A GMO pesticidal protein (Cry1ab) in the blood of women pregnant and the fetus? Shoddy work and a probably nonexistent catastrophic scenario

Alain de Weck

Two researchers from the University of Sherbrooke Canada (1) recently published an article finding the presence of the pesticidal protein Cry1ab GMO in the blood for almost all pregnant women and their fetuses, and non-pregnant women. It is assumed that this protein appears in the blood after dietary intake of GM-maize, which is the main source in Canada. The authors also describe the absorption of chemical pesticides with low weight molecular glyphosate (GLYP) and glufosinate (Gluf), which are used in conjunction with certain GM crops (eg soybeans).

The observations presented in this paper are, however, limited to the protein Cry1ab, which is an insecticidal protein produced by the soil bacterium B. thurigensis and has a molecular weight of 130 kDa (kilodaltons). The gene incorporated in various GM crops, especially maize MON810, is a truncated gene resulting in a 69 Kda protein and 617 amino acids (2).

As the authors point out (1), their relationship is actually the first to proclaim the dietary intake of GMO toxin in humans, particularly in the pregnant woman and the fetus, opening perspectives and toxicological scenarios of particular concern. No doubt this publication will soon loop on all Web sites and organizations that have the calling to disseminate real or imaginary dangers of GM foods.

However, the problem is that a scientific evaluation of the results presented by Aris and Leblanc (1) raises many questions and doubts about the findings. The first doubts are physiological, on the principle around the absorption of the protein Cry1ab during its passage in the gastrointestinal system and the presumed mechanism of its absorption into the blood.

According to the classical notions (3-6) currently valid, the vast majority of proteins are not absorbed as such but digested to the point of being amino acid or di-and tripeptides. There is only very few exceptions and these exceptions have been well studied in recent years, because they form the majority of so-called food allergens. In fact, to react with the antibodies formed by patients allergic to foods, it is necessary that the responsible allergens, most often proteins, can stay more or less intact in the blood. It happens, but in minute concentrations (0.1 - 2 ng / ml) for classic food allergens such as ovalbumin, some proteins allergenic milk or nuts (7-11). The absorption capacity of the stomach or bowels is , however, highly selective: it is restricted to few proteins that are not likely to be digested at the intestinal passage (7,8). In fact, the digestibility tests in vitro or in vivo has become a criterion for assessing the ability of a protein to be absorbed intact form and allergenic risk arising.

Regarding GMO protein CryAb1, there are many studies that show directly or indirectly that this protein, when ingested orally, is not allergenic and is not absorbed into the blood, even in minute quantities. Cry1Ab protein intake does not trigger an allergic reaction in mice made allergic by injection (12,13). In patients allergic to various corn proteins and reacting as well to GM corn MON810 as to natural corn, there is no evidence of sensitivity with respect to Cry1ab (14).

Based on standardized tests in vitro digestibility, Cry1ab also seems to belong to the broad category of easily digestible protein that is absorbed only after degradation to amino acids or oligopeptides (12,15), especially if Cry1ab was heated by cooking, as is the case for human consumption (15). This is confirmed by various studies on the presence and digestibility of Cry1ab after administration of controlled GM corn in different animal species such as the pig (16,17), the cow (18-20), wild boar (22),
the deer (21,22), pheasant (22), chicken (23) and mice (12,13).

In none of these species and the controlled oral administration of GM corn, was the presence in the blood or tissues of intact or fragmented Cry1ab protein still capable of immunological reaction found. Cry1ab protein is rapidly degraded in soil (24). In short (25), the Cry1ab protein has none of the characteristics associated with food toxins or allergens, it has no sequence homology with known allergens (26), it has no N-glycosylation sites allowing secondary immunization, it is rapidly degraded by gastric and intestinal action, it has no side effects in mice-fed orally at a dose of 5 g / kg. So there is a reasonable certainty and documented that there is no adverse effect of the inclusion of Cry1ab in food and feed (25). In this context, the assertion of such absorption in humans actually represent a first, and should have made the Canadian authors particularly cautious, but this obviously has not been the case.

In fact, a second category of doubts and questions arise in terms of the immunological technique. Indeed, the only basis for the results presented is a double sandwich ELISA commercial test, allegedly specific to Cry1ab (Agdia, Elkhart, IN, USA) (27). All known immunologist warned that such tests cannot provide specific results, especially for the presence of blood or serum proteins. Thus various ELISAs are unusable for serum, due to non-specific binding, due to variation of the remainder of the serum from one individual to another (28 and unpublished results). These results and nonspecific enzymatic variable signals give at first sight exactly the same type of results as those reported by Aris and Leblanc (1). In addition, the peroxidase enzyme conjugates type, such as that used in the test Agdia are particularly susceptible to this type of non-specific effect, creating false positives (29). It has been clarified by the remainder at least two users Agdia the test does not give reliable results in the blood (16,33). Comparisons made by various authors between commercial sandwich ELISA (27,30,31) and various laboratory tests from anti-Cry1ab polyclonal and monoclonal antibodies (32-36) show that the environmental type tests sandwich ELISA for Cry1ab vary greatly in terms of sensitivity and specificity. Tests of this kind are likely to be particularly susceptible to nonspecific false positive reactions, especially in the presence of serum (37).

