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Letter to Editor

Seasonal and circadian variations of hemodynamic and electrocardiographic parameters in telemetered beagle dogs

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Dear Editor,

Telemetered beagle dogs are widely used in nonclinical cardiovascular studies. Usually, animals are monitored for days and months to obtain successive telemetry data. However, the time-related variations that may confuse the data interpretation have not been illustrated. Serving as domestic animals, beagle dogs are reported with seasonal and circadian variations in biochemical (Ruaux *et al.*, 2012) or diseases (Debnath *et al.*, 2016). To define the seasonal and circadian variations of telemetry data in beagle dogs, we investigated the background data of systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), PR interval (PRi), RR interval (RRi), heart rate (HR), QT interval (QTi), and corrected QT (QTcv) in our facility.

In this investigation, totally 24 dogs (12 females and

12 males) were included, data were obtained from non-treated controls in 35 individual telemetry studies. All animal studies complied with the applicable guidelines, and were approved and monitored by the local IACUC in Shanghai Innostar Bio-tech Company, an AAALAC-accredited facility. The animals were surgically implanted with DSI TL11 M2 D70-PCT telemetry devices (Baird *et al.*, 2014). Data of SBP, DBP, MBP, PRi, RRi, HR, and QTi were recorded and analyzed using DSI Physiological Data Acquisition and Analysis System. Corrected QT was calculated with Van de Water formula:

$$QT_{cv} = QT - 87 \times (60/HR - 1)$$

All data were statistically analyzed using SPSS 21.0 or GraphPad Prism 5 software, and were presented as mean±SD.

As shown in Fig. 1, no difference was noted among

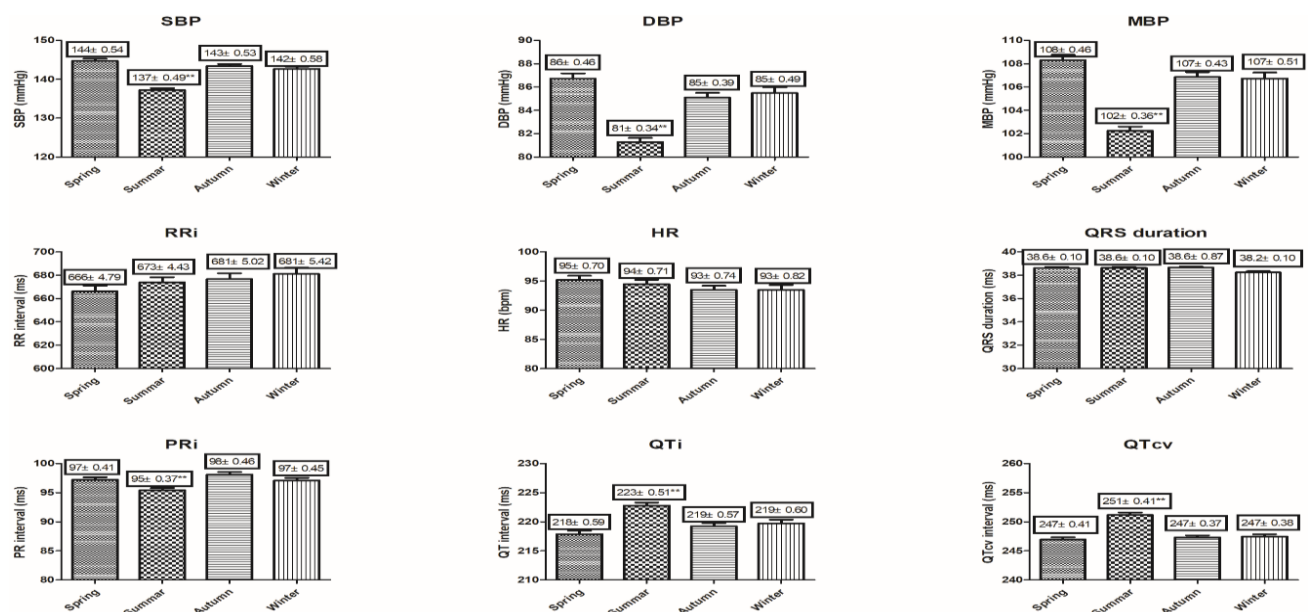


Fig. 1: Seasonal variation of hemodynamics and electrocardiogram in telemetered beagle dogs. Data was presented as mean±SD. A one-way ANOVA was used to assess the differences between seasons, and the pairwise comparison with value of spring was conducted using Dunnett t-test. ** P≤0.01. Spring: March to May, Summer: June to August, Autumn: September to November, and Winter: December to February. SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MBP: Mean blood pressure, RRi: RR interval, HR: Heart rate, PRi: PR interval, QTi: QT interval, and QTcv: corrected QT

