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Full Length Research

Consumer information rights concerning the absence of harmful gamma radiation in food and drink products: First experimental step with a global perspective.

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Gamma radioactivity produced by human technology is the most direct dangerous industrial product to life and it is caused during the decay of atoms. Two global catastrophic events in which nuclear plants were involved separated only by 25 years were the confirmation that, independently of nuclear weapons, 100 % of security in the nuclear energy management was, is and always will be a complete unrealistic idea, and therefore, the next ecological and/or human catastrophe regarding radioactivity is only a question of time. Although the guarantee of offering the information of food and drink product quality concerning the date of expiry or the ingredients content is nowadays stipulated in laws around developed societies, this is not the case of the radiation safety conditions.
An important investment to offer information regarding the gamma radiation safety conditions in each food or drink product offered by the market to the consumer is needed. In that direction, the implementation of a previous experiment in the market is suggested.

Keywords: consumer information; consumer rights; food and drink business; product labeling; radiation safety; radioactive pollution.

LIVING IN A GLOBAL POLLUTED WORLD

Living in a sustainable way for human population on Earth and/or in whatever other habitable planet, moon or artificial biosphere will be the most relevant challenge of human civilization ever, which, in the best expected conditions could be achieved before the next century (Brown 1981; Gitelson, Lisovsky and MacElroy 2003; Liu et al. 2012). This will implies sustainable energy, food and material supplies to a non-growing human population in a planet, a moon or in an artificial biosphere or to a growing human population proportional to the constant migration and the respective colonization of other empty planets, moons

and/or new artificial biospheres and also, in case of our planet, a global cleaning system which could eliminate the global pollution impact of these two last centuries on the Earth.

But meanwhile, humans will live on this planet, a global polluted world with, at the moment, an increase of environmental pollution and an increase of human population that uses limited material, food and dirty energy resources in a non sustainable way (Holdren and Ehrlich 1974). Therefore, at short time, investing a huge effort in order to prevent the possible consequences of the pollution caused by human civilization to the earth´s ecosystems and human health could be the only way to permit the continuation of our society.

In that sense, and regarding human health, different governments and international public organizations have invested and are still investing a lot of money and social efforts to prevent health disorders and problematics to the population caused by the environmental pollution for decades as is the case of the well known lead pollution by petrol companies (Harriet 1968; U.S. Consumer Product Safety Commission 1977), resulting in the restriction or in the rigorous prohibition for the use of several compounds as happens with the dichlorodiphenyltrichloroethane (DDT) after the publication of “Silent Spring” (Carson 1962) which at the same time resulted in the creation of the U.S. Environmental Protection Agency.

All these politics have been and continue to be extended and completed to the situation that nowadays, there are restrictions in relation to the air pollution in different countries expressed in the National Ambient Air Quality Standards by the United States Environmental Protection Agency (http://www3.epa.gov/ttn/naaqs/criteria.html) which set maximum atmospheric concentrations for specific pollutants in the USA and in the analogous document in the European Union; the E.U. Air Quality Directive Regulations (http://ec.europa.eu/environment/air/quality/legislation/existing_leg.htm), regarding the industrial pollution in rivers, lakes, seas and oceans which are expressed in the United States Environmental Protection Agency, (http://www3.epa.gov/) and in the EU Water Framework Directive (http://ec.europa.eu/environment/water/water-framework/index_en.html) or in the Environmental Offences and Penalties of New South Wales (http://www.rms.nsw.gov.au/about/environment/soil-water-quality/index.html) and regarding the food and drink industrial production and prosecution expressed in the Guidelines on the application of ISO 9001:2000 for the food and drink industry (http://www.iso.org/iso/catalogue_detail?csnumber=38866).

Moreover, the presence of gamma radioactive emission in food and drink products also has its own specific regulation in the Council Directive of 13 May 1996, 96/29/Euratom, (https://osha.europa.eu/en/legislation/directives/73) and in the United States Environmental Protection Agency, (http://www3.epa.gov/; Food Standards Agency, EU, https://www.food.gov.uk/).

RADIOACTIVITY AFFECTING EARTH

The nuclear radiation or radioactivity is the flow of energy emitted from the nucleus of an unstable atom that in consequence suffers a decay to another nucleus of lower energy and which could takes from seconds to thousands of years depending on its nature (Loveland, Morrissey and Seaborg 2006).

