

## Original article

## Citizens' perceptions of the presence and health risks of synthetic chemicals in food: results of an online survey in Spain



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## ABSTRACT

**Objective:** To explore factors influencing perceptions and viewpoints on the responsibility for the presence of toxic substances in food, on enforcement of laws and regulations that control human exposure to toxic substances in food, and on the effectiveness of such regulations.

**Methods:** An online survey was completed by 740 individuals from several parts of Spain (median age, 47 years; 67% were women; 70% had completed university studies).

**Results:** Over 87% of respondents said that it was possible that throughout their lives they could have accumulated in their body toxic substances potentially dangerous to their health. The attribution of the responsibility for toxic substances in food to a larger number of social groups was more frequent among respondents who consulted information about the problem more often (odds ratio [OR]: 1.92), who correctly identified factors that increase the likelihood of toxic substances in food being harmful to human health (OR: 2.86), who better knew the health problems that may be caused by such substances (OR: 2.48), and who recognised more food groups that tend to have concentrations of toxic substances potentially harmful to health (OR: 2.92) (all p values <0.001). Women were 65% less likely than men to answer that regulations on toxic substances in food are effective (p <0.001); and so were participants who identified more food groups with potentially toxic concentrations.

**Conclusions:** Among study participants there was a widespread scepticism and distrust towards the enforcement and effectiveness of laws and regulations that in Spain aim to control human exposure to toxic substances in food.

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## Percepciones de la ciudadanía sobre la presencia y los riesgos para la salud de compuestos químicos sintéticos en los alimentos: resultados de un estudio en línea en España

## RESUMEN

**Objetivo:** Explorar factores que influyen en las percepciones y puntos de vista de los ciudadanos sobre la responsabilidad de la presencia de sustancias tóxicas en los alimentos, sobre la aplicación de las leyes que en España controlan la exposición humana a dichas sustancias y sobre la efectividad de tales leyes.

**Método:** 740 personas de varias partes de España (mediana de edad, 47 años; 67% mujeres; 70% con estudios universitarios) completaron una encuesta en línea.

**Resultados:** Más del 87% de las personas encuestadas consideraron que era posible que a lo largo de su vida hubiesen acumulado en su cuerpo sustancias tóxicas potencialmente peligrosas para su salud. Atribuir la responsabilidad sobre la presencia de sustancias tóxicas en los alimentos a un mayor número de grupos sociales fue más frecuente entre quienes declararon consultar con más frecuencia información sobre el problema (odds ratio [OR]: 1,92), quienes identificaron correctamente factores que aumentan la probabilidad de que las sustancias tóxicas en los alimentos sean perjudiciales para la salud humana (OR: 2,86), quienes conocían mejor los problemas de salud que pueden ser causados por dichas sustancias (OR: 2,48) y quienes señalaron más grupos de alimentos que tienden a tener concentraciones de tóxicos que pueden ser perjudiciales para la salud (OR: 2,92) (todos los valores de p <0,001). Las mujeres fueron un 65%

## Palabras clave:

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menos propensas que los hombres a responder que las regulaciones legales sobre sustancias tóxicas en los alimentos son efectivas ( $p < 0,001$ ), y también lo fueron las personas que identificaron más grupos de alimentos con concentraciones potencialmente tóxicas.

**Conclusiones:** Entre los/las participantes en el estudio hubo un amplio escepticismo y desconfianza respecto a la aplicación y la efectividad de la legislación que en España aspira a controlar la exposición humana a sustancias tóxicas en los alimentos.

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## Introduction

A substantial body of scientific evidence indicates that numerous synthetic environmental chemicals may increase the risk of some human diseases, and that for the general population food is often the main source of exposure to such compounds. Water and air pollution, personal care products, food packaging, and other consumer goods are also sources of exposure. Some types of persistent toxic substances were never intentionally released into the environment (e.g., dioxins), and the manufacture of others was halted decades ago in many countries (e.g., polychlorinated biphenyls, organochlorine pesticides). However, today many such persistent substances remain detectable in animal and human food webs, as well as in most human beings, both at low and high concentrations. Due to frequent exposure, food and human contamination by non-persistent toxic substances is also commonly observed.<sup>1–10</sup>

While research on the potential health effects of environmental chemicals is quite strong in Spain,<sup>6,11</sup> only some in-depth studies exist on perceptions, attitudes, and behaviours of citizens related to food safety;<sup>12–17</sup> and, to our knowledge, few studies have specifically addressed citizens' views on the causes and consequences of the presence of synthetic toxic substances in food. Of course, there is a rich international scientific literature on such issues.<sup>10,12,18–24</sup>

Therefore, the main aim of the study was to explore factors influencing perceptions and views on the responsibility for the presence of toxic substances in food, on *enforcement* of laws and regulations that control human exposure to toxic substances in food, and on the effectiveness of such regulations.

