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Editorial

Voices in *Molecular Pharmaceutics*: Meet Dr. Zahari Vinarov, Who Unites Physical Chemistry and Pharmacy to Tackle Fundamental and Industrial Biopharmaceutical Challenges

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CURRENT ROLE

I am currently an associate professor, leading several research projects funded by the pharmaceutical industry or public research agencies. One of these projects is a five-year (2022−2027) national grant (the 3D GUT project), which aims to create a personalized, interactive, 3D virtual model of the human stomach and small intestine that can predict the phase distribution, absorption, and food interactions of oral drugs (small molecules, peptides, and RNA/DNA), based on advanced time-, space-, and phase-resolved in silico profiling of drug concentrations (Figure 1). To achieve this ambitious goal, our team will (1) capture gastrointestinal anatomy and dynamics via 3D MRI, providing personalization and describing interindividual variability in organ size and shape, (2) use computational fluid dynamics to study the real hydrodynamics at anatomically and physiologically relevant conditions, and (3) integrate all main physicochemical and biochemical reactions, at colloidal and molecular levels, including advanced formulation behavior, drug dissolution, phase distribution, and permeation. This challenging and highly multidisciplinary effort aims to lead to a novel simulation platform of the upper gastrointestinal tract, opening new horizons in personalized medicine, oral drug absorption, and food effects research, while facilitating the efforts to abolish animal studies.

CHALLENGES OR BARRIERS

My journey as a scientist at the interface between pharmacy and chemistry started in 2008, as a research assistant in the Department of Chemical and Pharmaceutical Engineering in Sofia University, while still being an undergraduate Pharmacy student. The exposure of the Department to the industry introduced me (as a research team member in >15 projects) to an uncharted territory: the diverse applications of chemical engineering and formulation science.

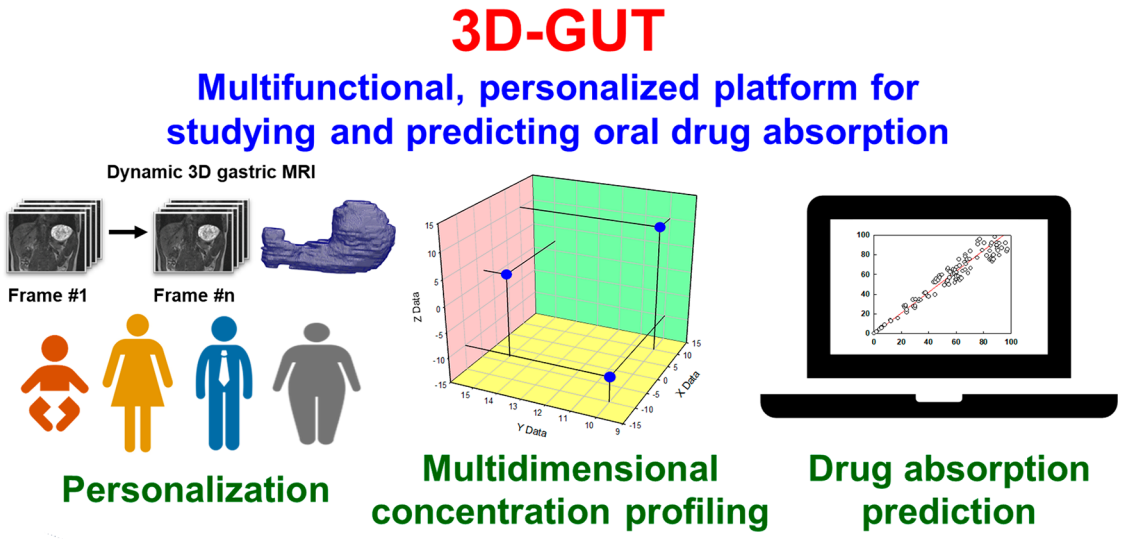

Figure 1. Current main research project (2022−2027).

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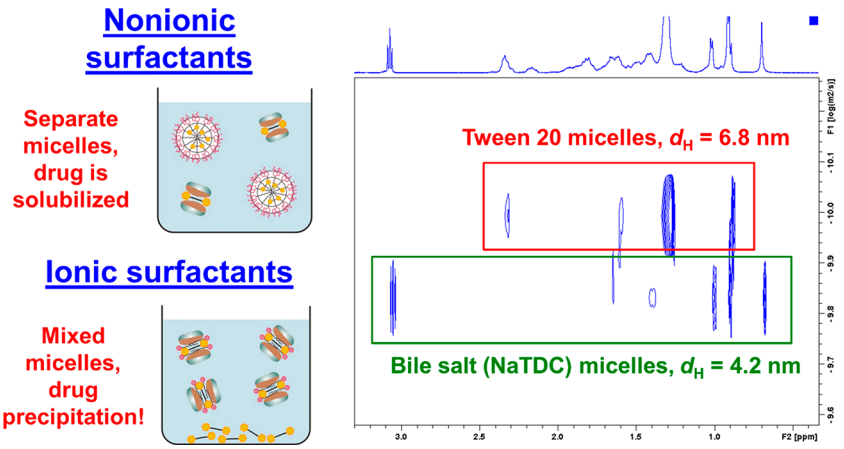

Figure 2. DOSY NMR results, illustrating the coexistence of Tween 20 and taurodeoxycholate micelles.

However, although we had long-standing partnerships with chemical companies such as Unilever, BASF, etc., it was difficult to engage the pharmaceutical industry. Reaching out to local players was also impossible, as Bulgaria still lacks the presence of any of the big R&D pharmaceutical companies (only a couple of generic producers are present). The situation changed with the help of an EU project (COST Action UNGAP), which connected us to the European family of drug absorption researchers and later resulted in my postdoc in the group of Professor Patrick Augustijns in KU Leuven, where I worked on a project with Janssen Pharmaceutica. Nowadays, I am back in Sofia University with several ongoing projects with the pharmaceutical industry.

■ ONE THING I HOPE TO ACCOMPLISH IN THE FUTURE

I hope that in the coming years I can establish our department and Sofia University among the leaders in oral formulation development and drug absorption.

■ A RECENT MOLECULAR PHARMACEUTICS PAPER

The study we published on surfactant−bile interactions in biorelevant media (Effect of Surfactant−Bile Interactions on the Solubility of Hydrophobic Drugs in Biorelevant Dissolution Media) provided some particularly interesting insights. We found that nonionic surfactants and bile salt mixtures behave as ideal mixtures in respect to drug solubilization: A linear change in the solubilization capacity as a function of mixture composition was observed. In contrast, ionic surfactants behaved quite differently, exhibiting a sharp decrease in drug solubilization after the addition of minimal concentrations of bile salts. After we demonstrated that mixing the surfactants with pure taurodeoxycholate leads to the same trends, we studied the mechanisms in more detail by nuclear magnetic resonance (NMR)spectroscopy. With the help of diffusion ordered spectroscopy (DOSY), we showed that nonionic surfactant micelles can coexist with bile salt micelles (limited or no mixing), whereas ionic surfactants formed mixed micelles with low drug solubilization capacity with the bile salts, leading to drug precipitation (Figure 2).[1]

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Notes

Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

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