

---

## Preface

---

This book represents quintessence of the basic results on studies of the interaction of anti-cancer actinomycin antibiotics with DNA.

Special emphasis is given to explaining the molecular mechanisms of action of heterocyclic antibiotics (for example, actinomycin D and its derivatives), establishing the key physical and chemical properties of their specific and nonspecific complexes with DNA and model structures, as well as demonstrating the application of modern biophysical instrumental methods (mainly spectral), allowing the study of the mechanisms and properties of these complexes in native systems at physiological micromolar concentrations.

Unlike a number of reviews and monographs on this topic, the author seeks not so much for a huge number of known natural and synthetic antibiotics (it is almost impossible and not necessary), but to perform on a thorough analysis of a typical multi-class of antibiotics – actinomycins, which are of great interest not only as a powerful natural anticancer agents, but also as typical DNA-binding heterocyclic substances. The obtained results may help to better understand and clarify the mechanism of action of natural hetero-cyclic antibiotics on tumor cells. And, last but not least, the obtained knowledge and information can be applied while studying a number of various synthetic antibiotics.

For comparison with actinomycins, the data on the intercalating dye ethidium bromide - a strong carcinogen – are presented in Chapter 3, and findings on heterocyclic antibiotic Hoechst, often used as a fluorescent probe, having anti-tumor activity, are presented in Chapter 10.

From vast literature on actinomycin complexes with DNA, summaries and critical analysis are given here for selected papers, in which have been put forward fundamentally new ideas, original models were suggested, or decisive

experiments were carried out. Therefore, the bibliography includes only two hundred references [1 - 215], which were used for crucial analysis.

A major portion of the results, presented in the book, belong to the author and his colleagues, who have performed the work on DNA-actinomycin complexes for 10 years and have come to some important conclusions that provoke the development of an entirely new view on old topic. For instance, the data presented in the book (mainly spectral ones) and their comparison allow illustrations that one can not automatically transfer the results obtained by X-ray analysis, NMR and molecular dynamics in crystals, concentrated solutions and a gas phase, respectively, for complexes of antibiotics with DNA in aqueous solutions at their low physiological micromolar concentrations.

The author expresses his deep gratitude to Dr. R. Wadkins (USA), as well as I.V. Savintsev, A.E. Kovalev, M.A. Bitehtina, R.E. Elemessov and other colleagues for working together to study the DNA-actinomycin complexes, and CRDF and NATO for financial support of this research.

*Nikolai Vekshin*

*Pushchino*

*9 May 2010*