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## **Oxidation, aggregation and immunogenicity of therapeutic proteins**

Torosantucci, R.

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# **Oxidation, aggregation and immunogenicity of therapeutic proteins**

*Riccardo Torosantucci*

The research described in this thesis was performed at:

- The Division of Drug Delivery Technology at the Leiden Academic Centre for Drug Research (LACDR), Leiden University, Leiden, The Netherlands.
- The Department of Pharmaceutics, Utrecht Institute for Pharmaceutical Sciences (UIPS), Utrecht University, Utrecht, the Netherlands.
- The Department of Pharmaceutical Chemistry of Kansas University, Lawrence, Kansas, USA.

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The cover of this thesis was design by Ernesto Venanzi, Rome: human insulin aggregates detected by light microscopy, surrounded by oxidized amino acids and the chemical structure of 2-amino-3-(3,4-dioxocyclohexa-1,5-dien-1-yl) propanoic acid (DOCH), measured in oxidized and aggregated therapeutic proteins.

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# **Oxidation, aggregation and immunogenicity of therapeutic proteins**

Oxidatie, aggregatie en immunogeniciteit van therapeutische eiwitten  
(met een samenvatting in het Nederlands)

## **Proefschrift**

ter verkrijging van  
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door

**Riccardo Torosantucci**

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***“Memento audere semper”***

Gabriele D'Annunzio

*Ad Alberto, Antonella, Gaetana ed Olga Ekin*





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