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Comparative Study of Saliva and Plasma in Hormone Level Monitoring

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Introduction

Monitoring hormone levels plays a vital role in diagnosing endocrine disorders, evaluating reproductive health, managing stress, and optimizing hormone replacement therapies. Traditionally, plasma or serum samples have been the gold standard for hormone quantification due to their established clinical reference ranges and analytical reliability. However, the invasive nature of blood collection, associated stress responses, and the need for trained personnel pose limitations, particularly in repeated or at-home sampling. In contrast, saliva sampling offers a non-invasive, stress-free, and easily accessible alternative that reflects the biologically active, unbound fraction of many hormones. The present study provides a comparative analysis of saliva and plasma for hormone level monitoring, focusing on analytical correlation, advantages, challenges, and the implications of using salivary diagnostics in routine clinical and research settings [1].

Description

In this study, we evaluated the concentrations of key hormones cortisol, testosterone, estradiol, and progesterone in matched saliva and plasma samples from a cohort of 120 individuals, comprising both healthy volunteers and patients undergoing hormonal therapy. Samples were collected under controlled conditions at specific times of day to account for circadian fluctuations. Saliva was collected using passive drool or swab techniques, while plasma was extracted via venipuncture. Hormone levels were quantified using high-sensitivity immunoassays and liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS), which allowed for the precise detection of both total and free hormone fractions.

The results revealed a strong positive correlation between salivary and plasma free hormone levels, particularly for cortisol and testosterone (Pearson's $r > 0.85$, $p < 0.001$). These findings support previous research suggesting that salivary measurements reliably reflect the unbound, bioactive portion of hormones available to tissues, which is often more clinically relevant than total plasma concentrations. For estradiol and progesterone, the correlation was moderate ($r = 0.65–0.75$), influenced by factors such as sample timing, menstrual cycle phase, and salivary flow rate. Nonetheless, salivary estradiol still showed consistent patterns with plasma levels in tracking ovulatory cycles and hormonal replacement therapies in women.

One of the most compelling advantages of salivary hormone testing is its ability to capture diurnal variation and dynamic hormonal changes without inducing stress, which can itself skew cortisol and other hormone measurements. Repeated sampling throughout the day allowed for detailed mapping of cortisol awakening response and diurnal decline, offering insights into Hypothalamic–Pituitary–Adrenal (HPA) axis function. This is particularly valuable in the assessment of stress-related disorders, chronic fatigue, and adrenal insufficiency. In contrast, plasma-based testing often provides only a single-point snapshot, which may not fully represent hormonal rhythm or functional reserve.

However, salivary testing is not without challenges. Contamination from food, bleeding gums, or improper sample handling can affect results. Additionally, lower hormone concentrations in saliva necessitate ultra-sensitive detection methods, and reference ranges are less standardized compared to plasma assays. Inter-individual variability in salivary flow rate and pH can also influence hormone partitioning and recovery. Despite these hurdles, advances in assay technologies and standardized collection protocols have significantly improved the reliability and clinical applicability of salivary hormone testing [2].

Conclusion

The comparative analysis underscores the growing relevance of saliva as a viable matrix for hormone level monitoring alongside plasma. While plasma testing remains the benchmark for certain diagnostic applications, salivary hormone measurements provide significant advantages in terms of convenience, non-invasiveness, and the ability to track biologically active hormone fractions and temporal fluctuations. With continued advancements in analytical sensitivity and standardization, saliva-based testing is poised to become a mainstay in both clinical practice and research. Integrating saliva into hormonal assessment protocols will enhance personalized medicine, patient empowerment, and the overall efficiency of endocrine diagnostics in the evolving landscape of healthcare.

Acknowledgement

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Conflict of Interest

None.

References

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