

# Fraud in Maize Gluten: Discovery through Microscopy Controls and Chemical Analyses

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## Products with the appearance of maize gluten contain cereal by-products and N-rich organic compounds.

Maize gluten is a protein rich raw material (roughly 60 % of crude protein) used mainly in ruminant and poultry feedstuffs. Even if it is a by-product, left over following maize starch extraction, it is also a valuable and expensive component entering in animal feeding, with high nutritional value especially because of its high methionine level and low degradability in the rumen.

**Switzerland does not produce this material and consequently imports about 50.000 tons of maize gluten per year.**



The only normal maize gluten

The companies importing raw materials usually have samples analyzed for GMO content and may also check additional parameters such as crude protein (RP) content. In addition, Switzerland's official control authorities perform occasional sampling at the border or in the feed mills and have the products checked, also for the presence of meat and bone meal (MBM).

**In the last years, to avoid the problem of transgenic maize grown in the USA, a large part (above 80 %) of the maize gluten was imported from China.**

The RP analysis is a measurement of the nitrogen content of a sample followed by a calculation (extrapolation) using an average factor for known products (6.25). This type of analysis does not allow to differentiate between nitrogen in proteins and nitrogen in simple organic compounds like urea and related compounds.

The method used for checking the samples for the presence of MBM, the classical microscopy (CM), similarly does not give absolute proof for the presence or absence of definite proteins, but the observation of the particles gives good information on the content of the presented maize gluten: does it look normal, does it stain as usual, does it contain starch, seed envelopes or wheat bran, etc...?

More information on the presence or absence of protein is given by the analysis of a single amino acid, the methionine for example.

**Some findings of the CM (such as presence of starch and wheat bran), accompanied by very low methionine content despite a high RP value, led the official control unit to analyze some samples for the presence of urea, melamine, cyanuric acid, ammeline and ammelide. In spring 2007, 11 out of 63 samples of maize gluten analyzed proved to be falsified: a large part of the product was constituted of wheat by-product, whereas the nitrogen content was artificially elevated, mainly through addition of urea. In some cases small quantities of melamine or cyanuric acid were also found.**

Urea is a nutritional additive authorized for ruminants -if declared. In pigs and poultry however, this substance can cause kidney problems. As for the other two organic substances, they are not authorized in animal feeding.

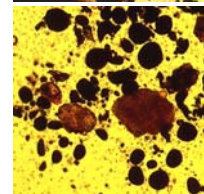
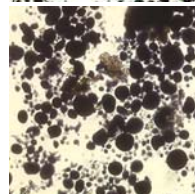
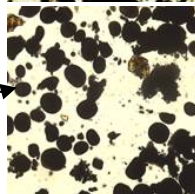
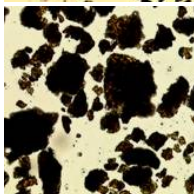
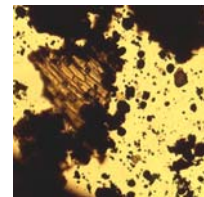
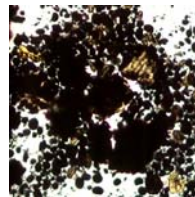
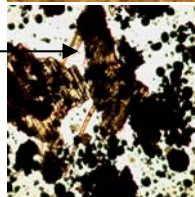
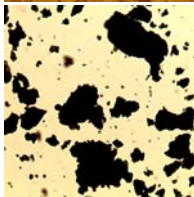
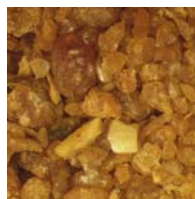
The fraud concerned about 2500 tons of imported maize gluten from China. Unfortunately, a large part of the product had already been used, but the rest was either destroyed or (when only urea was present) used in ruminant nutrition after cautious analysis and corrected declaration.

### Normal maize gluten:

- high crude protein (600 g/kg)
- few starch grains and bran fragments
- high methionine content (14 g/kg)
- low fibre (cellulose) content (10 g/kg)

### Falsified maize gluten:

- high crude protein ( $N * 6.25 = 650$  g/kg)
- numerous starch grains and bran fragments
- low methionine content (2 g/kg)
- high fibre (cellulose) content (55 g/kg)
- urea content (140 g/kg)
- melamine content (60 mg/kg)



Bran particle

Coloration with potassium iodine solution

Starch grain



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Federal Department of Economic Affairs DEA  
Agroscope Liebefeld-Posieux  
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