The nuclear radioactivity could be alpha emission, which consists in atoms of helium, beta emission which is constituted by high speed electrons or positrons and gamma emission, the most dangerous radioactive emission for the living organisms consisting in very short wavelengths (very high energetic photons) that achieve the speed of light in vacuum and which have a very high penetration capacity (Loveland, Morrissey and Seaborg 2006).

Gamma emission can disturb the structure of many molecules, breaking covalent molecular forces and, in pluricellular organisms, can affect the cell division regulation producing cancer and being lethal over specific thresholds of intensity and/or exposition

time (Hutchinson 1966; Lara, Rodrigues and Velker 2013).

Earth is affected by gamma radiation from natural radioisotopes of rocks and magma and also from atmospheric interactions with cosmic ray particles. There are very few cases of gamma rays produced by Earth´s natural sources that are not of nuclear origin such as lightning strikes and others produced by several astronomical processes and most of them are screened by Earth's atmosphere. But nowadays, the most risky gamma radiation for the ecosystems and for the human health is caused by human technology (Leighton and Sands 1966; Grupen et al. 2005).

NUCLEAR TECHNOLOGY HUMAN PROBLEMATIC: THE CASE OF THE NUCLEAR ENERGY WORLD DEPENDENCE

Artificial gamma radioactivity comes from the atomic explosions of Hiroshima and Nagasaki at the end of the Second World War, the atomic probes during and after this war, the lost atomic devices, the radioactive production in the nuclear power plants for electric energy production, the radioactive devices that are part of the engines in the atomic submarines and from the radioactive devices for atomic deterrence, for medical or for scientific purposes.

Artificial gamma radioactivity on Earth is spread around the biosphere as happened with i) the atomic bombs which exploded during and after the Second World War or after the accidents of the nuclear power plants of Chernobyl in 1986 and Fukushima in 2011, ii) provisionally stored in the nuclear plants which works in America, Europe, Asia and Africa, iii) indefinitely stored in very high security conditions in cemeteries under the expected less seismic soils and v) stored in uncertain conditions inside containers which were released to the Atlantic and to the Pacific ocean (Livingstone 2003; Hamblin 2008; Feiveson et al. 2011; Smith and Beresford 2005; Hindmarsh et al. 2013).

Considering their number, the huge amount of gamma radioactivity that they produce and their exposition to possible earthquakes, tsunamis, terrorist attacks or plane crashes, the nuclear power plants which produce energy by the fission of uranium and sometimes also by the fission of plutonium are the most risky artificial gamma radioactive source for pacific uses in the world independently of possible internal accidents (Kessler et al. 2014).

There are hundreds of nuclear power plants distributed most of them in the USA, Europe and Japan that produce about the 17% of the electric energy consumption of the world in 437 nuclear power reactors (data from the International Atomic Energy Agency). These reactors produce constantly high amounts of gamma radioactive waste material which needs to be transported in strict security conditions and in special containers to be kept in expected totally isolated radioactive waste cemeteries situated in expected complete free-seismic areas under the earth surface called Deep Geological Repositories for, in the worst cases, an expected period counted in thousands of years (Kessler et al. 2014).

The security on those plants during the transporting of the radioactive waste and on the radioactive cemeteries is carried out under the supervision of the International Atomic Energy Agency (IAEA, https://www.iaea.org/) which works “for the safe, secure and peaceful uses of nuclear science and technology”. But, as happens with all the human work, although risks could be reduced, it is not possible to reach the 100% of effectiveness of security in nuclear technology (Apikyan and Diamond 2009) and therefore, a radioactive leak from whatever technological source during the production, the management or the maintenance of the industrial human gamma radioactive products is theoretically always possible. Unfortunately, although the risk of the nuclear installations and devices is calculated as extremely low, the facts have demonstrated that the accidents in these installations occur in expected and also in completely unexpected ways (Sovacool 2011; Smith and Beresford 2005; Hindmarsh et al. 2013).

