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INTRODUCTION – PLASMIDS

Most of the genetic information of cellular organisms, both prokaryotic and eukaryotic, is located in large DNA molecules forming chromosomes. Loss of this information by a cell means its death within a rather short time. Nevertheless, in most cells, chromosomes (and in Eukaryota also mitochondrial and chloroplast genomes) do not contain the whole genetic information. Additional genetic information is located in relatively small DNA (or, rarely, RNA) molecules, which are not essential for cell survival under certain environmental conditions. Such “additional” carriers of genetic information are called “plasmids”. Although they are not necessary for survival of organisms under optimal environmental conditions, it would be hard to imagine, in their absence, the existence of the enormous potential of organisms (particularly bacteria) to adapt themselves to various conditions and, perhaps, the surprising diversity of cellular functions.

Effects of the presence of plasmids in various organisms, which are important for humans, can be observed almost every day. For example, rapid spreading of resistance of bacteria to antibiotics is mediated mainly by plasmids. However, there are also examples of advantageous effects of plasmids – for instance, a large part of biotechnological processes, based on cells bearing recombinant DNA, would not be possible without plasmids.

Plasmids play a very important role in scientific research. Since they are relatively small nucleic acids molecules they can be used as ideal models in studies on mechanisms of DNA replication regulation or on partitioning of DNA copies to daughter cells during cell division. There are also fascinating, and very important, problems concerning plasmid biology; the examples are: horizontal gene transfer, stable maintenance of plasmids in cells or plasmid-specified features of cells that allow them to survive under extremely hard environmental conditions.

What is the importance of current studies on plasmids? The key role of these extrachromosomal genetic elements in cell biology, especially in bacteria, together with the crucial role of bacteria as pathogens of humans, animals and plants, and as tools in biotechnology, indicate that such studies are absolutely necessary. It is worth mentioning that the journal “Plasmid”, whose aim and scope can be easily deduced from its title, was established over twenty years ago. The journal publishes both original articles and reviews, and has been fully recognized by the scientific community.

Problems concerning biology of plasmids, and their importance for human health and for biotechnology are presented in a series of articles in this issue of KOSMOS. The authors of the articles are specialists in different fields of

plasmid biology, and they have been generally recognized due to their achievements in studies on extrachromosomal genetic elements. I would like to thank the authors for participa-

tion in preparing this issue of KOSMOS and for preparing materials which can be helpful on understanding our current knowledge on this fascinating field of biology.

A handwritten signature in black ink, consisting of a large, stylized capital 'A' followed by a smaller, more complex mark that resembles a stylized 'W' or 'G'.