Methyl Glyoxal as Cause of Infantile Beriberi, Preliminary Report

By

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Arakawa’s reaction was published in 1930 from our Clinic. Human milk negative to Arakawa’s reaction was defined as a milk from a thiamine deficient body. Soon after the publication of the reaction, it was noticed that Arakawa-negative milk is a more or less toxic milk. In 1934 Takamatsu found that it contained methyl glyoxal (like substance) and showed with Sato (one of the authors) that synthetic methyl glyoxal caused death with heart enlarging and hypernea in thiamine deficient animals, while thiamine was, as their results showed, able to keep the animals healthy in spite of use of the glyoxal.

We (Sato and Takamatsu) were thus able to publish as early as 1934 that (synthetic) methyl glyoxal would cause death with heart enlarging. Takamatsu showed that methyl glyoxal could make Arakawa-positive milk Arakawa-negative, and in 1948 T. Morikawa proved that Arakawa-negative milk could if treated with ether, become Arakawa-positive due to the removal of (ether-soluble) methyl glyoxal (like substance).

In spite of these and other investigations from our Clinic most of the beriberi references, busy with pyruvic acid, seem to have considered these works as unimportant mainly because since the publication of the Emden-Mayerhof scheme of carbohydrate metabolism methyl glyoxal has been discarded.

Now strictly chemical investigation of human milk (negative to Arakawa’s reaction) in a large amount was started by Wako (one of the authors), who was able to isolate methyl glyoxal by strictly chemical analysis from it at last, while pyruvic acid was incapable of being identified from milk even by paper chromatography.

In 1940, Fehily experienced that, in Hongkong where fatal infantile beriberi had been prevailing, the milk of these mothers was Arakawa-negative, and that it was, as had been shown by many papers from our Clinic, changed to Arakawa-positive milk on thiamine administration to lactants.

The cause of acute cardiac death in infantile beriberi is methyl glyoxal, or beriberi death is due to methyl glyoxal poisoning.

References