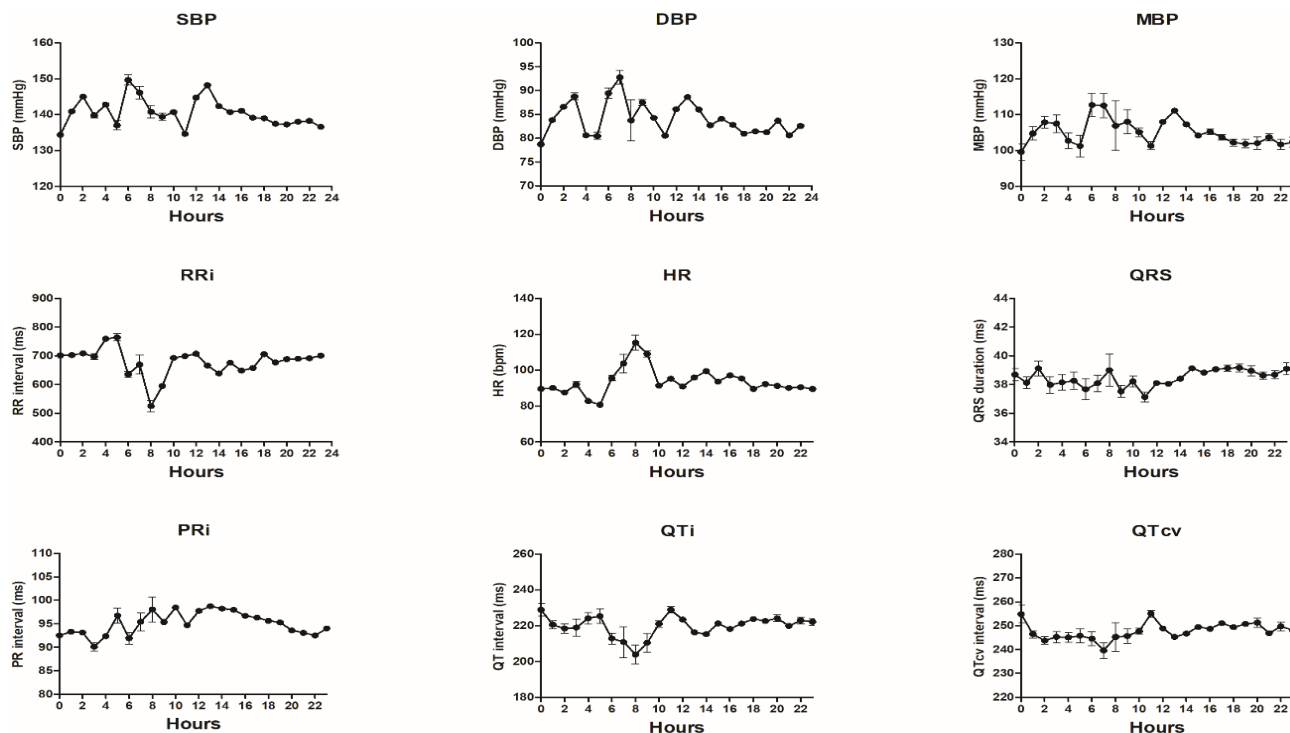


Fig. 2: Circadian variation of hemodynamics and electrocardiogram in telemetered beagle dogs. Data was presented as mean \pm SD. A one-way ANOVA was used to assess the differences between hours. SBP: Systolic blood pressure, DBP: Diastolic blood pressure, MBP: Mean blood pressure, RRI: RR interval, HR: Heart rate, PRi: PR interval, QTi: QT interval, and QTcv: corrected QT

the seasons of spring, autumn, and winter, while lower SBP, DBP, MBP, and PRi, as well as higher QT_i and QT_{cv} were noted in summer when compared to other seasons. Figure 2 illustrated that upregulation of SBP, DBP, and MBP during the daytime with peak values at 7:00 and 14:00, and downregulation during the night (although a slight increase was observed from 2:00 to 4:00). The profile was the same as the circadian rhythm in human beings (Giles, 2006). Same as the human counterpart (Black *et al.*, 2019), an increase of HR (or RRI decrease) was observed at daytime with peak value at 8:00. PR interval fluctuated during the daytime and was relatively stable at night. At about 11:00 am, a slight increase of QT_i and QT_{cv} was noted.

In conclusion, this investigation demonstrated seasonal variations of SBP, DBP, MBP, PRi, QT_i, and QT_{cv}, as well as circadian variations of SBP, DBP, MBP, RRI, HR, PRi, QT_i, and QT_{cv} in telemetered beagle dogs.

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Conflict of interest

The authors declare no conflict of interest.

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