## Materials and methods

### Study population and opinion survey

This is a cross-sectional study in which an online survey was the main methodological tool. Based on the theoretical framework, and findings from the first phase, of an ongoing research project on sociocultural dimensions of human contamination by persistent toxic substances and other environmental chemical agents,<sup>12,16,17</sup> we designed the online survey “Presence of toxic substances and confidence in food products” (see [Appendix 1 online](#)). The Internet platform used was SurveyMonkey,<sup>25</sup> and the survey was available to be answered from 15th to 31st May 2013. A short informative cover letter was followed by the informed consent, seven sociodemographic questions, 16 questions regarding knowledge, sources of information, perceptions and opinions about chemicals in food, and a final section for optional comments (see [Appendix 1 online](#)). The invitation to participate in the survey was made by snowball sampling via email.<sup>26</sup> The survey was initiated by 949 individuals, and 64 people (6.7%) did not proceed beyond informed consent (the first question, see [Appendix 1 online](#)). The present study is thus based on 885 individuals with at least sociodemographic information ([Table 1](#)). Of such 885 individuals, 740 (83.6%) answered all 24 questions, 94 (10.6%) only questions about personal characteristics, 38 (4.3%) responded until question 16, and 13 (1.5%) until question

20. People who did not answer all questions were older, had a lower level of formal education, and were more often pensioners or unemployed than the 740 subjects who completed the survey. As one of the purposes of the present study was to obtain information on the knowledge that participants had about the questions in the survey, we kept the maximum number of participants in each analysis.

Over 67% of 885 participants were women. The median age was 47 years, 69.9% had university studies, and 54.5% were employed by others ([Table 1](#)). Women were about two years younger, and had a slightly lower educational and occupational status than men. More than one third of respondents lived in the province of Barcelona, and 46% in parts of Spain other than those specifically mentioned in [Table 1](#). For the classification of the occupation, the 10 categories of International Standard Classification of Occupations (ISCO)-08 (1996-2014) were used; in the analyses they were grouped into five categories ([Table 1](#)).

### Main dependent and independent variables

The three main dependent variables of interest stemmed from three questions of the survey: question 14 (“The *responsibility* of the presence of toxic substances in food belongs to...”); question 15 (“In Spain, laws and regulations that control or should control human exposure to toxic substances are *enforced* in...”); and question 16 (“In Spain, laws and regulations that control or should control human exposure to toxic substances are *effective*”) (see [Appendix 1 online](#)). Responses to question 14 on responsibility were classified in three groups, according to whether respondent held responsible *a*) between 0 and 3 of the 8 social groups; *b*) 4 to 5 social groups; and *c*) respondents that held responsible 6 to 8 social groups. Responses to question 15 on enforcement were classified in four groups: *a*) ‘often’, when the responses were mostly always or often; *b*) ‘sometimes’; *c*) ‘never’, when they were mostly rarely or never; and *d*) ‘do not know’, when they were mostly “do not know”. Responses to question 16 on effectiveness were “yes”, “no” and “do not know” (see [Appendix 1 online](#)).

We created the variable ‘main means of information’ to consider combinations of responses to questions 9 (“work with or study toxic substances”), 10 (“frequency of consultation of information on toxic substances”), and 11 (“sources of information about toxic substances”). In this new variable, the category of ‘experience’ was for participants who worked with or studied toxic substances and, in addition, either *a*) consulted information often or sometimes from  $\geq 2$  different sources of information, except family and friends, or *b*) consulted information rarely but used three sources, except family and friends. The second category for the variable ‘main means of information’ was ‘interested’, and it included participants who did not work with or study toxic substances and *a*) consulted often or sometimes information about toxic substances from  $\geq 2$  sources of information, except family and friends, or *b*) consulted information rarely or never from 4 or 5 sources, family and friends included. The third category of ‘main means of information’ was ‘little or not interested’, and it grouped participants not classified in the other two categories.

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