Preliminary Communications

Unusual Reaction to Suxamethonium Chloride

Brit. med. J., 1966, 2, 1305

In the course of experimental surgery on a large number of six-month-old boars a most unusual reaction to the relaxant suxamethonium chloride was encountered in three animals. The affected pigs were litter mates, suggesting that this hitherto undescribed reaction is familial, resembling in this regard those cases of suxamethonium sensitivity associated with reduced levels of pseudocholinesterase (Lehmann and Ryan, 1956).

In each pig premedication and induction of anaesthesia were entirely without incident. For premedication phencyclidine (phenylcyclohexylpiperidine) 30 mg. and atropine sulphate 1.8 mg. were given intravenously. Anaesthesia was induced by a halothane/oxygen mixture some 20 minutes after the premedication.

CASE REPORTS

Case 1.—After induction a 100-mg. dose of suxamethonium chloride was given intravenously. Instead of the fasciculation and mild contraction of the limb muscles ordinarily associated with suxamethonium administration, the injection was immediately followed by a violent convulsive seizure which was not followed by relaxation, though apnoea occurred. The jaw was forced open, a V12 cuffed endotracheal tube introduced, and ventilation with oxygen begun. Within 30 to 40 seconds of intubation the muscles of the neck, trunk, and limbs slowly contracted and became hard and fixed. At this point, though the circulation seemed to be unaffected, the skin showed patchy mottling similar to that seen in cadavers, and the appearances as a whole resembled those of an animal in rigor mortis. Another striking feature at this stage was brawny oedema affecting the soft tissues of the lower jaw. Gallamine triethiodide (280 mg.) was given intravenously but was without effect on the muscle contraction. Ventilation was continued and it was noted that the soda-lime canister became too hot to touch some four minutes after having been introduced into the circuit, suggesting that the CO₂ output was higher than normal. Despite the use of a mechanical ventilator, as compliance decreased ventilation became inadequate and the animal died of asphyxia. The pulse rate and volume remained normal until adequate ventilation could no longer be maintained.

Case 2.—Here again the intravenous injection of 100 mg. of suxamethonium produced a convulsive seizure which was not followed by a period of relaxation. Despite difficulties due to vocal-cord spasm, intubation was carried out and the lungs of the pig were ventilated with a halothane/oxygen mixture. The rectal temperature at this time was 102.8° F. (39.3° C.). Within five to seven minutes, when complete board-like rigidity identical with that described in the first pig had developed, the temperature was 109° F. (42.8° C.), and this eventually rose to 111° F. (43.9° C.). Ventilation became increasingly difficult owing to decreasing compliance, and the animal died. Cadaveric mottling and brawny oedema of the tissues of the lower jaw were again prominent features.

Case 3.—The third litter mate was scheduled for operation a week after the two already described. At the time of its suxamethonium injection the pig was fairly deeply anaesthetized and was relaxed, well oxygenated, and breathing quietly. Electrocardiographic monitoring showed no abnormality. Injection of suxamethonium was followed by the now expected convulsive seizure, and within two minutes board-like rigidity of all the muscles was present. The

degree of vocal-cord spasm which accompanied this was so great that intubation proved impossible. For a few minutes ventilation was carried on by means of a face mask, but compliance rapidly decreased and ventilation could no longer be maintained. Until this point was reached the electrocardiographic tracing remained normal. In none of the affected animals did the muscle spasm relax after death.

The brains of the first two cases were examined by Dr. A. C. Palmer, of Cambridge Veterinary School. He found severe and widespread venous congestion, together with petechial haemorrhages in the thalamus, midbrain, and roof of the cerebellum. We have interpreted these changes as being secondary to severe generalized anoxia.

DISCUSSION

In the course of these misadventures three separate batches of suxamethonium were used. Two of these were used on the same day to produce relaxation in other pigs, and these inductions were without incident. The third batch was not used on any other animals but was submitted for testing to Professor E. Zaimis, of the Royal Free Hospital Medical School, who reported it as being in no way abnormal. This suggests that the cause of this bizarre reaction is to be found within the pigs themselves rather than being due to any defect in the samples of suxamethonium.

The occurrence of this clinical picture in three litter mates indicates that the abnormal reaction is probably genetically determined. The possible inheritance patterns and the pharmacological nature of the defect must await investigation of future litters from the dam and sire of these affected animals. It seems likely, however, that the postulated genetic abnormality has a high degree of penetrance.

The recognition of this abnormal reaction pattern may be of some clinical importance in view of recent evidence which suggests that similar abnormal reaction to the administration of suxamethonium may be encountered in humans. One case with an almost identical clinical picture to the one described in pigs is being reported by Dr. H. T. Davenport, of the Montreal Children's Hospital (personal communication, 1966), and he and his colleagues have collected and are investigating a further four such cases in Canada.

These data, together with ours, suggest the existence of a probably rare but serious additional hazard associated with the use of depolarizing muscle relaxants.

This work was supported by the Tobacco Research Council. We are grateful to Professor A. C. Dornhorst, Professor E. Zaimis, and Dr. A. C. Palmer for valuable advice and help.

L. W. HALL, M.A., B.SC., PH.D., M.R.C.V.S.,
Department of Veterinary Clinical Studies, Cambridge
Veterinary School.

N. WOOLF, M.B., PH.D., M.MED.PATH., M.C.PATH.,
Department of Pathology, St. George's Hospital Medical
School, London.

J. W. P. BRADLEY, B.M., B.CH., F.R.C.S.,
Department of Surgery, St. George's Hospital, London.

D. W. JOLLY, M.R.C.V.S.,
Huntingdon Research Centre.

REFERENCE

Lehmann, H., and Ryan, E. (1956). *Lancet*, 2, 124.