

Correspondence

Non-ideal Gas

SIR,—In view of the continuing flurry of polemics over the rights and wrongs of CS "gas", it is absolutely vital that the slender body of available factual evidence relating to the toxicity of the material be described with dispassionate accuracy. In the circumstances we have no alternative but to apologize and to assume full responsibility for a premature conclusion in our work on the toxicity of CS, which was reported in your excellent article¹. Investigations carried out since these preliminary results were presented at the BSSRS symposium last November have revealed that the cytotoxic effects of injected CS on kidney and liver cells in mice are by no means clear-cut, and also that the primary locus of short-term toxicity resides in neither of these organs. In any case, this histological work is likely to prove irrelevant to the use of CS in riot control.

Some studies of CS toxicity have been published. Punte and his associates² at Edgewood Arsenal, Maryland, derived an approximate value for the LD₅₀ of 8 mg/kg body weight by intravenous injection into rabbits. These authors also showed that inhalation of CS aerosols by pigeons and by various mammals could cause death, and included LC₅₀ values. Pulmonary oedema and haemorrhage of the adrenal glands were sometimes found, especially at high inhalation doses. Particles of CS also produced necrosis at sites of impact in both the gastrointestinal and respiratory tracts. As far as can be gathered, all experimental animals which have been subjected to CS aerosols were protected externally by hair or feathers. The comparison of such findings with the analogous situation in man is not therefore straightforward. Other studies have been carried out at Edgewood Arsenal and elsewhere, but, without denying the importance of making such studies public, the deduction that failure to publish automatically implies the discovery of disturbing features on the part of the material is a little facile.

When CS is employed in riot control, two things may happen. First, an amount of the agent may enter the body, and second, the subject may suffer cellular injury, most probably in the respiratory tract. If the Himsworth Committee confirms its original intention to consider CS as a drug, then the quantitative relationships between dose, effectiveness of action and toxic hazard become the crucial issue. The degree of exposure of any individual in a crowd can bear no resemblance to the defined dosage of a drug taken by a patient under the care of his physician. Moreover, very wide variation in the susceptibility of people to CS has been reported^{3,4}. With knowledge of the action of poisons increasing rapidly and with techniques for detecting cytotoxicity becoming more sophisticated, we may soon find that any anti-personnel chemical causes some tissue damage somewhere, and hence constitutes a hazard to health. If experimental support for this concept is forthcoming, a humane society may have no alternative but to abandon the use of these materials entirely.

Yours faithfully,

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¹ *Nature*, **226**, 95 (1970).

² Punte, C. L., Weimer, J. T., Ballard, T. A., and Wilding, J. L., *Toxic. Appl. Pharmac.*, **4**, 656 (1962).

³ Owens, E. J., and Punte, C. L., *Amer. Ind. Hyg. Ass. J.*, **24**, 262 (1963).

⁴ Punte, C. L., Owens, E. J., and Gutentag, P. J., *Arch. Envir. Health*, **6**, 366 (1963).

Syn and Anti

SIR,—In discussing the molecular conformation of nucleosides (*Nature*, **225**, 1190; 1970), your Biomolecular Structure Correspondent states that the pucker of the sugar ring in 4-thiouridine (Saenger and Scheit, *Angew. Chemie*, **8**, 139; 1969) is C2' endo whereas the original paper states that the pucker is C3' endo. In the case of pyrimidine nucleosides with a C3' endo pucker the energy minimum for a *syn* conformation is not as low as that for the *anti* conformation, which makes the 4-thiouridine structure perhaps even more interesting than your correspondent suggests.

Yours faithfully,

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Our Biomolecular Structure Correspondent writes: A typical C2' endo sugar has C2' ~0.5 Å out of the plane defined by C1', O1' and O4', on the same side as C5', and C3' ~0.1 Å out of plane on the other side. In a C3' endo sugar the out of plane displacements of C2' and C3' are reversed. In 4-thiouridine both C2' and C3' are displaced on the same side of the plane as C5' by 0.3 Å and 0.8 Å respectively, and this rather unusual conformation might be described as "C2' endo, C3' endo". However, from the point of view of the orientation about the sugar-base link, the position of C2' and its attached hydrogen is of particular importance and it was in this context that I described the conformation as approximating to C2' endo. It may be that this description left an impression over-generous to the computerized seekers after energy minima; nevertheless, theirs is never the most rewarding of pursuits and I feel the 4-thiouridine observation provides them with some modest crumb of comfort which it would be churlish to ignore.

Butterfly Blues

SIR,—In Peter Scott's impressive catalogue (*Nature*, **225**, 1174; 1970) of the conservation projects of the World Wildlife Fund, one small inaccuracy needs correcting. The Large Blue butterfly, *Maculinea arion* Linn., should not be described as a species "threatened with world extinction". I can testify to its continued prevalence over much of the Swiss Alps and the Jura, and five years ago I recall finding it equally common in the foothills of the Caucasus at Sochi.

This makes it none the less desirable to save *M. arion*, if possible, from extinction in Britain. And I would like to stress the special value of comparative studies of the environmental pressures on such species, in areas where they are disappearing and in others where they continue to flourish. The need for this type of study is liable to be neglected—possibly because, involving prolonged field work by identical methods in more than one country, it may frequently demand more time and money than the amateur can give it. I hope the World Wildlife Fund will step in to support such an approach where it is required.

Yours faithfully,

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