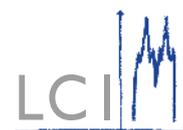


# Is 'Red' Always 'Red'?

4-aminocarminic acid as an accompanying substance in 'carmine'



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## A. What is 4-aminocarminic acid?

4-aminocarminic acid (4-ACA) belongs to the class of primary aromatic amines (cf. figure 1). It is a molecule with an anthraquinone structure, in which glucose is glycosidic bound. In solution it has an intense red colour which even remains stable at low pH values, higher temperatures, and exposure to light.

## B. Where does 4-aminocarminic acid occur?

4-ACA occurs as a by-product in the approved food colouring E 120 'carmine'.

The natural pigment carmine is an anthraquinone dye that is extracted from the dried female cochineal scale insect (*Dactylopius coccus*) using water, ethanolic, or

Regulation (EU) No 231/2012). The colouring E 120 produces an intensive red tone, but in contrast to 4-ACA, it changes to orange at lower pH values.

When extracting the pigment from the cochineal insect and when heating the colouring, 4-ACA may be spontaneously generated from free carminic acid and a source of ammonium (e.g., the insect's protein) and, hence, may also be present in the extract to a marginal extent. In low amounts, it may also naturally occur in the insect itself and, thus, may be simultaneously extracted.

## C. How does 4-aminocarminic acid get into foods?

The German Federal Ministry of Food and Agriculture (BMEL) has current information

## D. Can 4-aminocarminic acid pose a health risk?

### Current EFSA data gathering process

Regulation (EU) No 1333/2008 provides that food additives are to be regularly re-evaluated by the European Food Safety Authority (EFSA) since their applications and analytical methods may be expanded and modified in course of time. Hence, within the scope of re-evaluating the colouring E 120, 4-ACA also came under the scrutiny of the public authorities. Whereas a few primary aromatic amines (pA, such as 4-naphthylamine) – to which also 4-ACA belongs – are classified as carcinogenic, no data has so far become available on the toxicity of 4-ACA.

Carmine (E 120) itself is deemed to pose no risk to health from a toxicological point of view.

## E. How is 4-aminocarminic acid analysed?

As a water-soluble red colouring, 4-ACA can be successfully analysed using high performance liquid chromatography (HPLC) and a photodiode array (PDA) detector set at a wavelength of 525-530 nm. Analysis via tandem mass spectrometry (LC-MS/MS) is also applicable.

## F. Do maximum levels exist for 4-aminocarminic acid in foodstuffs? Current debate

The specifications for E 120 are currently under revision including its denominations and the maximum levels of certain occurring contaminants. Accordingly, there is also a discussion about a maximum level of 4-ACA in the colouring E 120. A position paper recently published (February 2017) by the Natural Food Colours Association (NATCOL, Basle) submitted a proposal to the European Commission (DG SANTE) and EFSA for setting a maximum 4-ACA content of 3% in the final colouring solution. SW

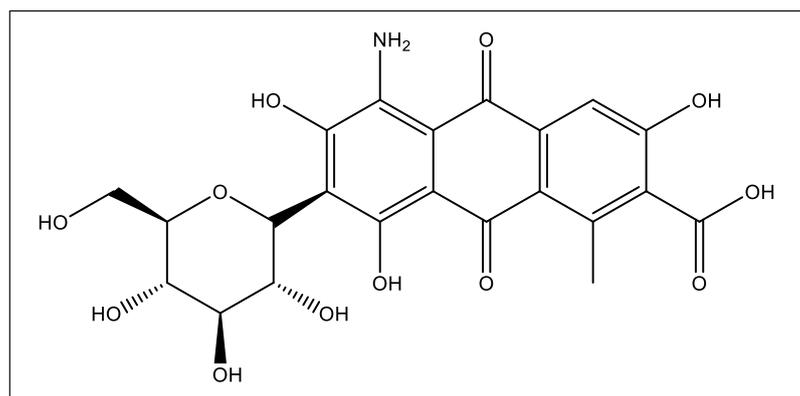


Figure 1: Structure of 4-aminocarminic acid

water/ethanolic mixture. Other approved denominations of 'carmine' are cochineal or natural red 4, listed in the Colour Index (C.I.) as CI 75470.

According to the EU positive list of food additives (Appendix II of Regulation (EU) No 1333/2008), E 120 is approved for all foods and beverages; the substances used are the ammonium, calcium, potassium, and sodium salts of carminic acid and its aluminium lakes (specifications set out in

on hand relating to the fact that the colouring carmine E 120 containing high levels of 4-ACA is used in various foodstuffs. However, it is labelled as carmine E 120. 4-ACA is not included in the EU's list of approved additives and is hence a non-approved additive. E 120 with considerable amounts of 4-ACA is marketed as 'acid-resistant 'carmine' and can be found in high levels in foods and beverages where E 120 is declared as being the colouring agent. This raises the suspicion of food fraud.