

# Highlights of Analytical Chemistry in Switzerland

## Division of Analytical Chemistry

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### Alcohol Markers Reveal Relapse Drinking Episode

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Alcohol abuse and alcohol dependence are major public health problems. Because of the known ability of alcohol abusers to hide their addiction and the importance of an early diagnosis of alcohol abuse, assays for the verification of alcohol intake are required. Direct ethanol metabolites (ethyl glucuronide and ethyl sulfate) and changes in the isoform pattern of transferrin (Tf) present in serum are biomarkers for recent and chronic excessive alcohol intake, respectively. The two ethanol metabolites are non-volatile, water soluble and stable. They can be detected in serum and urine hours after complete elimination of the ingested alcohol. The microheterogeneity of Tf isoforms changes upon chronic consumption of large amounts of ethanol: the relative amount of desialylated isoforms becomes higher compared to the pattern of healthy teetotalers and social drinkers. Carbohydrate-deficient transferrin (CDT) encompasses Tf isoforms with zero (asialo-Tf) and two (disialo-Tf) sialic acid residues in the carbohydrate side chains of the molecule.

Longitudinal monitoring of individuals with a history of alcohol abuse is important for the early detection of relapse drinking after abstinence and in legal cases. Alcohol, alcohol metabolites,

and CDT levels should therefore be determined on a regular basis over an extended period of time. In sera of a patient collected over a period of more than four months, alcohol could not be detected. The same was true for ethyl sulfate in the first sample collected after a three-week break. Analysis of CDT, however, revealed about a twelve-fold increase of CDT after the three-week interval without sample collection. CDT levels before the break and again in the samples collected later than five weeks after the break were normal. Sera were analyzed by a capillary electrophoresis assay for which the upper reference value was determined to be 1.70%. Asialo-Tf could be unambiguously detected in the first four samples after the break. The presence of asialo-Tf and the high amounts of disialo-Tf and thus CDT monitored and the characteristic decay of these levels thereafter unambiguously revealed an episode of relapse drinking of this patient. **This example demonstrates that the capillary electrophoresis assay applied to samples from patients with suspected chronic excessive alcohol consumption provides a solid basis to identify alcohol abusers.**

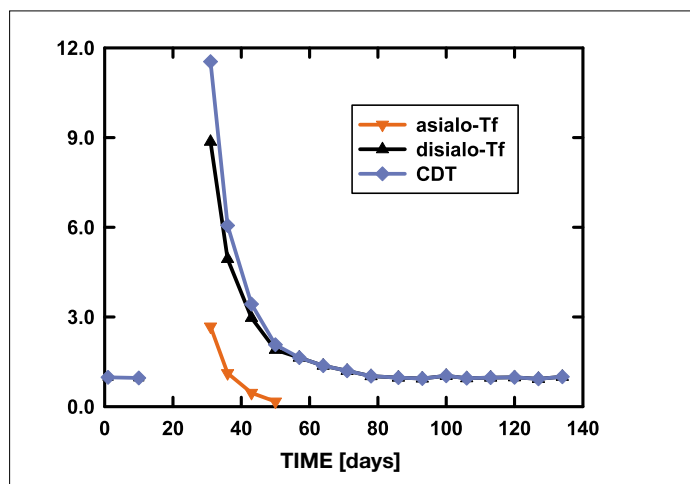
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#### References

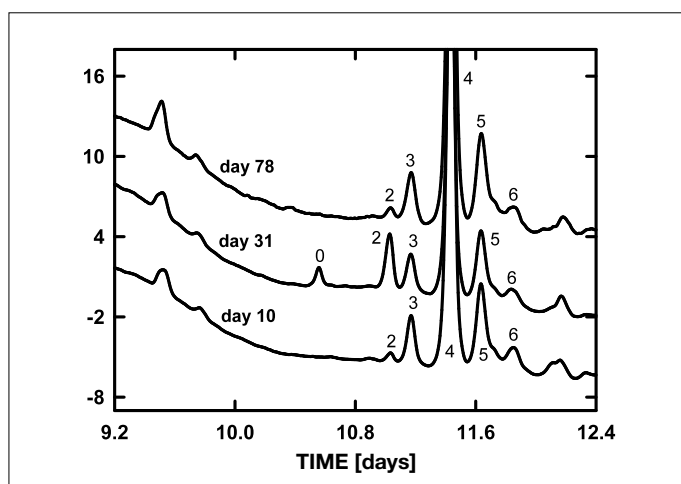
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How much is too much?



CDT, disialo-Tf and asialo-Tf serum levels determined by capillary electrophoresis in samples of a patient collected over a 132-day period.



Electropherograms showing the transferrin patterns of three sera. 0, asialo-Tf; 2, disialo-Tf; 3, trisialo-Tf; 4, tetrasialo-Tf; 5, pentasialo-Tf; 6, hexasialo-Tf. Data at days 10 and 78 show normal transferrin patterns whereas that at day 31 is typical for an alcohol abuser.

#### Can you show us your analytical highlight?

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