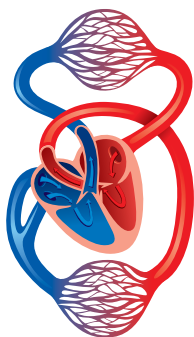


ASSURE[®] BRILLIANCE

COMPREHENSIVE SERVICE & SUPPORT PROGRAM

Blood Composition and Blood Glucose Testing



Blood glucose monitoring is a common assessment employed by healthcare professionals to guide patient management strategies. In many settings, a handheld blood glucose meter (BGM) is the device of choice. A BGM can provide a fast, accurate, and readily available tool to measure blood glucose levels. Blood glucose tests generally use a capillary blood sample acquired through a finger stick. This technique is accepted as the standard of care for self-monitoring and lends itself well to blood glucose monitoring in the clinical setting.

Some of the care provided by healthcare professionals may include intravenous access for delivery. While this does provide easy access to blood samples, it is important to ensure the sample is suitable for the medical device being utilized. All FDA-cleared blood glucose meters include individualized instructions for use (IFU) that provide guidance on how and where on the body a test sample should be obtained. Adherence to the IFU is the best way to ensure accurate results and minimize risk of patient harm.

Blood composition changes as it travels through the body. When blood leaves the lungs and begins its journey through the arterial system it is oxygen- and nutrient-rich. One of these nutrients in the blood is glucose (sugar). As the blood travels deeper into the peripheral vasculature, it will enter arterioles which lead to capillary beds. As the blood travels through the capillary bed, oxygen and nutrients are absorbed. At this time, the blood picks up waste products, including carbon dioxide, and begins traveling through the venules and the rest of the venous system to a variety of organs where the waste products and carbon dioxide are removed and the process begins again.

It may not seem like these changes in blood composition (Table 1) would be enough to affect the results of a blood glucose reading, but they are. The difference between a capillary and venous blood glucose test result can be as high as 49.5% (90 minutes postprandial).¹

As blood glucose monitoring systems have advanced they have become more sensitive and better able to detect the glucose in smaller samples in shorter periods of time. The challenges in developing an accurate BGM are amplified when drawing venous test samples and is why few medical device manufacturers have a blood glucose meter cleared by the FDA for venous blood glucose testing. Some of the challenges which may potentially impact the results, given the broad variation in collection techniques and environment variables, include but are not limited to:

- Postprandial venous glucose values may be significantly lower than capillary test samples
- Extended exposure to room air
- Anti-coagulants in collection vials

With all these variables it is important to review the IFU provided with the blood glucose system being used, to ensure the correct blood sample type is obtained for an accurate test result.

Table 1

Differences in blood makeup as it travels through the circulatory system.

Capillary Blood

Description

Capillary beds consist of the smallest blood vessels of the circulatory system. The capillary beds form a mixture of arterial and venous blood. The sample from a dermal puncture will therefore be a mixture of arterial and venous blood along with interstitial and intracellular fluids

Composition

PaO₂: 80–95 mmHg³
PaCO₂: 26–41 mmHg³
Color: Bright Red

Arterial Blood

Description

Oxygen- and nutrient-rich blood flowing from the heart into progressively smaller arteries to arterioles which branch into capillaries.

Composition

Blood Glucose: Comparable to capillary blood²
PaO₂: 80–95 mmHg³
PaCO₂: 35–45 mmHg³
Color: Bright red

Venous Blood

Description

Deoxygenated blood, urea and other waste products flow away from the capillary beds into the venules within the tissue which lead to progressively larger veins as it travels back to the heart.

Composition

Blood Glucose: up to 49.5%¹ lower than capillary blood³
PvO₂: 20–49 mmHg³
PvCO₂: 41–51 mmHg³
Color: Dark Red

References

1. Yang C, Chang C, Lin J. A Comparison between venous and finger-prick blood sampling on values of blood glucose. IPCBEE. 2012(39)206-10.
2. Patel N, Patel K. A Comparative Study of Venous and Capillary Blood Glucose Levels by Different Methods. GCSMC J Med Sci. 2015;4(1)53-6.
3. Lockwood W. Blood Gas Analysis. www.RN.org. Published: May 2016. Accessed: Jul 2016.