

## Dioxin in feed and food: Is public health running behind?\*

The dioxin contamination adds to the list of improper officialdom in Belgium. The behaviour of the authorities has been mainly guided and is still guided by economic protective measures. However, it is clear by now that this unfortunate approach has led to the opposite result. In Belgium alone, the dioxin episode affects at least 30 industrial sectors and more than 15 000 businesses. More than one month after the beginning of the crisis all public health activities are still dictated by the economic demands. All available laboratories are determining levels of contamination in samples of food to get the authorisation to release food stocks for the international market.

The examination of food contamination is one of the main preventive public health actions. However, once more there is a great chance that the health of the population comes second: (1) the sampling procedure for the laboratory measurements presently carried out on foods is not designed to make inference on daily intakes of dioxin; (2) all these economic driven activities leave no time to determine the real contamination of the population; (3) the evaluation of the level of contamination of the population is currently not yet at the political agenda. Up till now no data are available on the dioxin levels in the Belgian population. This means that nobody can inform the population if they really have been exposed and if so to what extent they have been exposed. Those data are at least necessary to tackle the epidemic of fear and for the population to recover from the current state of shock.

The level of distress in the population translates itself into jokes, for example, during meals people no longer say "Enjoy your meal" but they just wish each other "Good luck". "Good luck" refers to a probability of a positive outcome that one hopes to be high, but at the same time one also accepts that this probability can be very close to zero. This uncertainty, which contributes to much of the anxiety, is mainly a result of the improper communication and of the distribution of contradictory information by both the authorities and the scientific world. The Belgian authorities gave first the appearance of a cover up. This was followed by a dispute between Belgium and the European Union to define the time frame of exposure. This discussion was again totally inspired by economic concerns. Added to this, the list of the food products that were "still safe to eat yesterday but no longer today" increased daily: for example, mothers were interrupting their youngster's breakfast with cereals after hearing in the morning news that milk was now also on the black list. The communication of risk experts via the mass media was confusing, incomprehensible and often contradictory. Results from laboratory experiments were used to extrapolate concentration levels in food into health risk for humans. However, no considerations were given to the prevalence of those levels within the food products, to the uncertainty of those extrapolation and to the consumption patterns. The risk measures used in those presentations were not consistent. They ranged from a proportion to a probability within a (most often undefined) time period to a lifetime cumulative probability.

In the editorial by McMichael one sentence is striking: "But with dioxin, how will we know who has been affected and when the excess risk has been dissipated?"<sup>1</sup> The Belgian dioxin episode has some specific epidemiological features.

First of all, it is not a point exposure as there is around, for example, incinerators or as has been observed in Seveso. The ingestion of contaminated food was most probably not limited to a population living in a well defined geographical area. Also the exposure is not associated with specific groups such as observed in occupational related exposures.<sup>2</sup> Hence, a definition of the exposed population should at least include the total population with residence in Belgium during the period of the food contamination. However, no information is available if the exposure distribution was equally spread throughout the country.

A second characteristic is that the time frame of exposure is unknown. Probably the end of the exposure period can be set around the beginning of June 1999. On the other hand the uncertainty around the beginning of the exposure is much greater. Contaminated animal food was delivered between the 22 and 26 of January. The health problems in the poultry were noticed from the 4 February onwards. The current hypothesis is that the dioxin episode in Belgium is totally attributable to a one time accident: a single contamination of animal feed with PCB oil. Therefore one can expect that dioxin contaminated food products reached the consumer already around mid-February. However, given the methods used for handling oils and fats during the recycling process one cannot exclude a more latent intoxication of animals over a much longer period.

The third issue is that the probability of exposure may be heterogeneous within the exposed population (defined in space and time) because of dietary habits. Belgium does not have population data on food consumption patterns.<sup>3</sup> The last food consumption survey covering the total adult population was done in the early eighties (BIRNH-study).<sup>4</sup> This means that even if the prevalence of exposures levels could be determined in food products it cannot be used to estimate the mean dietary intake of dioxin by the population or to identify high risk groups.

