BioPad

Textile Engineering

the functional textile connection

PhotoBonding Technology

Key features for biomolecule immobilization by light

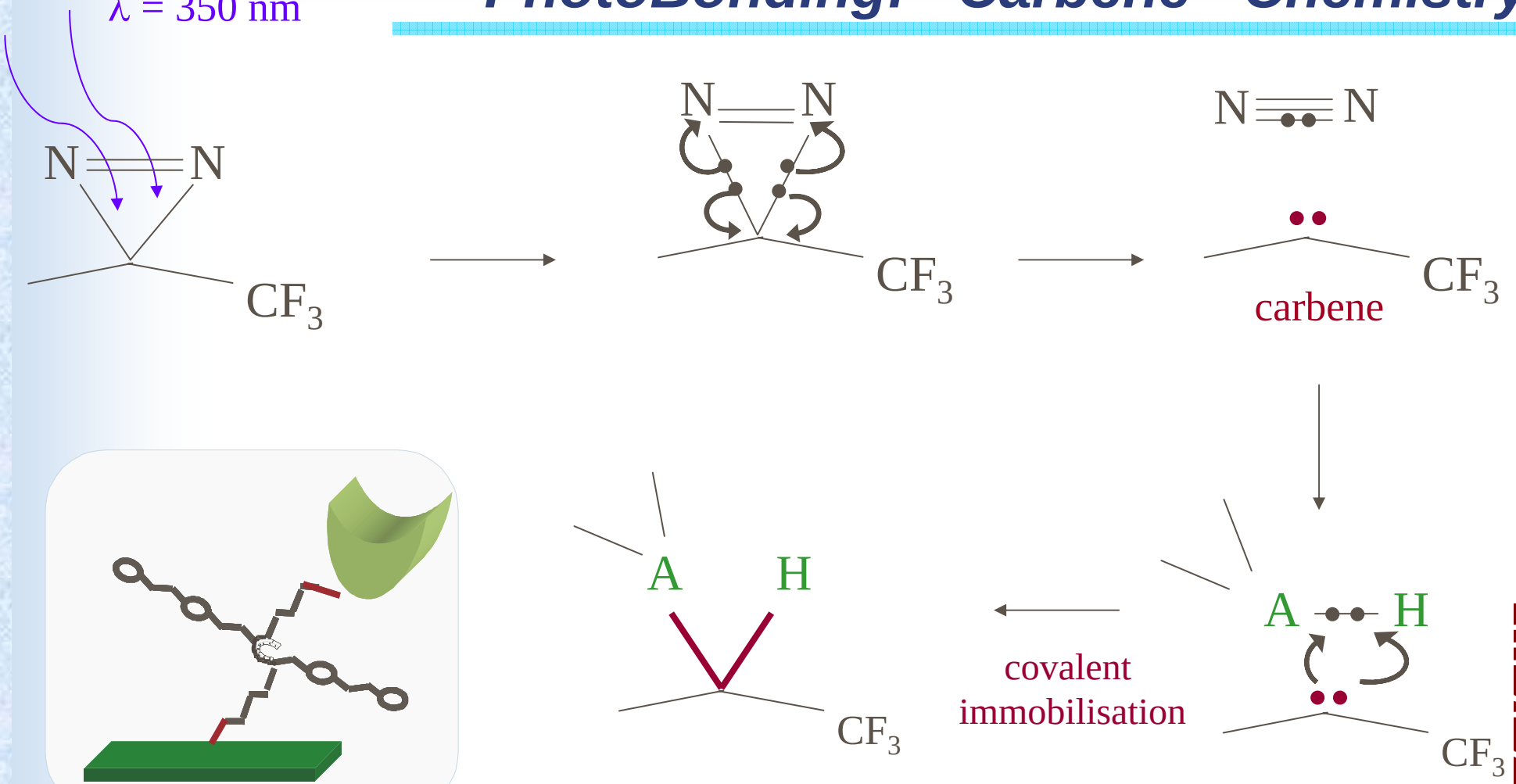
- No surface functionalization required
- No probe molecule functionalization required
- Biomolecule surface density solely depends on irradiation intensity (dose and time)
- Co-immobilization of stabilizing agents possible
- Cost-effective single-step process
- Probe molecule orientation: 50 % right-side up (statistical)

