amchova et al., 2015).

In the last decades, an increase in the incidence of allergies and asthma has been observed. Besides the well-known hygiene theory, other factors, such as administration of antioxidant supplements, food preserving agents and colorants, have also been suggested to be correlated with the increase in the incidence of allergies and asthma (Vojdani and Vojdani, 2015). Previous researches shown contradictory results on this topic, as erythrosine was shown to inhibit hematopoietic prostaglandin D2 synthase, which is a member of the glutathione transferases, catalyzing the isomerization of prostaglandin H2 to prostaglandin D2. This is a mediator of allergy and inflammation responses and hence could be of therapeutic importance in the treatment of allergy and asthma (Mazari et al., 2015). Furthermore, it was found in other studies that even small doses of azo-dyes absorbed from tattoos were recently suggested to trigger immune responses of the body (Baumler, 2015).

CONCLUSION

Food additives ensure that food can be delivered around the world maintaining its quality and safety, without losses in an ever-growing competitive market. Their role is becoming more and more important with the increase in consumption of highly processed food due to changing lifestyles of modern citizens. Nevertheless the food additives should be used judiciously according to the legal requirements.

REFERENCES


