

Letter to the editor

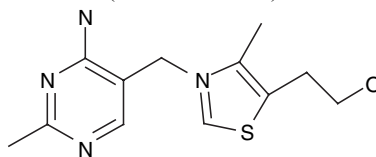
Prediction of asthma hazard of thiamine

The cases of occupational asthma caused by thiamine described by Drought et al. (1) provide an example of yet another novel low molecular weight organic asthmagen. For this group of compounds, a quantitative structure-activity relationship model (QSAR) has been developed for prediction of asthma hazard by Jarvis et al. (2). On submitting a chemical structure, the model calculates an asthma hazard index between zero and one indicating the likelihood that the chemical structure has asthmagenic potential. It is freely available on the internet through the following website: <http://www.coeh.man.ac.uk/research/asthma> (Accessed 1 December 2005).

In the cases reported by Drought et al., confirmation of thiamine as the asthmagenic chemical has been obtained through

bronchial challenge testing. It also scores a hazard index of 0.95 on this asthma hazard QSAR indicating that it almost certainly has the chemical structural requirements for asthmagenicity. Validation has shown that the QSAR correctly identifies asthmagens with a sensitivity of 86% and specificity 99%.

Thiamine (CAS no.59-43-8)



The asthmagenicity probably resides in the highly nucleophilic (electron rich) parts of the molecule including four nitrogen atoms (three heterocyclic and one amine).

One can postulate that these nucleophilic species can readily react with native protein. Such a chemical reaction could result in immunogenicity via a classical hapten-protein conjugate. If more than one of these nitrogen atoms react simultaneously at different sites of a protein molecule, cross-linking and conformational change could result, exposing epitopes that the immune system regards as foreign.

Readers are invited to use the Chemical Asthma Hazard Assessment Program online and to provide us feedback.

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References

1. Drought VJ, Francis HC, Niven RMcL, Burge PS. Occupational asthma induced by thiamine in a vitamin supplement for breakfast cereals. *Allergy* 2005;**60**:1213–1218.
2. Jarvis J, Seed MJ, Elton RA, Sawyer L, Agius RM. Relationship between chemical structure and the occupational asthma hazard of low molecular weight organic compounds. *Occup Environ Med* 2005;**62**:243–250.