NADHJA®

Autofluorescence Analyzer

Measurement of NADH concentration changes

in tissues

NAD: Coenzyme to control the energy metabolism

The cell needs energy to maintain its vital functions and to provide its functional performance. NAD (nicotinamide adenine dinucleotide) is the molecular control system of the energy metabolism of the cell. It is involved in numerous redox reactions of the cell metabolism. NAD^+ can be reduced to NADH (= energy rich) by the uptake of two electrons and one proton (H^+). This is the switch function between aerobic and anaerobic glycolysis.

There are two alternative ways of energy supply for the cell. The decision which one of the two ways is taken depends on the energy demand and the availability of the fuel glucose and oxygen and is taken by NAD.

Option 1: aerobic glycolysis

Combustion of glucose under oxygen supply in the citrate cycle and biological oxidation in the mitochondria:

energy efficiency: 100% **degradation product: CO_2 and H_2O**

control enzym: NAD ↑ NADH ↓

Option 2: anaerobic glycolysis

Combustion of glucose without oxygen supply:

energy efficiency: 25% **degradation product: lactate ↑**

control enzym: NAD ↓ NADH ↑

Lactate leads to a reduction of the pH value in the cytoplasm and thereby to a change of the protein structures (denaturation). This means stress for the cell and leads to cell damage.

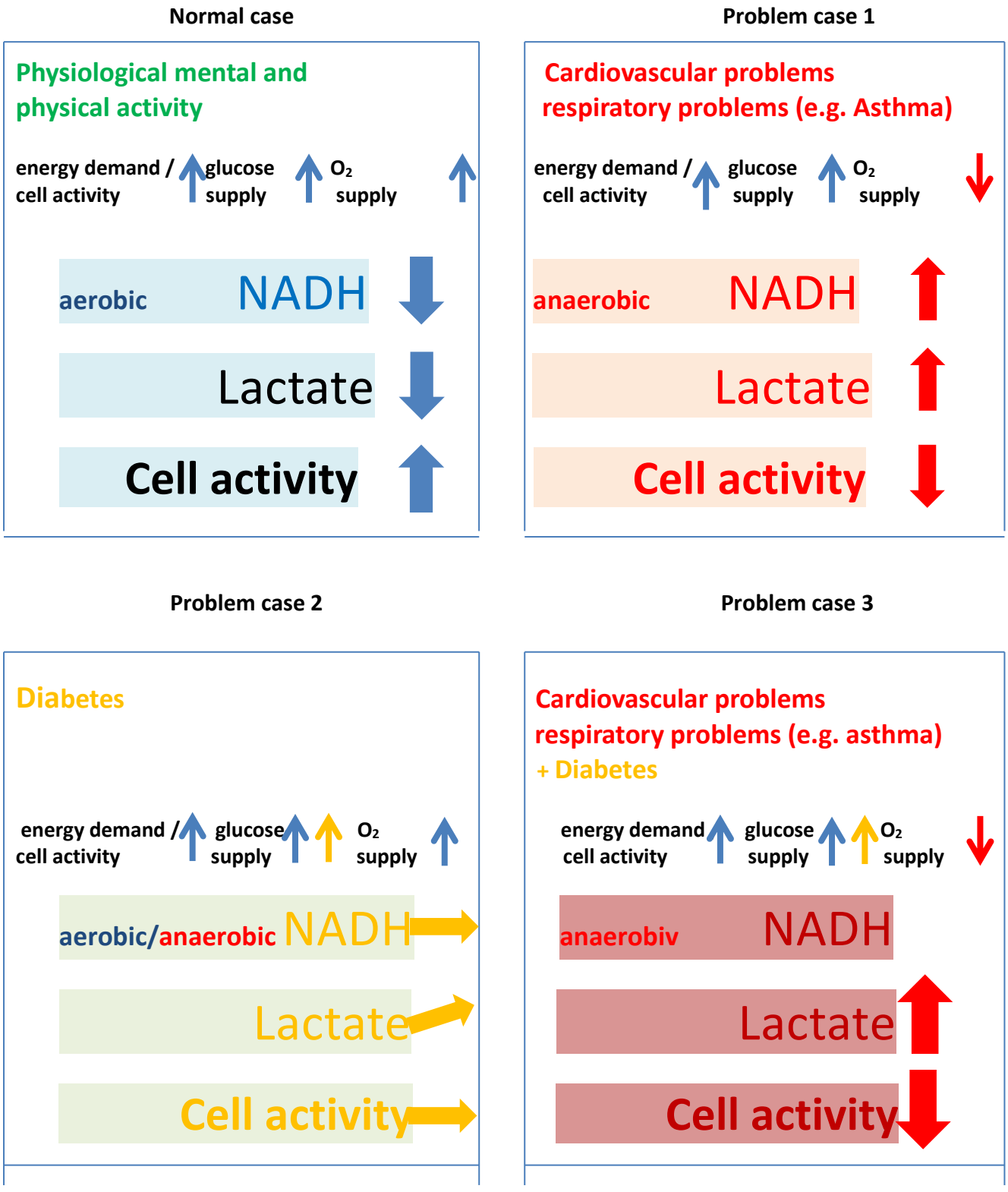
A permanent measurement of the NADH level in the cell is essential for monitoring the stress level of the cell and in particular for:

- **intense stress with high energy demand, e.g. sport**
- **lack of O_2 supply, e.g. asthma or cardiovascular diseases**
- **cell damage (especially mitochondria), e.g. by toxins**

With the device NADHJA ® it is for the first time possible to measure NADH continuously, invasively or non-invasively, in real time and by laser induction of the photon emission (autofluorescence) .