PhotoBonding Technology

Key features for dextran-based photolink-polymer

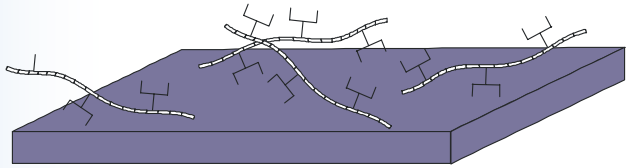
- **Hydrophilic**
- **Biocompatible**
- **Surface passivation (suppress non-specific binding, suppression of bacterial deposition)**
- **Bi-functional polymeric cross-linker (*heterofunctions for secondary modifications)***

PhotoBonding: Carbene - Chemistry



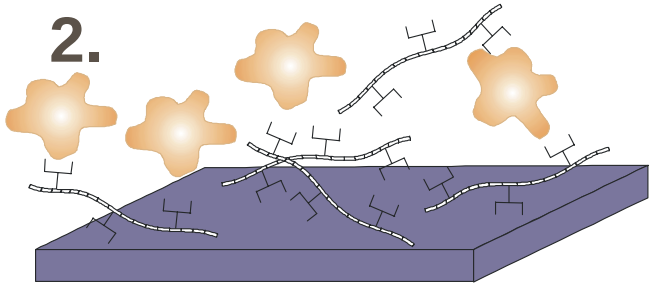
PhotoBonding: Proceeding

1.



Material surfaces:
Coating with OptoDex

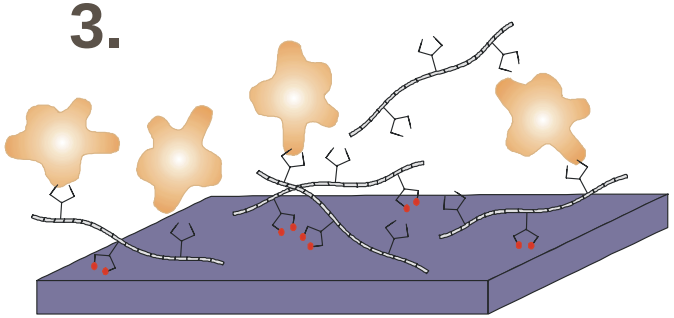
2.



Coating with biomoleculars

Photobonding

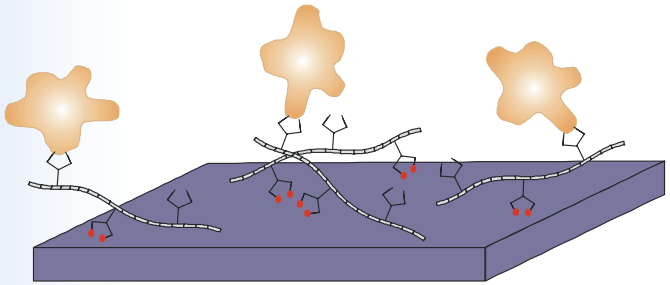
3.



Covalent binding of biomolecules
on matrial surfaces

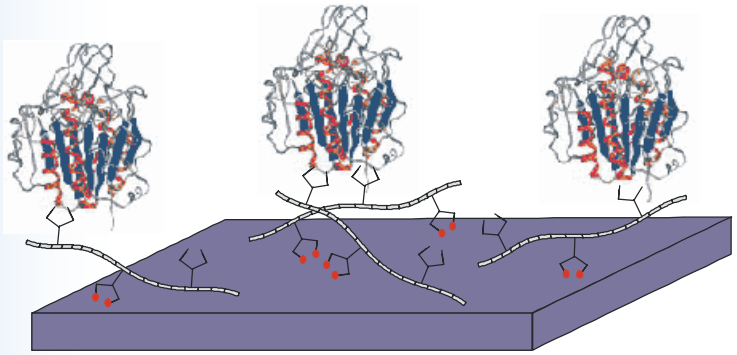
Washing

4.

