Short communications

Responses to pressor substances in conscious and anaesthetized cats

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The blood pressure responses to intravenous injections of noradrenaline, tyramine and McN-A-343 have been determined in conscious cats and in cats under pentobarbitone sodium, α-chloralose, urethane or α-chloralose plus urethane anaesthesia. All four anaesthetic agents reduced the pressor responses, the reduction being most pronounced with urethane and least pronounced with α-chloralose. Pentobarbitone sodium exerted a greater inhibitory effect on the responses to McN-A-343 than on those to noradrenaline or tyramine.

Anaesthetic agents can modify the responses to drugs acting on the cardiovascular system. The use of a technique for continuous measurement of the blood pressure in conscious cats has permitted an investigation into the effect of some anaesthetic agents on the cardiovascular reactivity. The results of this study may help in the selection of suitable anaesthetic agents for cardiovascular research.

Methods.—*Conscious cats.* Five conscious female cats (2·4–3·2 kg) were prepared for the measurement of the aortic blood pressure and for the intravenous injections of substances according to the method described by Day & Owen (1970). The technique is a modification of that described by Thuransky (1966) in which the valve system described by Hall, Gomersall & Heneage (1967) has been used to close the aortic cannulae.

Anaesthetized cats. Twenty female cats (2·5–3·1 kg), five for each anaesthetic drug, were anaesthetized by an intraperitoneal injection of one of the following drugs: pentabarbitone sodium, 40 mg/kg; urethane, 1·5 g/kg; α-chloralose, 80 mg/kg; a mixture of urethane, 400 mg/kg with α-chloralose, 40 mg/kg. After cannulation of the trachea, the right carotid artery was prepared to monitor the blood presure and the right jugular vein for the intravenous injections of the pressor substances.

The blood pressure responses to noradrenaline, tyramine and to McN-A-343 (4-(*m*-chlorophenylcarbamoyloxy)-butynyltrimethylammoniumchloride) were studied in conscious and in anaesthetized animals.

In preliminary studies in conscious cats, doses of noradrenaline, tyramine and McN-A-343 eliciting blood pressure increases of about 75 mmHg were determined and used throughout this series of experiments. Each of the three pressor agents was administered three times to each cat at intervals of 10 min, that is fifteen responses to each substance were obtained in each group—one group of conscious cats and four groups of anaesthetized cats. As all the anaesthetics reduced cardiovascular reactivity, larger doses of each of the pressor agents were also given to the anaesthetized cats in order to determine the dose required to elicit pressor responses of similar magnitude to those observed in the conscious cats.

Results.—The pressor responses to injections of noradrenaline, tyramine and McN-A-343 were reduced by all four anaesthetics used. The mean of the responses to the pressor agents in each group of cats is illustrated in Fig. 1.

To quantitate the reduction in the cardiovascular reactivity caused by the anaesthetics larger doses of noradrenaline, tyramine and McN-A-343 were given to the anaesthetized cats. The factor by which it was necessary to increase the dose to obtain a response similar to that in the conscious animals represented the degree of reduced cardiovascular reactivity. α-Chloralose reduced the responses to all three pressor agents by a factor of about 1·5, the urethane-chloralose mixture by a factor of about 5 and urethane alone by a factor of about 12. Pentobarbitone sodium decreased the reactivity to noradrenaline and to tyramine by a factor of about 2, and to McN-A-343 by a factor of about 5.

Discussion.—Anaesthesia is usually required for cardiovascular research. This study provides information on the effect

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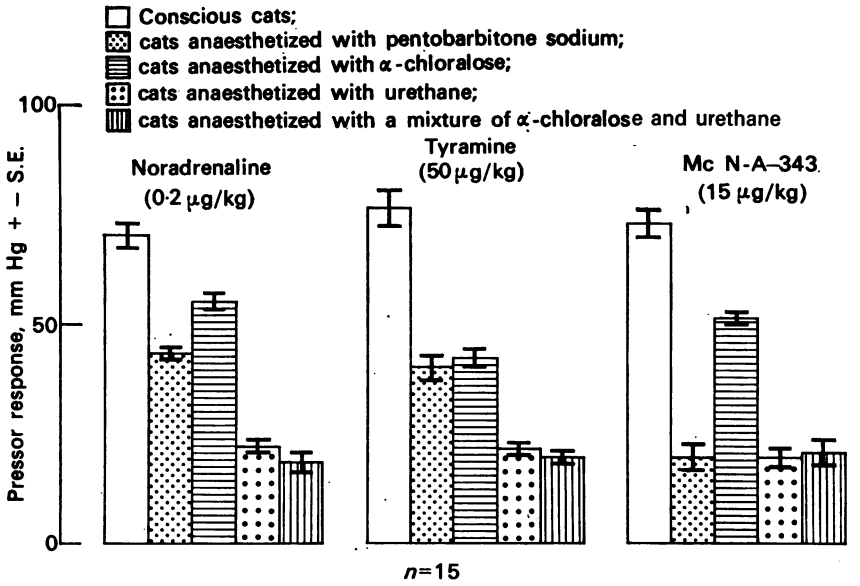

FIG. 1. Pressor responses in conscious and anaesthetized cats. Responses to noradrenaline, tyramine and McN-A-343 in conscious cats, cats anaesthetized with pentobarbitone sodium, cats anaesthetized with α-chloralose, cats anaesthetized with urethane and cats anaesthetized with a mixture of α-chloralose with urethane. (Means ± standard errors of the means.)

of four commonly used anaesthetics on the cardiovascular reactivity. Responses to pressor agents have been determined in conscious cats in which the cardiovascular system and its control mechanisms might be expected to function normally. A comparison of the responses observed in conscious cats with those of anaesthetized cats has clearly shown that each of the four anaesthetics used reduced the cardiovascular reactivity.

The pressor responses to noradrenaline are due to stimulation of peripheral receptors in the muscles of the cardiovascular system, those to tyramine to the release of noradrenaline from the postganglionic sympathetic nerve endings and those to McN-A-343 to a stimulation of sympathetic ganglia (Roszkowski, 1961).

α-Chloralose, urethane and the mixture of α-chloralose and urethane caused different degrees of reduction of cardiovascular reactivity but for a given anaesthetic the reduction in the responses to each of three pressor substances was similar. This would suggest that the reduced reactivity in the anaesthetized cats was due to a reduction in the responsiveness of the peripheral noradrenaline receptor, α-chloralose causing the least reduction and urethane the most. Pentobarbitone sodium caused a reduction of the receptor responsiveness by a factor of about 2 to noradrenaline and tyramine, but caused a larger reduction in reactivity to McN-A-343. This is probably due to an additional depression of autonomic ganglion transmission which occurs after administration of barbiturates (Exley, 1954).

The results of this study indicate that all four anaesthetics investigated reduce the cardiovascular reactivity in cats. The effect is least pronounced under α-chloralose anaesthesia which would, therefore, seem preferable to pentobarbitone sodium, urethane and mixtures of α-chloralose with urethane for cardiovascular research projects.

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