

Fact sheet: Urinary NGAL



Diagnostic relevance

Neutrophil gelatinase-associated lipocalin (NGAL; also known as lipocalin-2) is a small protein found not only in neutrophils but also in certain epithelia, such as renal tubules, where its expression is dramatically increased in ischemic or nephrotoxic injury. NGAL levels rise in urine and blood within 2 hours of renal insult, making NGAL a biomarker for acute renal injury.

In contrast to other biomarkers, urinary NGAL allows detection of acute renal failure within hours of the insult. Studies by Bangert and colleagues [1] have shown that the mean NGAL concentration in urine from healthy donors was 5.3 ng/ml (range from 0.7 - 9.6 ng/mL). The mean NGAL concentration in plasma from healthy donors was 63 ng/mL (range 37 - 106 ng/mL). NGAL levels rise steeply immediately after renal injury. In unselected patients admitted to intensive care, the NGAL concentrations in urine ranged from 110 ng/mL to 40,000 ng/mL, while the mean NGAL concentration in EDTA plasma ranged from 25 ng/mL to 3491 ng/mL.

Urinary levels above a cut-off of 350 ng/mL or plasma levels above 400 ng/mL are associated with acute renal failure with an approximate 90 % positive predictive value.

Numerous studies support the significance of NGAL as a biomarker for acute renal injury which may lead to acute renal failure [2-8]. The field of renal biomarkers has recently been reviewed [9,10]

Indication

- Early detection of acute renal injury
- Imminent acute renal failure

Pathophysiology

Lipocalins are a diverse family of proteins with a common tertiary structure, which confers on lipocalins the ability to bind a wide variety of molecules and specific cell-surface receptors, and form covalent and non-covalent complexes with other soluble macromolecules.

NGAL (neutrophil gelatinase-associated lipocalin) was originally found in specific granules of the human neutrophil, where it is complexed with matrix metalloproteinase 9 (MMP-9). NGAL is also expressed in most tissues normally exposed to micro-organisms, and it is induced in epithelial cells during inflammation

NGAL can also bind bacterial iron-binding proteins and thus act as a potent bacteriostatic agent by sequestering iron. Taken together, NGAL may be involved in the innate immune system and acute-phase response to infection.

Moreover, NGAL has been suggested to act as a growth and differentiation factor in multiple cell types, including developing and mature renal epithelia. In this context, it has been reported that NGAL can function as an anti-apoptotic "survival factor" thus protecting against acute ischaemic renal injury.

Under biomarker aspects, wider interest has been sparked by the observation that NGAL is massively upregulated after renal tubular injury and may participate in limiting kidney damage [11].

Method

- ELISA

Sample

- Urine/Plasma

Preanalytics

- Standard

References: Urinary NGAL



References

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Further information

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