# Characterization and Potential Clinical Application of a Novel Test System for the Quantification of Histamine Degradation Activity in Humans

Christian Lutz[1], Gabriele Frost[1], Thomas Knittel[1], Albert Missbichler[2]
[1]FROST Diagnostika, Otterstadt, Germany [2]ALDORM Consulting Group GmbH, Vienna, Austria

## AIMS

Histamine intolerance (HIT) is a multifaceted clinical condition triggered by histamine-rich foods, alcohol and/or by drugs that liberate histamine or block diamine oxidase (DAO), the main enzyme involved in the metabolism of ingested histamine. As the suspected HIT pathomechanism involves impaired degradation by catabolizing enzymes, the aim of the study was the development of an assay measuring the total histamine degrading capacity (THDC) in an easily accessible human specimen, such as serum, independent of the patient-specific nutritional status and symptoms and to compare results with state-of-the-art assays (DAO REA, DAO ELISA) as well as clinical data.

## METHODS

The FD THAK/THDC test quantitatively determines the capability to degrade histamine in human serum samples irrespective of the way of degradation. Individual samples were incubated with a histamine-containing provocation solution and histamine levels before and after provocation were determined with the THAK/THDC ELISA. Values are expressed as % histamine degrading capacity based on the histamine levels before and after provocation. A 0-25% degradation was regarded to indicate insufficient or low total histamine degrading capacity (THDC) (“low”), the 25-40% range to indicate limited THDC (“borderline”) and values > 40% as normal THDC (“normal”). THDC serum values were compared to total DAO serum levels (DAO ELISA, Immundiagnostik AG) and DAO activity as determined by the DAO REA assay (Sciotec). Cut off values for low activity in both latter assays were 3U/ml and borderline values were in the 3-10 U/ml range.

## RESULTS

In 36 patients with a clinically defined HIT diagnosis insufficient of low THDC levels (< 25% degradation) were detected in 94% of cases (n=34), in 2 patients THDC was between 25-40% and no cases of a THDC < 40% were evident. In these 36 HIT patients DAO REA levels below 3 U/ml were detectable in 20% of cases only (n=7), between 3-10 U/ml in 24 pts and > 10 U/ml in 5 cases. DAO serum levels were below 3 U/ml in 2 pts, between 3-10 U/ml in 28 pts and > 10 U/ml in 6 pts. In this HIT patient cohort there was a correlation between a pathological THDC and DAO REA test (7/7 pts) and vice versa (7/33 pts.) (Figure 1).

In patients with clinical symptoms after food uptake regarded as food hypersensitivity (n=21) a THDC value below 25% was not detectable, THDC values between 25-40% were present in 19 cases and > 40% in 2 cases. In this group DAO REA levels were below 3 U/ml in 0 cases, between 3-10 U/ml in 11 cases and > 10 U/ml in 10 cases, while DAO serum levels were below 3 U/ml in 0 pts, between 3-10 U/ml in 10 pts and > 10 U/ml in 11 pts (Figure 2).

In control patients (n= 62) a pathological THDC was not detectable and all patients had levels > 40% total histamine degrading capacity, while borderline DAO REA values (3-10 U/ml) were evident in 3 patients and in 14 pts for borderline DAO serum levels (3-10 U/ml) (Figure 3).

## CONCLUSION

The easy to use FD THAK/THDC test is a promising novel assay system detecting more cases of histamine intolerance than the currently employed standard marker DAO REA and DAO ELISA. The test could be a valuable diagnostic tool for the identification and characterization of patients with clinical symptoms related to impaired histamine metabolism.