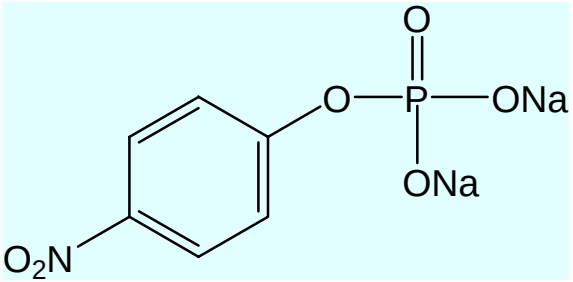


Photobonding of Alk. Phosphatase on Tissue

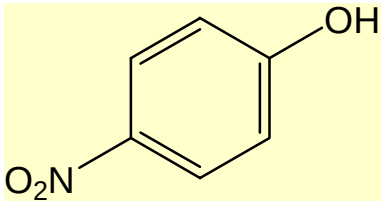
A referenced experiment



Photobonded Alk. Phosphatase on tissue



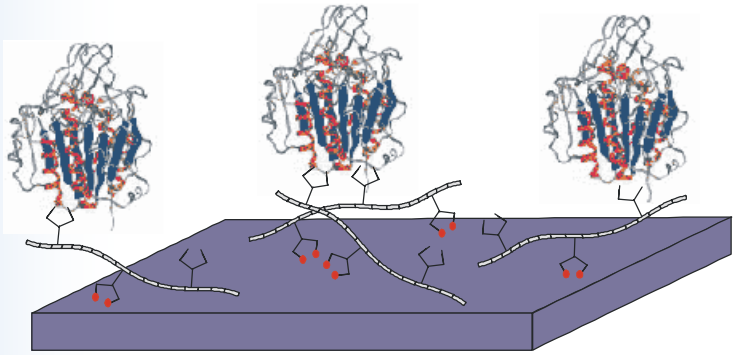
pNPP: a substrate for detecting Alk. Phosphatase (colorless)



When the Alk. Phosphatase and pNPP reacted, a yellow-water-soluble reaction product is formed, it absorbs light at 405 nm

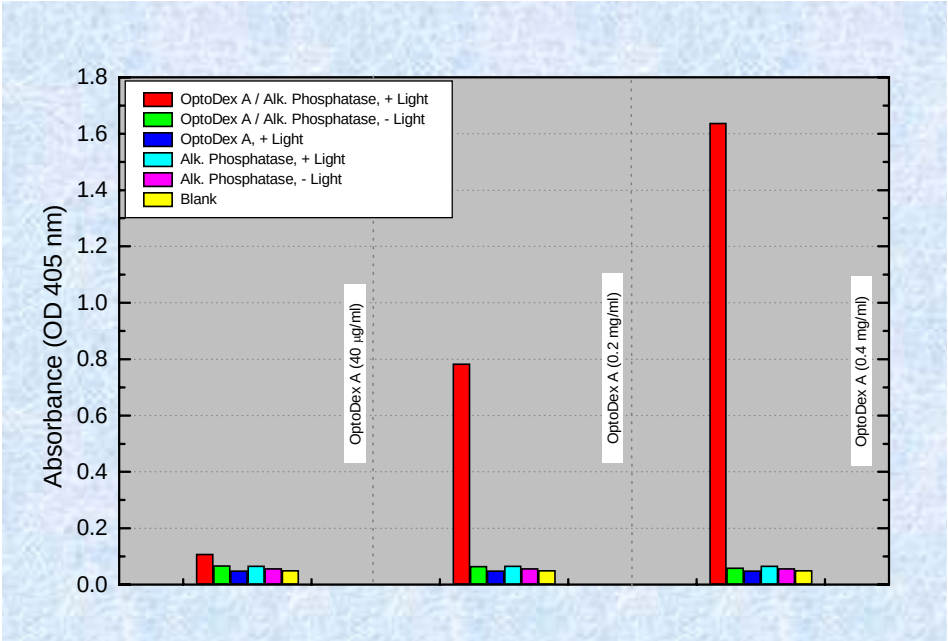
Photobonding of Alk. Phosphatase on Tissue

