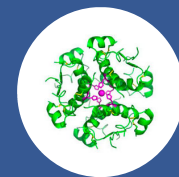


# SALIVARY INSULIN QUICK START GUIDE



## BIOLOGICAL CONSIDERATIONS

**Insulin function and regulation:** Insulin is a peptide hormone secreted from the beta cells of the pancreas and is responsible for maintaining normal blood glucose levels and supplying cellular energy by facilitating glucose uptake into cells. It also has many anabolic roles in regulating carbohydrate, protein and lipid metabolism, cell division and growth. Insulin secretion is stimulated or inhibited by many hyperglycemic hormones, such as Glucagon or Growth hormone, specific nutrients, like glucose or amino acids, and vagal or adrenergic neural pathways.

**Insulin dysregulation and pathogenesis:** The lack of insulin production in type I Diabetes Mellitus, caused by autoimmune islet destruction, results in pathogenic levels of glucose in the blood and requires exogenous insulin administration. Type II diabetes mellitus (T2DM) on the other hand is caused by the lack of insulin activity referred to as insulin resistance. 40% of people in the US are insulin resistant and are progressing towards T2DM. In most cases, they are completely unaware. Elevated fasting insulin or the dysregulation of insulin after ingestion of glucose over time are diagnostic hallmarks of insulin resistance. IR precedes T2DM onset by several years. Fortunately, IR is reversible by behavioral health changes which present an important opportunity for a pre-diabetic individual to avoid T2DM onset altogether.

**Utility of measuring salivary insulin:** In saliva, insulin shares a nearly linear correlation to fasting blood levels ( $r=0.92$ ) and is a reliable surrogate for serum measures. Interestingly, it takes roughly 30-40 minutes for serum insulin to be detectable in saliva (Fekete 1993) when studied using oral glucose tolerance tests (OGTT). Overall, salivary insulin at fasting or using an OGTT presents a unique opportunity to monitor insulin levels with convenient home sampling so that biofeedback can be provided more frequently to track an individual's degree of insulin resistance and monitor disease progression or regression through beneficial lifestyle changes.

<b>Biological Representation</b>	Systemic
<b>Serum-Saliva Correlation</b>	0.92

## SAMPLE TIMING AND DESIGN

**For Fasting Insulin:** Do not consume food or beverage within eight hours prior to saliva collection.

**For Oral Glucose Tolerance Testing:** Salivary insulin levels lag approximately 30-40 minutes behind serum levels.

## FREQUENTLY STUDIED WITH

Cortisol

## TECHNICAL SUMMARY

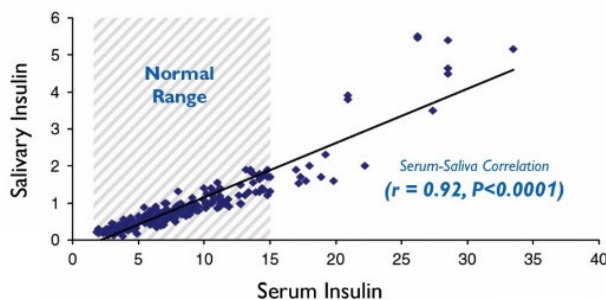
Sample Collection Methods & Volumes	
Passive Drool	✓
SalivaBio Swabs	✓
Optimum Collection Volume	125 $\mu$ L*

\*Add 300  $\mu$ L to the total collection volume for all analytes of interest.

## EXAMPLE DATA

Figure A: Correlation between fasting salivary and serum insulin.

Figure B: Insulin levels in serum and saliva before and after ingestion of 50 grams of dextrose



\*Fabre B, et al.

Figure A

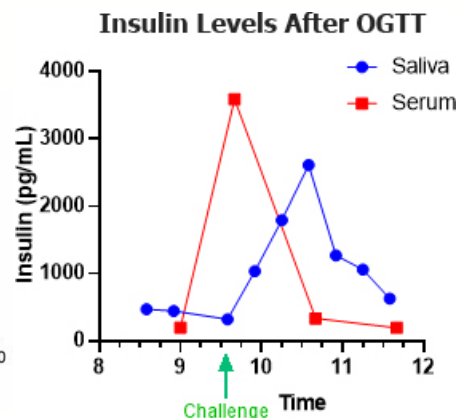


Figure B

## KEY RESOURCES

- Granger, DA, Taylor, MK. (2020). Salivary Bioscience: Foundations of Interdisciplinary Saliva Research and Applications. Springer. <https://springer.com/book/10.1007/978-3-030-35784-9>
- \*Fabre B, et al. (2012). Measurement of fasting salivary insulin and its relationship with serum insulin in children. *Endocr Connect.* 1(2): 58–61.
- Jones, A. (2021). UAB researchers find that 40 percent of young American adults have insulin resistance and cardiovascular risk factors. UAB News.
- Hartman ML, et al. (2016). Unhealthy Phenotype as Indicated by Salivary Biomarkers: Glucose, Insulin, VEGF-A, and IL-12p70 in Obese Kuwaiti Adolescents. *J Obes.* 2016: 68
- Zhao X, et al. (2016). Using Metabolomic Profiles as Biomarkers for Insulin Resistance in Childhood Obesity: A Systematic Review. *J Diabetes Res.* 2016:8160545.
- Goodson, JM, et al. (2014). Metabolic Disease Risk in Children by Salivary Biomarker Analysis. *PLoS One.* 9(6): e98799.
- Fekete Z, et al. (1993). Salivary and plasma insulin levels in man. *Biochem Mol Biol Int.* 30(4): 623–629.

