

18 Discussion

This study showed several arguments for both hypotheses.

18.1 Bornem

18.1.1 Coca-Cola Company products hypothesis

The Coca-Cola consumption hypothesis was supported by a high risk of illness for students exposed to regular Coca-Cola consumption. A similar risk for girls and boys, the lack of classical MSI trigger amplifier present or occurring “in line of sight” at least for the 12 first cases (the students did not see each other getting ill), the lack of other risk factors, i.e. SF36 and the lack of interaction with the SF36 also supported this hypothesis in Bornem.

The major symptoms were more important for the first 12 cases. Doctors in the emergency noted that those first cases were sicker (pallor and weakness) than the following. No clusters within a classroom were identified among the first cases, marking the lack of occurring “in line of sight”. In Bornem, the risk to be ill was similar for girls and boys and the cumulative incidence curve rose sharply in the early phase for both genders.

The off-odour of the regular Coca Cola noted by the students was confirmed by the toxicological analysis, H₂S and COS were identified as the responsible compounds.

Even with levels of compounds below the lowest observed adverse effect level (LOAEL), symptoms of the students were consistent with the symptoms expected at a significant level of COS or [5] and several questions remain with only partial answer or no answer at all:

- 1) In 1962, Hall noted water carbonated with CO₂ containing COS produced detectable H₂S some hours later, becoming stronger and disappearing after a few days [6]. All toxicological analyses were performed several days after the production day of the Coca-Cola from Antwerp. At that time, it is likely that if there existed detectable levels of H₂S on the day of consumption, the performed analyses may have come too late to identify high levels of H₂S: the analyses only identified the residual concentrations. What were the expected levels of COS and H₂S at the moment of the consumption? The exact kinetic curve is difficult to reconstruct, but building on the information of the report on the determination of COS concentration in carbon dioxide for quality control purpose [6], there was some increase in COS levels on the alleged production day (June 4th) of the bottles consumed in Bornem.
- 2) The average delay of marketing the Coca-Cola products is 3 to 4 weeks. Since there was little or no more products stocked because of an increase in sales as a result of a game allowing to win a GSM, the glass bottles of Coca-Cola were delivered in Bornem 4 days after the production. This delay was the most adequate time for a peak of COS and H₂S at the time of the consumption of the beverages by the students. Were the bottles of the same production run from Antwerp spread with the same delay to other site of consumption sites? Plastic bottles take much longer period to reach the consumers, allowing eventual COS and H₂S contamination to evaporate.
- 3) Experts concluded that eventual toxic levels for COS and H₂S would require a substantial higher concentration than the one detected. Yet, little is know about the potential for smaller toxic doses for children, or about different toxicity levels through ingestion or inhalation.

Experts at the Danish Toxicology Centre (DTC) concluded, "In the evaluation of the results, it is essential to know in detail the association between the samples taken for analysis and the suspected

products to cause the illness. This detail information has not been available to the DTC at the time of writing this report, and therefore the value of the negative results will not be discussed further".

18.1.2 MSI hypothesis

Other arguments support a mass sociogenic illness in Bornem [2,3, 4].

The high risk of illness associated with the exposure to Coca-Cola consumption did not allow concluding to a toxic effect by the beverage.

The identified gas in the Coca-Cola could be a trigger factor and responsible for anxiety, stomach upset, and perhaps other anxiety symptoms. This hypothesis could be reasonable for the cases following the first cases. One can imagine that students probably carefully open the bottles after they heard of the first cases complain about the odour.

Symptoms were non-specific, but it was regrettable that collected blood sample were not analysed.

Classical risk factors of MSI were also present. The outbreak occurred in a school with a high proportion of teenager girls. The context of stress caused by the food security scare following the dioxine crisis, the upcoming elections and end examinations were cumulative risk factors.

The absence of toxicological confirmation of compounds responsible for toxicity is also in favour of a MSI, but as we saw above, some questions need more investigation.

18.2 Other schools

18.2.1 Coca-Cola Company products hypothesis

Even if the association with regular Coca-Cola consumption was weaker than in Bornem, it remained strong (Or = 5.5; 95%CI 2.4 - 13). Cases were also more likely to have consumed other beverages (Fanta and Coca-Cola light). Toxicological analysis revealed low concentration of p-chloro-m-cresol on the exterior of the cans, that explain a bad smell and taste notified by a few students.

18.2.2 MSI hypothesis

There are several arguments in favour of the MSI hypothesis.

The association with Coca-Cola is not focused on one particular drink (Coca-Cola regular), but also present with consumption of other Coca-Cola beverages. Therefore, the association with Coca-Cola is not focused on one particular production site, but implicating two different production sites (Dunkerque, Gent). Different products and different production sites make a toxic cause less likely.

Classical MSI risk factors [2,3,4] were present:

- Girls were more likely to be ill than boys
- The outbreak occurred in schools setting
- Teenagers were concerned
- Variable and non specific symptoms
- No consistency between observed symptoms and expected symptoms if there was a toxicity of the methyl-cresol [5]
- The off odour of the methyl-cresol could be a trigger factor
- Context of stress: food security, dioxin crisis, elections days, schools end examination

Case Control study among schoolchildren on the incident related to complaints following the consumption of Coca-Cola Company products, Belgium, 1999.

- Role of media (radio, television, and paper): widely diffusion of the incident of Bornem before the second and following outbreak occurred in Brugge.
- Concentration of methyl-cresol below the LAOEL
- Clusters in classrooms were identified at least in 2 schools (Lochristi and Harelbeke); clusters in a classroom would satisfy the classic requirement for MSI to be amplified when occurring “in line of sight”