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VABILO NA PREDAVANJE
V OKVIRU DOKTORSKEGA ŠTUDIJA
KEMIJSKE ZNANOSTI

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z naslovom:

Chemical Engineering in the Bio-Medical Field

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Vljudno vabljeni!

Abstract:

Mathematical models, defined as a mathematical metaphor of some aspects of reality [1], are aimed at the description of what cannot be directly observed (for example, molecules, atoms and subatomic particles) and at the emulation of the behavior of something [2]. Accordingly, mathematical modelling can be viewed as a cognitive activity of human mind that requires a deep knowledge of the device/object/phenomenon under study. This is the reason why different competences such as, for example, engineers, physicians, biologists and mathematicians are needed to build up a reliable mathematical model devoted to work in the "BIO" field [3].

Recently, mathematical models have gained further importance in the bio-medical and bio-pharmaceutical field due to the development of personalized medicine, a new emerging approach that relies on the idea of patient uniqueness, thus overcoming the old idea of the "average patient" [4]. This strategy, via an optimized dosing, is greatly beneficial for the patient, as it allows the reduction of side effects and the improvement of the effectiveness of the therapeutic treatment. At the same time, however, it poses the not negligible problem of patient uniqueness that needs to have a rational approach adaptable to each patient.

In this light, the present lecture focusses the attention on mathematical models devoted to describe the simultaneous processes of drug release and absorption/distribution/metabolism/elimination processes (ADME) [5 - 8]. At this purpose, some of the most important physicochemical phenomena affecting drug delivery and ADME processes will be discussed from a physical and mathematical point of view. In addition, the strict connection among mathematical models and experimental data will be stressed as experimental data not only serve to verify model reliability but they play a very important role in model building. Indeed, they are fundamental in the enucleation of the really important phenomena ruling drug release and ADME processes. Finally, the attention will be shifted to the problem of the delivery of nucleic acid based drug (NABD), such as siRNA. Indeed, despite this class of drugs seem to represent the new frontier for what concerns the therapeutic treatment of many relevant diseases all over the world, the mathematical modelling activity on this topic seems to be still in its infancy [9].

Ultimately, all the above considerations make clear the considerable development of a new branch of Chemical Engineering that could be defined "Biological Engineering" [10].

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