

False TSH and Free Thyroid Hormone Measurements in Pediatric Patients Treated with High Dose of Biotin

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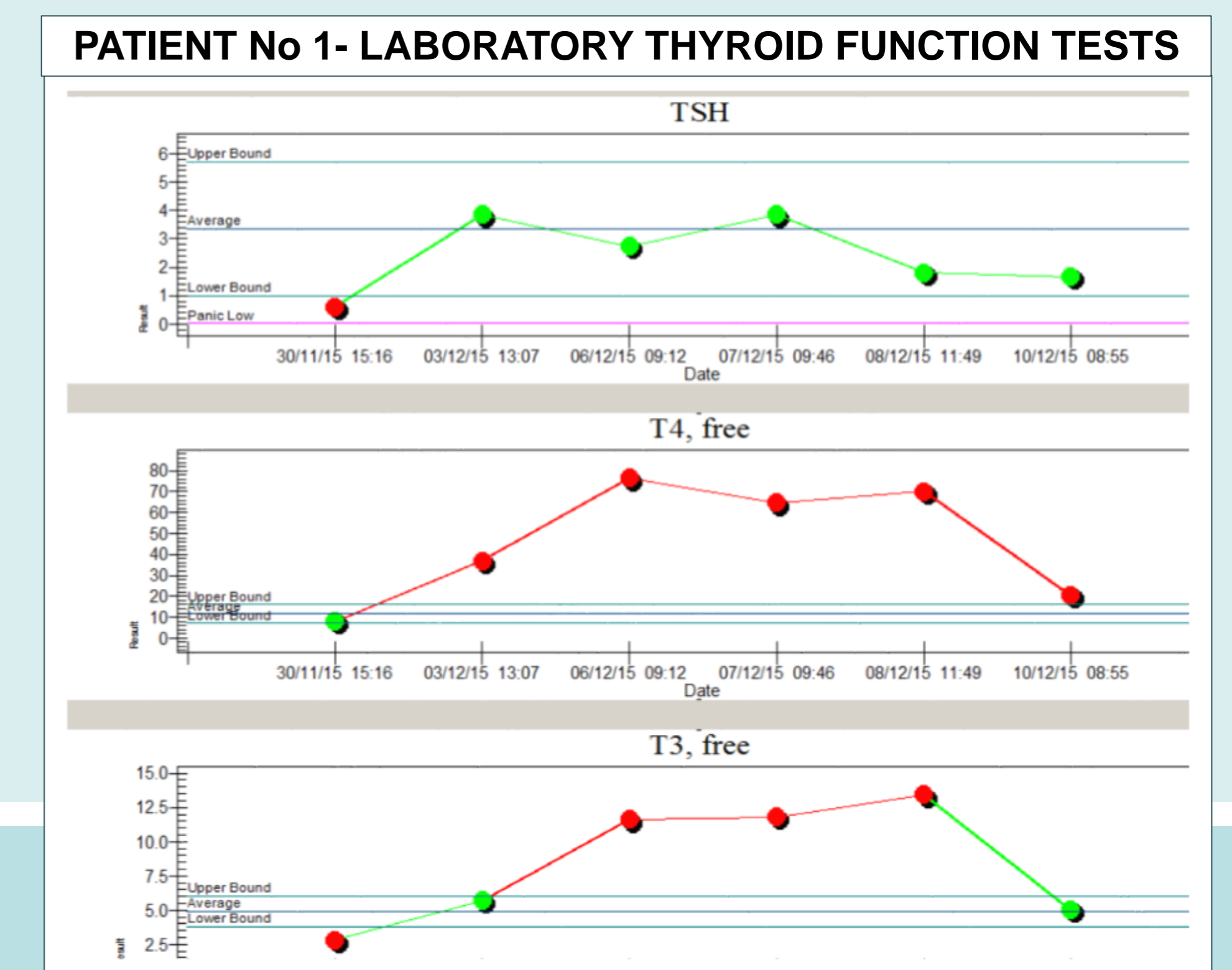
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Background

- Immunoassays are subjected to a number of interferences giving abnormal results which may lead to unnecessary investigations and treatment.
- We present clinical cases in which biotin treatment could be involved in abnormal results of thyroid function tests (TFTs) obtained by immunoassays based on biotinylated antibodies/analogs.