In addition to the lethal capacity, two more factors make the gamma radioactivity pollution the most dangerous that human can produce:

Period problematic: The human technology of nuclear energy involves atoms which produce gamma radioactivity in a decay that could takes from hundreds to thousands of years (Loveland, Morrissey and Seaborg 2006).

Confinement problematic: As the radioactive products are actually unstable atoms, when a leak occurs, depending on the situation and conditions of the accident, the radioactivity could be very difficult to be confined to an specific place and when this radioactive pollution reaches the food chain in the ecosystems, the global danger to the biosphere and the human population could be completely unexpected (Vosniakos 2012).

Although there are countries which prefer to reduce their dependence on nuclear energy (Schreurs 2013), in average, the interest on this type of electricity production seems to increase around the world and in consequence, it is expected that the number of nuclear power plants in the planet will also increase during the next decades (World Nuclear Association, http://www.world-nuclear.org/). But even human decide to stop producing gamma radioactive waste today, those 3 reasons mentioned above explain the need of continuing investing in the research to create better technology and strategies to guarantee the prevention of possible new atomic catastrophes.

INFORMATION GUARANTEE OF NON-HARMFUL GAMMA RADIOACTIVITY INTENSITY IN PRODUCTS: AMPLIFYING THE CONSUMMERS RIGHTS

Essentially, there are 3 ways by which radioactivity could be globally spread through the Earth´s biosphere when a nuclear disaster occurs; i) by air, ii) by the oceanic or the continental water masses and iii) by the organisms. The direct air radioactive pollution could happens through specific explosions in nuclear devices as was the case of the Chernobyl nuclear plant in Ukraine, the direct water radioactive pollution could occurs when the radiation affects the hydric environments as happened in Fukushima I and the pollution by organisms happens when the radiation affects at some level the food chain of an ecosystem.

As all the biosphere is connected, specially by the hydric cycle, a local radioactive pollution could become a global or at least an international phenomena (Elliot 2013; Shestopalov 2002; Vosniakos 2012).

Even food or drinks in the markets should not present confirmed mortal or high toxic chemical compounds according to laws of many administrations around the world, those present the information regarding their ingredients dedicated to the consumers, (U.S Food and Drug Administration, http://www.fda.gov/; European Comission: Labeling and nutrition, http://ec.europa.eu/food/safety/labelling_nutrition/index_en.htm). But this is not the case of the radioactive safety conditions which are only considered unquestionable.

EXPERIMENTAL DESIGN

In conclusion, unfortunately, the next ecological and/or human catastrophe regarding radioactivity is only a question of time. Furthermore, nowadays, the present conditions of global radioactive pollution in rivers, pounds, lakes, underground water masses, seas and oceans and inside the food chain of different ecosystems is a field which is still being studied and therefore it is not totally known (Vosniakos 2012; Hamblin 2008).

This situation reinforces the need to ensure the right of consumers to be directly informed about the radioactive safety conditions of the food and the drink products offered by the markets. To that aim, the installation of Geiger counters in supermarkets and big shop areas in order to offer to clients the possibility of checking that they are free of dangerous gamma radioactivity intensity is suggested as the next and necessary step in the list of consumer rights.

But obviously, the decision of offering this service globally and independently of any local radioactive catastrophe could produce unexpected consequences in the consumer habits. Therefore, previously to apply

standard and global regulations in that respect, it will be necessary to evaluate them.

Here I present the first experiment to test the consumer behavior when a big surface offer the possibility to check the gamma radioactivity of any product of the specific market.

The experiment consists in the installation of Geiger counters (1 per 50 square meters) in the fruit zone of various supermarkets placed in countries with no historical radioactive emergencies, during a time without any global radioactive emergency and in societies with no determined special sensibility to the radioactive risks. Each Geiger counter will be provided by a scale level offered to the public indicating from what level radiation is harmful to the human body (referring to the World Health Organization directives) and by an automatic counter system which will count each time when the Geiger is used. Also, each unit of fruit will be counted automatically in the cash register.

For internal experimental comparison, this last parameter will be checked before and after the installation of the Geiger counters. Results of the units of fruit consumed before and after the installation of the Geiger counters and the usage per fruit unit bought will be used. This experiment will provide information about how the presence of the machines can affect the fruit consumption and how frequently consumers use the counter Geiger service which will be useful to estimate the possibilities of it implementation.

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