INTERNATIONAL JOURNAL OF PHARMACEUTICAL EXCIPIENTS

Soundbites from the IPEC Foundation's Awards Ceremony.

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Editorial

KEY WORDS: IPEC-Americas Foundation Award Dinner, Excipients, AAPS,

The IPEC Foundation Award Dinner was held on October 22, 2024 at the Hyatt Regency Hotel in Salt Lake City and was attended by more than fifty guests including academic, industrial scientists and organizations such as the USP. Recipients of Graduate Student Awards presented brief overviews providing summaries of their research areas and the progress to date. The following gives a thumbnail sketch for each of the award-winning topics:

KINNARI ARTE (PURDUE UNIVERSITY)

Understanding Impact of spray-freeze drying on RNA lipid nanoparticles

Delivery of naked mRNA is challenging due to its hydrophilic and polyanionic nature. It is also labile and prone to degradation. LNPs address these challenges but they require sub-zero storage temperatures which complicates supply of these important therapies. The relatively high water content in these formulations (~18-24%) is a major contributor to this stability issue. Spray-freeze drying is being investigated as a process for producing more stable formulations with reduced water content. Steps in the process, such as annealing, can have a major impact on RNA stability and work is ongoing to increase understanding in this area using techniques such as cryoSEM to examine particle morphology.

AKSHAY NARULA (UNIVERSITY OF CONNECTICUT)

Mechanisms and impact of excipients on spray drying of amorphous nanoparticles

Current spray-dried dispersions have several limitations such as processing challenges due to their poor physical attributes (e.g., soft in nature). Using Atazanavir as a model drug various excipients are being evaluated for their ability to improve the preparation of amorphous nanoparticles. Studies have also been conducted on the influence of excipient choice on salt formation with certain drugs, which also impacts formulation

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performance and underscores the importance of informed excipient choices.

HENIS PATEL

A patient-centric approach to improve oral absorption and overcome limitations associated with current cancer treatment

Sotorasib, a KRAS G12C mutation inhibitor for lung cancer treatment, presents significant challenges due to its pH-dependent solubility and poor bioavailability, requiring a high daily dose (960 mg; 8 tablets). Co-administration with acid-reducing medications (PPIs), commonly used by cancer patients, significantly reduces bioavailability, impacting drug absorption. To address these limitations, a pH-independent nanocrystalline formulation was developed using a combination of anionic surfactant, non-ionic polymer and lyoprotectants such as lysine acetate and trehalose. These excipients were designed to stabilize the nanocrystalline drug particles across the GIT pH range. The lyophilized nanocrystals demonstrated excellent re-dispersibility, minimized fasted/fed variability, and showed improved dissolution profiles. Solid-state characterization techniques, including DSC, PXRD, SEM, and Cryo-TEM, are being used to assess particle morphology and degree of crystallinity. *In silico* pharmacokinetic modeling predicts a significant enhancement in oral bioavailability compared to the free drug. By improving solubility, bioavailability and dosing convenience, sotorasib nanosuspension offers a patient-friendly and potentially more effective therapeutic approach for non-small cell lung cancer (NSCLC) patients, addressing key limitations of the current treatment regimen.

ADWAIT PRADHAN (UNIVERSITY OF TEXAS)

Developing a rational blueprint for assessment of twin-screw melt granulation (TSMG)

Despite its considerable potential as a continuous manufacturing process for oral products, TSMG has been relatively under-utilized for many years. To be successful there needs to be sound mechanistic understanding of the process to determine the optimum balance between temperature and time for instance. The technique uses a molten polymer for densification and granule growth and this, plus the use of appropriate mixing elements (screw configurations), combine to influence the final product quality in terms of its material and chemical (stability) properties. Developing a process very early in development is challenging and this research is developing a material-sparing approach to TSMG feasibility. Utilizing material-sparing thermal techniques like Differential scanning calorimetry (DSC) in conjunction with ball-milling to simulate thermal and shear stress, an empirical model was developed to predict drug stability of thermolabile gabapentin during TSMG and it showed good correlation with measured drug degradation (R2=0.92).

RACHANA SAPKOTA (PURDUE UNIVERSITY)

Investigating partial trehalose crystallization during lyophilization of proteins

Trehalose is a commonly used excipient in protein formulations. The physical state of trehalose can change during processing and impact protein stability. Phase separation has been studied using ss-NMR and model protein formulations (BSA, and mAb). Findings indicate that the duration of annealing (24 or 72 hours) can alter the degree of trehalose crystallinity which can be detrimental to the stability of certain drugs.

As the year draws to a close, it feels very fitting to showcase these scientific soundbites that all represent exciting opportunities for the future. The first year of the IJPE has also shown huge potential as a dedicated publication for excipient-related science and quality topics. Personally, it has been a very rewarding experience, and I am sure that the best is yet to come. I would like to thank all the enthusiastic authors, the incredible Scientific Reviewers, the outstanding Editorial Board, and the astonishing support from Kim Beals and M-B Moreton.