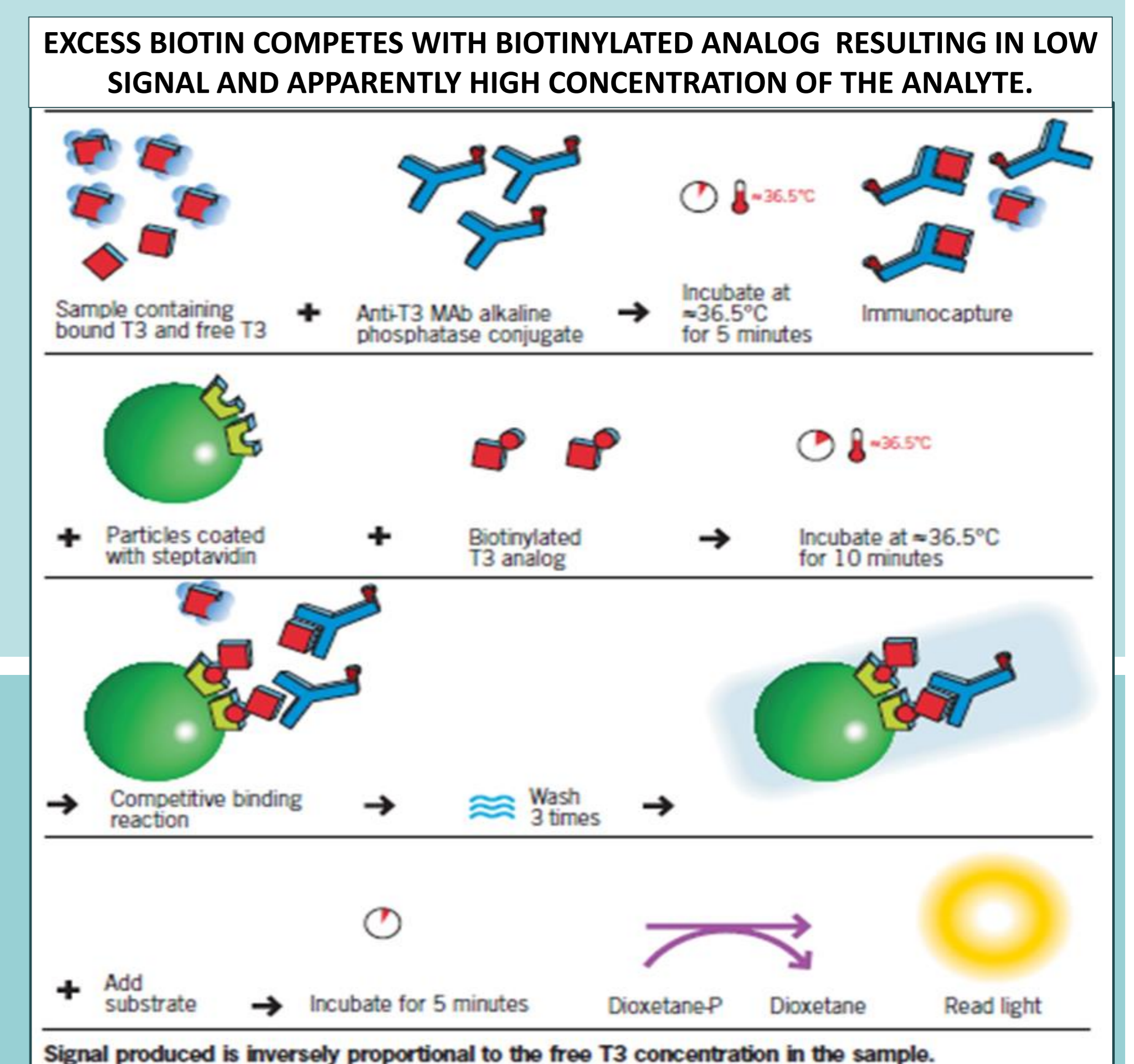
Case presentation

- Three infants were admitted to intensive care unit (ICU) during 2015, in Edmond and Lilly Safra Children's Hospital, because of respiratory distress and neurologic deterioration. Laboratory tests at admission revealed severe lactic acidosis.
- Thorough investigation led to the diagnosis of mitochondrial disease.
- During their hospitalization, near normal TSH and extremely highly elevated fT4 and fT3 were measured (Beckman-Dxl analyzer). Those results were discrepant from their clinical presentations; as neither had goiter, signs of thyrotoxicosis or family history of thyroid disorders.



Management and Outcome

- To assess the possibility of assay interference, and avoid unnecessary treatment and potentially further invasive investigations, TFTs in the same samples were evaluated by alternative methodologies (ADVIA-Centaur and Autodelfia analyzers), demonstrating normal fT3 and only moderately elevated fT4, as well as normal levels of tT3 and tT4.
- Medications given to the patients and Dxl TFTs assay principles were reviewed, pointing to potential interference, due to biotinylated Antibodies/Analogs used in fT3 and fT4 assays; Thus, excess biotin in patients' serum competes with the biotinylated antibodies for binding sites on streptavidin, resulting in falsely high levels of the hormones.
- Indeed, fT3 and fT4 levels measured in samples obtained twelve hours after biotin intake, were significantly lower, compared with levels obtained in close proximity to biotin intake.



Conclusions

- High dose biotin ($\geq 10\text{mg/day}$) is used therapeutically in some metabolic disorders.
- Furthermore, many patients are taking biotin as dietary supplement.
- Physicians need to be aware that biotin could cause assay interference, especially when test results are discrepant from the clinical picture.
- Awareness will avoid misdiagnoses and unnecessary treatments.