Public health should stop running behind. In the short-term the level of exposure in the population because of the dioxin episode and over and above the usual background exposure should be determined by comparing levels of dioxin before and after the "dioxin event" in biological fluid such as blood or breast milk. To determine the dioxin burden in blood you can focus on the population of blood donors. The population of blood donors is not strictly comparable to the general population but the difference is smaller compared with other countries because the blood donation in Belgium is philanthropic. However, the fact that a group of blood donors is not a representative sample of the general population does not constitute a problem. In an "ecological" time trend study a sample of the same population is observed at different moments. Plasma specimens, collected in December 1998, are still available at the central fractionating department of the Red Cross. Samples can also be selected from the blood donated at different periods up to the end of July 1999. The available information collected by the Red Cross centres allow for several possible confounding factors such as age, sex, place of residence, occupations. This type of study is necessary to provide the population the answers to the questions: "Have we really been exposed?" and "If yes, what is the excess exposure over and above the background exposure level we experienced?"

The determination of the absolute exposure because of the dioxin episode is only a first step in the process to calm the anxieties in the population. A much more complex task

\*The opinions in this editorial are from the author and do not necessarily represent those of the Belgium Institute of Public Health.

is to estimate the risk related to the measured exposure.<sup>5</sup> In contrast with cancer, a possible effect in the distant future, women with, for example, a first trimester pregnancy during the “dioxin episode”, will give birth within the next coming weeks (that is, from July 1999 onwards). Public health professionals and health services will have to counsel families on the outcome of current and future pregnancies and on the development of their offspring. It is known that exposure occurs to the developing fetus through placental transfer of dioxin in maternal blood via the placenta. In addition, exposure is likely to increase in the early postnatal period through breast feeding. Data on prenatal effects in humans are limited but give, in contrast with risks in laboratory animals, no evidence of teratogenic and mutagenic risks.<sup>6</sup> There are indications that in utero exposure causes growth retardation and developmental and psychomotoric delay, and that these effects may persist during childhood.<sup>7, 8</sup> There is some, but no strong, evidence for an association between paternal dioxin and outcome of pregnancies.<sup>9</sup> Current distress of the population, caused by the uncertainty about the exposure and the intensity of the exposure, will result in the attribution of any not optimal pregnancy outcome in the second half of 1999 (such as still birth, preterm birth, intrauterine growth retardation, birth defects and even infant death) to the dioxin episode. To be able to support the population experiencing these health problems it is essential to have a better insight in the level of absolute exposure during the dioxin episode in Belgium. Secondly, a study design (probably a case control design) should be prepared to compare the dioxin burden in parents with a negative pregnancy outcome with the dioxin levels in parents with a normal birth.

The public health community needs to bring health more to the foreground of the dioxin crisis. Within the current economic perspective in Belgium health is considered to be nothing more than safe food, meaning food products that can be sold. This approach will not be a sufficient cure for a population in shock. For the population to recover from this crisis specific public health actions are necessary. In the short-term this means to determine what has been for the population the absolute exposure over and above the background exposure and to find solutions on how to deal with negative birth outcomes, which will be attributed to the dioxin exposure.

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- 1 McMichael AJ. Dioxins in Belgian feed and food: chickens and eggs. *J Epidemiol Community Health* 1999;53:742-3.
- 2 Steenland K, Piacitelli L, Deddens J, et al. Cancer, heart disease and diabetes in workers exposed to 2,3,7,8-tetrachlorodibenzo-p-dioxin. *J Natl Cancer Inst* 1999;91:779-86.
- 3 Flanagan MJ. *Towards the development of food-based dietary guidelines in Europe*. Dublin: Institute of European Food Studies, 1999.
- 4 The Belgian Interuniversity Research on Nutrition and Health. *Current nutritional habits in Belgium*. Tijdschrift voor Geneeskunde, 1988;44. [in Dutch].
- 5 Morabia A, Porta M. Ethics of ignorance: lessons from the epidemiological assessment of the bovine spongiform encephalopathy (“mad cow disease”) epidemic. *Perspect Biol Med* 1998;41:259-66.
- 6 Mastroiacovo P, Spagnolo A, Marni E, et al. Birth defects in the Seveso area after TCDD contamination. *JAMA* 1988;259:1668-72.
- 7 Guo YL, Lin C, Yao W, et al. Musculoskeletal changes in children prenatally exposed to polychlorinated biphenyls and related compound (Yu-Cheng children). *J Toxicol Environ Health* 1994;41:83-93.
- 8 Patandin S, Lanting C, Mulder P, et al. Effects of environmental exposure to polychlorinated phenyls and dioxins on cognitive abilities in Dutch children at 42 months of age. *J Pediatr* 1999;134:33-41.
- 9 Michalek J, Rahe A, Boyle C. Paternal dioxin, preterm birth, intrauterine growth retardation and infant death. *Epidemiology* 1998;9:161-7.