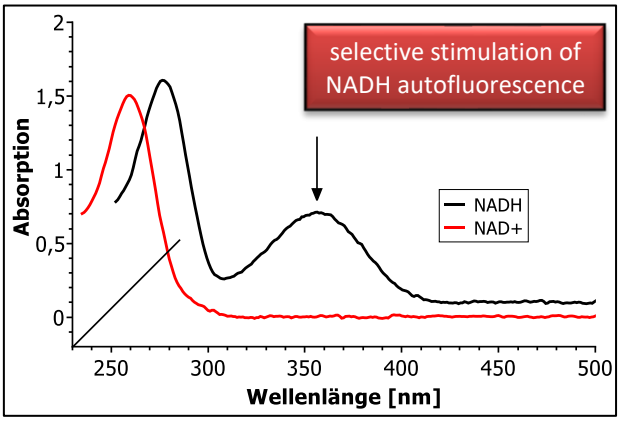
Lactate can only be measured by blood sample collection in time cycles. Continuous measurement in real time is not possible.

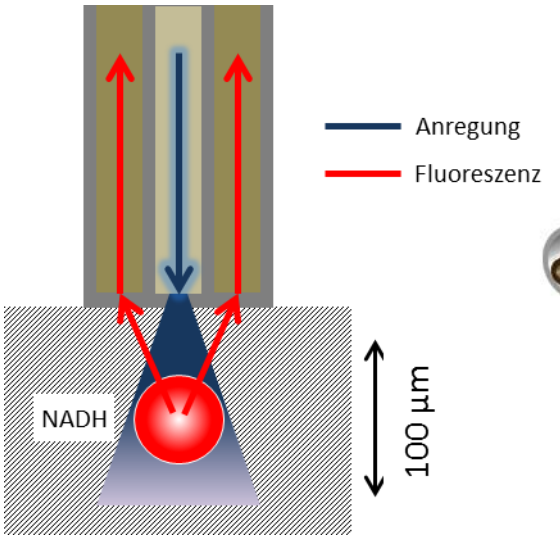
NAD - the molecular controller of the energy metabolism



Technical Details

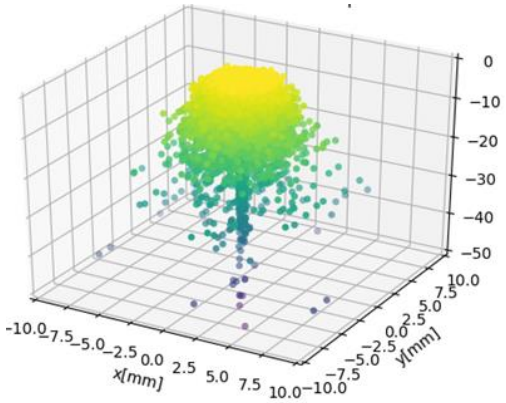
The analysis takes place by stimulating the NADH autofluorescence by means of defined laser pulses in the nanosecond range. The selective absorption of the NADH in the UV-A range is used. There is no separate fluorescence marker necessary for the measurement. The evaluation of the fluorescence impulses is done by a special impulse amplifier which separates the NADH fluorescence from the background fluorescence.





By using a fiberglass sample probe the place for measurement can be chosen at random. Depending on the respective requirements diverse probe tips can be used which allow in-vitro applications in and on various media as well as in-vivo measurements in tissues (e.g. on the skin).

With the help of Monte Carlo simulations of light propagation in organic tissues on the basis of multi-layer models fluorescence events can be reliably predicted. Based on this predefined probe geometries can be maximally optimized and thereby the reliability of the measurement is guaranteed.



Benefits:

- **Autofluorescence**
- **Real-time**
- **Flexible use**
- **Locally usable**
- **Gentle on the animals**

Area of use:

- Analysis/measurement of NADH concentration in cell metabolism
- Monitoring of cellular oxygen demand
- Monitoring of the oxygen level according to needs
- Analysis of the cell activity in states of oxygen deficiency
- Determination of cell pathological disorders of the cellular metabolism

Areas of research:

- Research of metabolism
- Cancer research
- Cardiovascular diseases
- Diabetes research
- Neurological diseases
- In-vitro monitoring of cell activity
- Pharmacology/Toxicology

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