Recommendations for Blood Pressure Measurement in Animals

Summary of an AHA Scientific Statement From the Council on High Blood Pressure Research, Professional and Public Education Subcommittee

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Accurate and meaningful measurements of blood pressure (BP) are often critical to the interpretation of studies of vascular biology, atherosclerosis, and other forms of cardiovascular disease. Although many research scientists have embraced advanced molecular technologies for studying cardiovascular function and disease pathogenesis, a surprising number of the same investigators continue to use suboptimal techniques for measuring BP in experimental animals. To address this problem and assist investigators in selecting optimal methods for BP monitoring, the American Heart Association (AHA) has developed a scientific statement on recommendations for BP measurement in experimental animals. These recommendations for BP measurement are briefly summarized in this article. The complete text and discussion of the recommendations are published online in Arteriosclerosis, Thrombosis, and Vascular Biology as well as in print in other AHA journals. Comprehensive recommendations for BP measurement in humans have also been developed and are published in the AHA journal Hypertension.

BP Measurement Methods

The techniques for measuring BP in experimental animals have improved considerably over the past decade, and several methods are available that allow routine monitoring of BP profiles throughout the day and night over prolonged periods of time in conscious, unrestrained, unstressed animals. Techniques for measuring BP in experimental animals can be divided into indirect methods and direct methods, and the technical details of these methods along with their advantages and disadvantages are discussed in the full report. The most commonly used indirect method for monitoring BP is the cuff technique, in which BP is measured in a tail or limb by determining the cuff pressure at which changes in blood flow occur during occlusion or release of the cuff. Radiotelemetry techniques or indwelling catheters connected to externally mounted transducers are widely used to make direct measurements of BP. In many situations, methods for measuring blood pressure through externally connected, fluid-filled catheters can provide nearly all of the same advantages as the more recently developed radiotelemetry techniques. Most methods for measuring BP can be applied in a range of animals, although certain technical modifications may be required depending on the species under study. In most cases, the choice of method should be driven by the investigative objective rather than the species of animal being studied.

Selecting a BP Measurement Method

Although indirect techniques that permit only intermittent measurements of BP may be suitable for some purposes, methods for directly measuring BP are generally preferred because of their ability to monitor the highly dynamic nature of BP in a comprehensive fashion. Selection of the methods to be used should ultimately be guided by the study objectives to insure that the techniques chosen are appropriate for the experimental questions being explored. Therefore, recommendations have been developed for selecting the optimal technique for measuring BP based on the study objective and on the advantages and disadvantages of the various BP measurement methods (Tables 1 and 2). For example, if the primary objective is to determine whether a new drug protects against atherosclerosis or cardiovascular damage independent of any effects on BP, then the investigator should use a monitoring technique that provides a comprehensive measure of the total BP load on the vasculature. For this kind of study objective, techniques that provide only sporadic measurements of BP would be less useful or even potentially misleading no matter how accurate those measurements might be. Specific recommendations for selecting BP measurement methods are summarized in Tables 1 and 2 and are discussed in detail in the full report.

Effects of Environmental Factors Including Anesthesia

It should be emphasized that regardless of the method used for measuring BP, systemic anesthesia should be avoided...
whenever feasible because of the well documented effects of anesthetics on cardiovascular function. It has long been recognized that commonly used anesthetics can affect multiple aspects of the circulatory system and that integrative cardiovascular responses often differ greatly in anesthetized versus conscious animals. A host of other external factors can also affect BP including, but not limited to, ambient room temperature, light cycle, noise levels, duration of human contact, number of animals per caging unit, proximity to other animals undergoing experimental procedures, cage unit size and design, and access to supplemental items such as toys, treadmills, and hiding spaces within the cage unit. Thus, it is important to keep in mind that many environmental factors can have substantial effects on cardiovascular function, and these factors should also be considered when using either indirect or direct methods for measuring blood pressure.

**References**

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