A referenced experiment



- OptoDex / Alk, Phosphatase, + Light
- OptoDex / Alk, Phosphatase, - Light
- OptoDex, + Light
- Alk, Phosphatase, + Light
- Alk, Phosphatase, - Light
- Background

Photobonded Alk. Phosphatase on tissue (*polyester*)



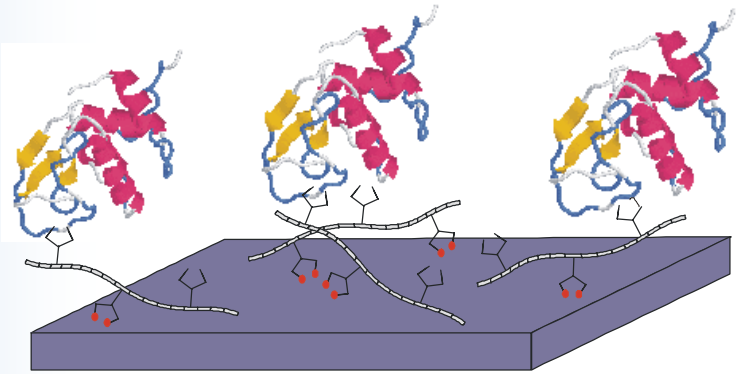
Bactericidal textiles

Lysozyme:

- a ubiqutous enzyme present in human serum, urine, seminal fluid and milk.
- widespead distribution in aminals and plants
- a ‘natural antibiotic’, attacks gram-positive bacteria (by breaking sugar backbone of peptidoglycan components in cell wall)
- suppresses inflammation

Bactericidal textiles

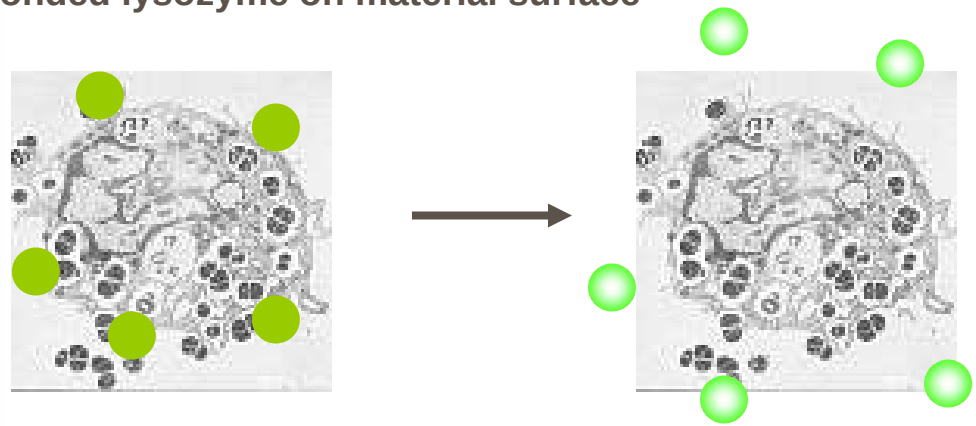
Lysozyme activity assay



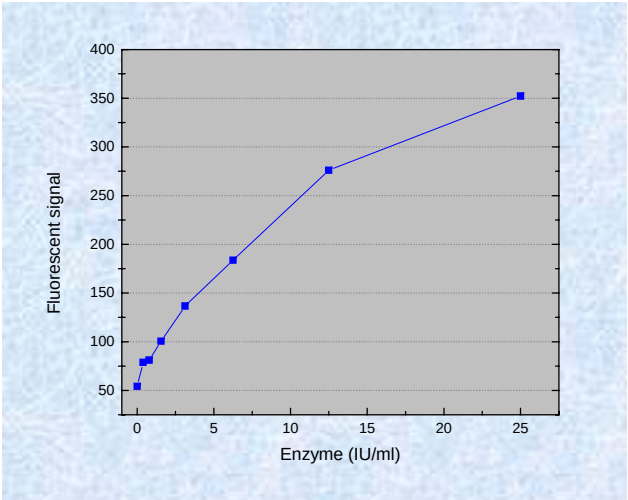
Photobonded lysozyme on material surface

Lysozyme cleaves the cell wall and relieves the quenching, yielding a dramatic increase in fluorescence that is proportional to lysozyme activity.