Under these conditions, the quantitative calibration used (1) to determine the concentration of Cry1ab must also be strongly doubted since the reference dilutions for Cry1ab have been established in PBST buffer and not in the presence of serum proteins, which makes quantitative determination of any claim illusory. In this regard, it is still strange that the average concentrations reported by Aris and Leblanc (0.13 to 0.19 ng / ml for females, 0.04 ng / ml for the fetus) are actually below the detection limit of the test given by Producer (0.25 ng / ml). Obviously, it would have been necessary to confirm the actual presence of Cry1ab in blood by another ELISA test with another type of enzyme conjugate but also by immunological assays and protein identification, such as a Western immunoblot or blot, as also suggested by Kuntz (38). Most of the authors cited here also emphasize that the identification of Cryab1 by sandwich ELISA requires another immunochemical test for confirmation.

The doubts raised by immunological techniques joins a quantitative argument of common sense, already mentioned by Kuntz (38). Considering the concentrations of Cry1ab allegedly detected in the serum of pregnant and nonpregnant women (respectively 0.19 ng / ml and 0.13 ng / ml), how much GM corn should be ingested to achieve such a result? According to the very plausible calculations of Kuntz, assuming a generous rate of absorption of 1%, the ingested dose of GM corn almost all the women of Quebec would be of the order of 0.12 to 1.5 kg per day of GM corn. This is totally unbelievable. In fact, the situation is probably even more grotesque: in several controlled food experiments of allergenic food proteins such as ovalbumin or milk proteins, the rate of absorption is detected in the range of 0.01% to 0.001% of the ingested dose (39-41).
In conclusion, the assertion that GMO pesticide Cry1ab protein is absorbed in the blood of pregnant and non-pregnant women, probably due to the ingestion and passage of GM foods is not based on reliable immunological findings. Given the general context on the gastrointestinal absorption of protein and several negative studies on the protein Cry1ab, it is extremely likely that the results reported by Aris and Leblanc (1) the result of an artifact. This does not, however, prevent the work from being described as scientific by all websites whose vocation is to interpret in an anti-GMO sense all publications that may sow doubt. (42)

1 Professeur émérite d’immunologie ; Institut d’immunologie (Université de Berne, Suisse) ; Département d’Allergologie (Université de Navarre, Espagne)
Références

(1) Aris A, Leblanc S. Maternal and fetal exposure to pesticides associated to genetically modified foods in Eastern Townships of Quebec, Canada. Reprod Toxicol. 2011 Feb 18. [Epub ahead of print]

(2) Bacillus thuringiensis Cry1Ab protein and the genetic material necessary for its production (pTDL004 or pTDL008) in Event T303-3 or T304-40 cotton plants (006525) Experimental Use Permit Fact Regulating Biocides - Active Ingredient Index. Environmental Protection Agency. 2007 www.epa.gov/op00001/pesticide


(20) Lutz B, Wiedemann S, Einspanier R, Mayer J, Albrecht C-/Degradation of Cry1Ab Protein from


(24) Badea EM, Chelu F Lacatusu A. Results regarding the levels of Cry1Ab protein in transgenic corn tissue (MON810) and the fate of Bt protein in three soil types. Romanian Biotechnological Letters Vol. 15, No.1, Supplement, 2010. www.ebooks.unibuc.ro/biologie/RBL/rbl1vol15Supplement/7%20Elens%20MArcela%20Badea.pdf


(27) Agdia Bt-Cry1Ab/1Ac ELISA Kit - ELISA for the detection of Bt-Cry1Ab/1Ac proteins Catalog number: PSP 06200 https://orders.agdia.com/Documents/m172.pdf_0


(31) Quantitative ELISA for Bt-Cry1Ab. Immunoassay for quantitative detection of Cry1Ab and Cry1Ac proteins in transgenic crops. http://www.krishgen.com

(32) Walschus U, Witt S, Wittmann C. Development of Monoclonal Antibodies Against Cry1Ab Protein from Bacillus thuringiensis and Their Application in an ELISA for Detection of Transgenic Bt-Maize. Food and Agricultural Immunology, 2002; 14 : 231-230

(33) Paul V, Steinke K, Meyer HD. Development and validation of a sensitive enzyme immunoassay for surveillance of Cry1Ab toxin in bovine blood plasma of cows fed Bt-maize (MON810). Analytica Chimica Acta, 2008; 607 : 106-113

(34) Icoz I, Andow D, Zwahlen C, Stotzky G. Is the Cry1Ab protein from Bacillus thuringiensis (Bt) taken up by plants from soils previously planted with Bt corn and by carrot from hydroponic culture? Bull Environ Contam Toxicol. 2009; 83:48-58.

(35) Crespo LB, Spencer ZA, Nekl E, Pusztai-Carey M, Moar WJ, Blair D, Siegfried W. Comparison and Validation of Methods To Quantify Cry1Ab Toxin from Bacillus thuringiensis for Standardization of Insect Bioassays. Applied Environmental Microbiology, 2008; 74 :130–135


(41) Tsume Y; Taki Y; Sakane T; Nadai I; Sesake I, Watabe K, Kohno T, Yamashita S. Quantitative evaluation of the gastrointestinal absorption of protein into the blood and lymph circulation. Biological & pharmaceutical bulletin, 1996; 19 : 1332-1337