Simulating dilution and handling of protein drugs in IV-bags

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FACTS & FIGURES

Start date:	01/07/2021
End date:	30/06/2025
IMI funding:	3 139 984 €
EFPIA in kind:	3 961 000 €
Other:	31 625 €
Total Cost:	7 132 609 €
Project website:	www.realhope.se
Social media:	@realhope LinkedIn

CHALLENGE

During the last 20 years the number of protein drugs has increased substantially. One drawback with these drugs is that their chemical and physical stability is considerably more complex than for small molecules.

Several **critical events** may affect the quality of the compounded protein drug during handling, **transportation** and **administration** in a hospital setting.

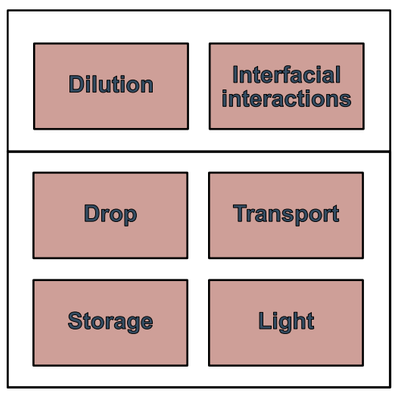
RealHOPE Project goals

- Gain improved understanding of real-life handling of protein drugs
- Develop tools and methods for simulation of real-life events during drug product handling
- Demonstrate and/or develop new technologies for safer handling at hospital pharmacies
- Develop educational and training materials to improve safety and handling of protein drugs

APPROACH & METHODOLOGY

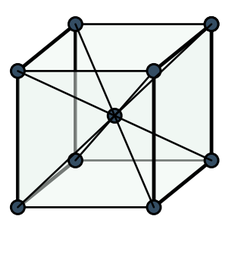
The aim of this work has been to develop an **in-lab simulation** method for dilution and **in-hospital** handling of IV-bags. To **identify critical factors** for **particle formation** handling steps were studied individually and in sequence.

Critical handling steps



Experimental set up

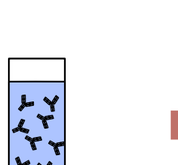
Design of Experiments (DoE) fractional factorial approach



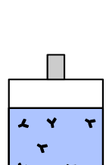
3. Handling sequences of IV-bags from DoE

1. Analysis of submicron and micron-sized particles using **DLS** and **FIM.**
2. Characterization of interfacial, colloidal and intrinstic stability of the protein using **QCM-d**, **B22** and **DSC**.

4. Characterization of protein and aggregation



1. Concentrated mAb1 formulation



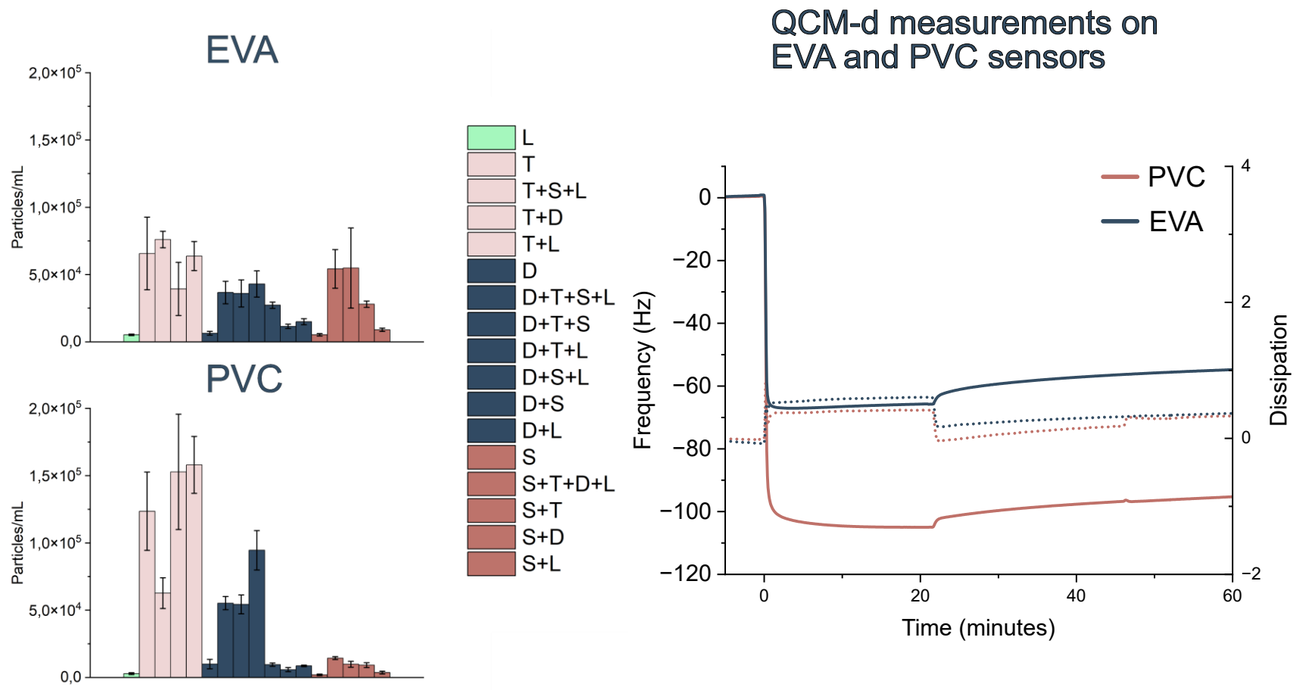
2. Dilution of mAb1 in 0.9 NaCl in IV-bags

Two IV-bag materials: PVC and EVA

RESULTS

IV-bag material* and sequences was found to have an effect on particle formation.

- The **mAb*** seemed to **adsorb more** on **PVC**, which might explain the higher particle concentration in PVC IV-bags.
- **PVC** tended to generate more particles when **transport** was in the **beginning** of the **sequence**.
- **EVA** tended to generate **more particles** if the bag was **stored before handling**.
- More particles where generated if **transport** was included in the sequence.



VALUE OF IMI COLLABORATION

- Creating **relevant studies** with **valuable results** for both industry and academia.
- The presence of **partner patients** has been critical for the project for collection of relevant data for the design of patient handling study.
- The importance of creating **meeting places between healthcare, academia** and **pharma industry**.

The IHI collaboration has provided a highly valuable forum to share knowledge, experiences and strategies between all participants - all sharing the same goal to **improve** the **treatment** and **life quality of patients** using protein drugs.

CAREER IMPACT

Participating in RealHOPE inspired me to starting a **PhD**, and it contributed to:

- **Co-authorship** on scientific publications, strengthening research credentials and **scientific communication** skills.
- Building new **professional connections** in academia and industry.
- Gaining insight into pharmaceutical company operations and potential future career opportunities within the life science sector.

*Protein drug substance and IV-bags provided by RealHOPE partners.

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