The fluorescence increase can be measured with the spectrofluorometer.



Micrococcus lysodeikticus: are labeled to such a degree that the fluorescence is quenched.

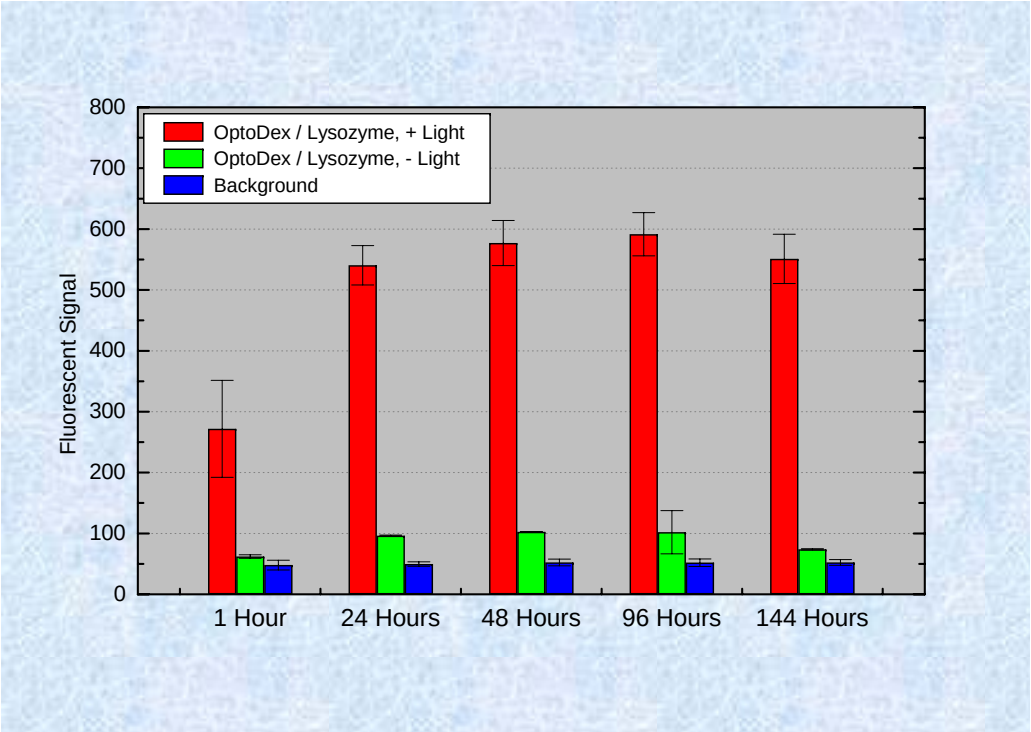


Bactericidal textiles

A mimic experiment A

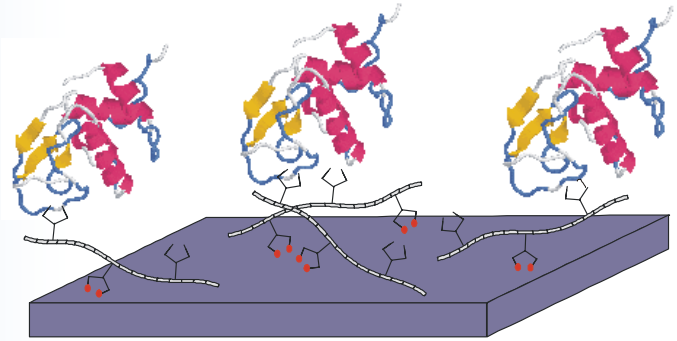
Photobinding of lysozyme on microtiter plate (*polystyrene*)

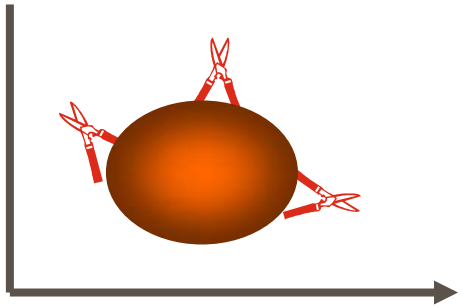
Detection of remained enzymatic activity with fluorescent-*Micrococcus lysodeikticus*



