

### Biosynthesis of N-Acetylneuraminic acid (NeuNAc, NANA) from the renewable resource chitin using *Trichoderma reesei* as whole-cell biocatalyst

NeuNAc is used as a precursor for the production of neuraminidase inhibitors, which are used for the treatment of viral diseases (e.g. drug Relenza). The production of NeuNAc is expensive and therefore a new process was developed at the TU Vienna combining the advantage of a single-step process and using the cheap and renewable substrate chitin. For this purpose, the filamentous fungus *Trichoderma reesei* was developed as a whole-cell biocatalyst and the missing enzyme functionalities were genetically introduced.

#### BACKGROUND

So far, N-acetylneuraminic acid was produced by means of multistage enzymatic catalysis, direct extraction from natural resources or via bacterial fermentation. High costs of the substrates (N-Acetylglucosamine) and enzymes as well as the multistage process make NeuNAc an expensive product. Aim of this project was the development of a single-step process using a renewable feedstock.

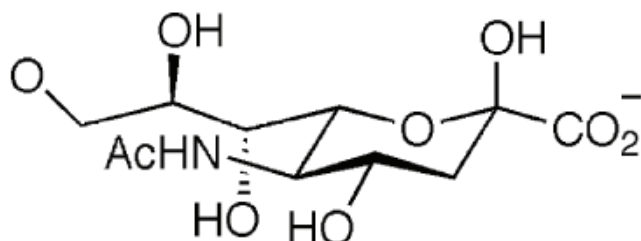


Figure 1: N-Acetylneuraminic acid (NeuNAc)

#### TECHNOLOGY

The industrially used fungus *Trichoderma reesei* is well known for its ability to degrade biopolymers like cellulose and chitin. The monomer of chitin, N-acetylglucosamine, is used as a precursor for the biosynthesis of NeuNAc. In order to enable the production of NeuNAc directly in the fungus it was necessary to insert two bacterial genes into the genome of *Trichoderma*. A strain carrying both genes has the ability to directly produce NeuNAc when grown on chitin.

#### ADVANTAGES

- Production of NeuNAc in a single-step process
- The renewable biopolymer chitin is used as a substrate
- *Trichoderma reesei* is used as a whole-cell biocatalyst

#### REFERENCE 048/10

**APPLICATIONS:** Precursor for the production of neuraminidase inhibitors like Zanamivir (active ingredient of Relenza) used for the treatment of viral diseases

#### KEYWORDS:

- Neuraminidase inhibitor
- NeuNAc NANA
- whole-cell biocatalyst
- *Trichoderma reesei*
- chitin

#### DEVELOPMENT STATUS:

Proof of concept was done in laboratory scale, process optimization is currently ongoing

#### IPR:

AT, EP patents granted

#### OPTIONS:

- R&D collaboration,
- license agreement
- sale

#### INVENTORS:

Robert L. MACH  
Matthias G. STEIGER  
Astrid MACH-AIGNER

#### CONTACT:

**Hildegard Sieberth**

TU Wien

Research and Transfer Support

A-1040 Vienna

T: +43.1.58801.415243

[hildegard.sieberth@tuwien.ac.at](mailto:hildegard.sieberth@tuwien.ac.at)

[www.rt.tuwien.ac.at](http://www.rt.tuwien.ac.at)