## RESULTS

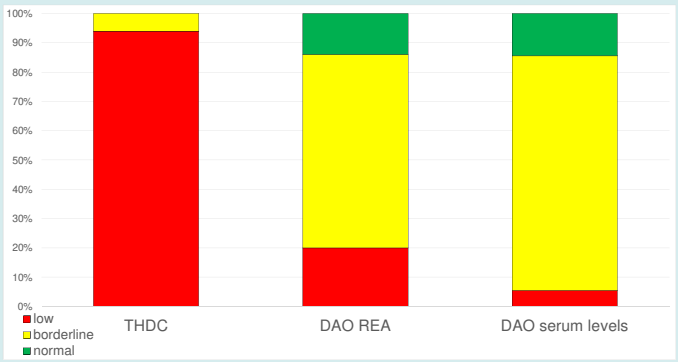


**Figure 1: THDC, DAO REA and DAO serum levels in 36 patients with clinically defined HIT diagnosis**

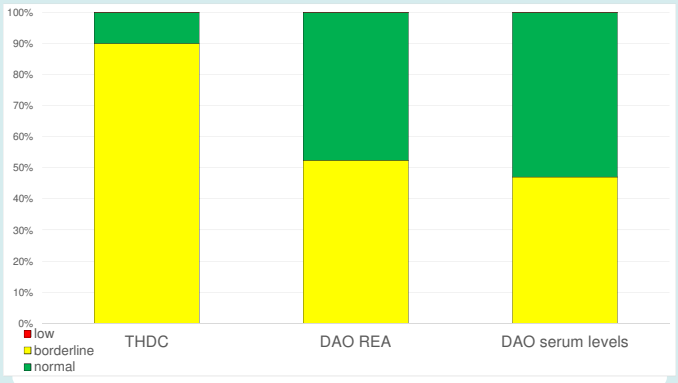


**Figure 2: THDC, DAO REA and DAO serum levels in 31 patients with food hypersensitivity**

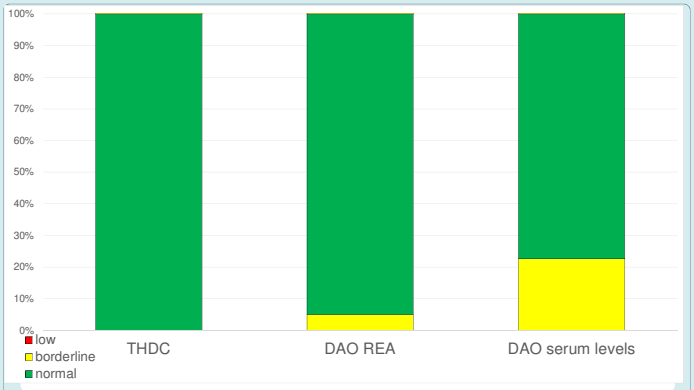


**Figure 3: THDC, DAO REA and DAO serum levels in 62 control patient**

For more Information please contact: FROST Diagnostika GmbH, Otterstadt, Germany
Phone: +49 6232 600487 0 ; email: info@frostdiagnostika.de ; www.frostdiagnostika.de

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Aims: Histamine intolerance (HIT) is a multifaceted clinical condition triggered by histamine-rich foods, alcohol and/or by drugs that liberate histamine or block diamine oxidase (DAO), the main enzyme involved in the metabolism of ingested histamine. The aim of the study was the development of an assay measuring the total histamine degrading capacity (THDC) in an easily accessible human specimen such as serum independent of the patient-specific nutritional status and to compare results with state-of-the-art assays (DAO REA) as well as clinical data.

Methods: The FD THAK/THDC test quantitatively determines the capability to degrade histamine in human serum samples irrespective of the way of degradation. Samples were incubated with a histamine-containing- provocation solution and histamine levels before and after provocation were determined with the THAK/THDC ELISA. Values are expressed as % histamine degrading capacity based on the histamine levels before and after provocation. A 0-25% degradation was regarded to indicate insufficient or low total histamine degrading capacity (THDC), the 25-40% range to indicate limited THDC and values > 40% as normal THDC. THDC serum values were compared to total DAO serum levels (DAO ELISA) and DAO activity as determined by the DAO REA assay.

Results: In 36 patients with a clinically defined HIT diagnosis insufficient of low THDC levels (< 25% degradation) were detected in 94% of cases (n=34), in 2 patients THDC was between 25-40% and no cases of a THDC < 40% were evident. In these 36 HIT patients DAO REA levels below 3 U/ml were detectable in 20% of cases only (n=7), between 3-10 U/ml in 24 pts and >

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Conclusions: The easy to use FD THAK/THDC test is a promising novel assay system detecting more cases of histamine intolerance than the currently employed standard marker DAO REA and DAO ELISA. The test could be a valuable diagnostic tool for the identification and characterization of patients with clinical symptoms related to impaired histamine metabolism.