Bactericidal textiles

A mimic experiment B

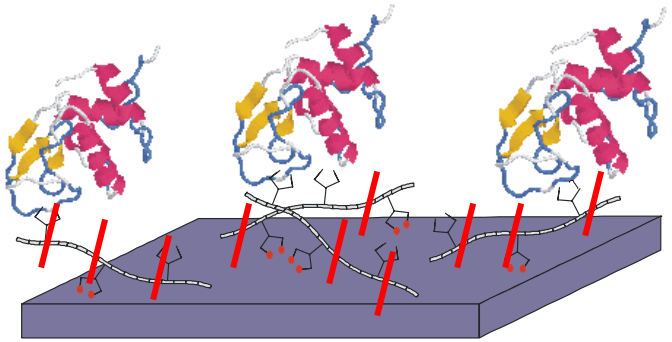




Dextranase

Dextranase degradates photolinker polymer by catalyzing the endohydrolysis of 1,6-α-glucosidic linkages in dextran.

Then photoboned lysozyme is released



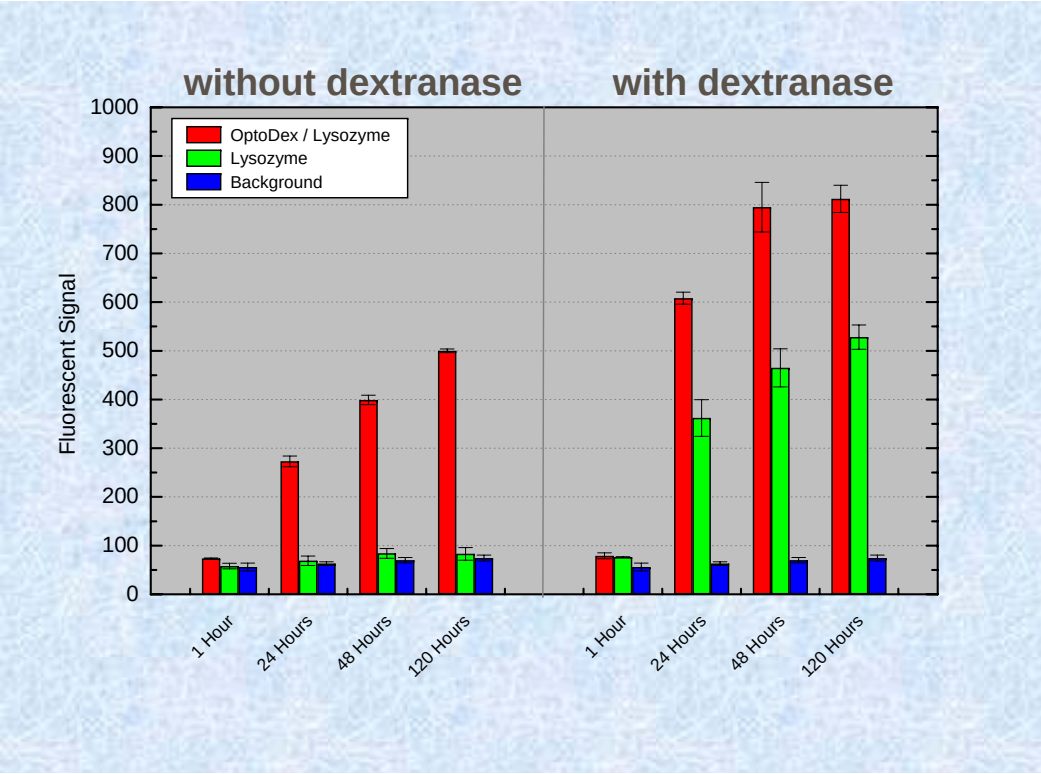
Bactericidal textiles

A mimic experiment B

Photobinding of lysozyme on microtiter plate (polystyrene)

Degradation of OptoDex by dextranase

Detection of remained enzymatic activity with fluorescent-*Micrococcus lysodeikticus*



Bactericidal textiles

Preliminary experiment:

photobonding of lysozyme on the tissue (polyester)