BRIEF NOTE

An Indirect Method for Measurement of Systemic Blood Pressure in Animals

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Systemic blood pressure is an important piece of information in the investigation of the physiological condition of the living body. In the medical field, an indirect method for measurement of systemic blood pressure has been used as a routine work both in making a diagnosis and in nursing. In the field of animal experiment or clinical veterinary medicine, however, such method has not yet been used practically. Main reasons why the indirect method for man cannot be applied to animals are the differences in hair and skin conditions and in the shapes of legs and arms. Therefore, it is very difficult to auscultate Korotokov's sound and to press uniformly peripheral arteries in animals.

In the recent years, the blood stream was observed by means of Doppler's effect of the ultrasonic wave. Several indirect measuring methods have been devised by the application of this effect to the systolic pressure of man. Few reports, however, were published on the systolic and diastolic pressure of animals [1].

The instruments of the present method

are composed of a cuff and an ultra sound converter monitoring the blood stream in the peripheral portion of the cuff biding. The frequency of the ultra sound wave is 5MHz and the probe 5 or 10 mm in diameter with a specific protecting improvement against noise. The cuff is concave with 50 cm in radius of curvature for the dog and cattle (13.5 cm×15 cm) and 90 cm for the horse (12 cm×22 cm). The cuff is placed at the forehead in dogs, the tail root in cattle, and the forearm in horses. The blood stream was investigated by the probe on the blood vessels of the proximal portion of the hand in dogs, on the A. caudalis in cattle, and on the A. mediana in horses.

Fig. 1 shows the original records of fundamental examination of this method on the Beagle dog to investigate the relationship between the measurements of the direct method and those of the indirect method. The monitoring sound of the blood stream changed remarkably at the point of internal pressure of the cuff was at the same level as the minimal blood pressure in the direct

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Fig. 1. Original record of a fundamental experiment

Remarks.

AP: Aortic pressure. FAP: Femoral arterial pressure. ant. AP: Blood pressure of the proximal portion of hand on opposite side. CP: Internal pressure of the cuff. AFV: Blood stream of proximal portion of hand. ECG: Electrocardiogram in A-B lead. HR: Heart rate in cardiograph.

Table 1. Systemic blood pressure in cattle, horses and dogs (Mean $\pm$ S.D.)

			Systolic pressure	Diastolic pressure
Cattle (Holstein)				
Cow	(26) *		145.4 $\pm$ 21.0	99.5 $\pm$ 21.4
Calf	(5)		124.0 $\pm$ 4.2	86.0 $\pm$ 6.5
Horse (Thoroughbred)				
Mare	(6)		145.0 $\pm$ 12.2	107.5 $\pm$ 12.1
Rearing colt	(3)		156.7 $\pm$ 7.6	108.3 $\pm$ 7.6
Colt	(2)		145.0	112.5
Dog (Beagle)				
Female adult	(17)		160.0 $\pm$ 8.9	103.5 $\pm$ 8.1
Male adult	(2)		165.0	105.0

Remarks.

*: Number of observations.

Fig. 2. Correlation charts of blood pressure by the direct method and internal pressure of the cuff

Remarks.

●: Pressure increasing. ○: Pressure decreasing. CP and ant. AP: See the remarks of Fig. 1.

observation. At the point of internal pressure the maximal blood pressure was reached in the direct observation, the pulsating sounds of the blood stream disappeared. The former was the diastolic pressure and the latter the systolic one. During this treatment, no changes were observed in aortic pressure, femoral arterial blood pressure, electrocardiogram, and heart rate in the dog, as shown in Fig. 1.

Fig. 2 presents correlation charts of measurements of systemic blood pressure by the

direct method and the internal pressure of the cuff separating the diastolic from the systolic phase. Linear relationships with correlation coefficients exceeding $+0.96$ were recognized in both pressure phases.

From these results, it is concluded that the present method may be applied practically to animal experiments and veterinary clinical practice. Systemic blood pressure determined by the present method in cattle, horses and dogs is summarized in Table 1.

References

- [1] Yoshida, S., T. Senta, S. Takenaga, and K. Kubo. (1973). *In* Proc. of the 76th Meeting of Jap. Soc. Vet. Sci., 103.