Current Topics

Nanoparticles for Cancer Therapy

Foreword

Kentaro Kogure

*Department of Biophysical Chemistry, Kyoto Pharmaceutical University;
5 Nakauchi-cho, Misasagi, Yamashina-ku, Kyoto 607-8414, Japan.*

Cancer is one of the most serious human diseases. Although diverse therapeutic approaches to treat intractable diseases have been developed, no universal cure for cancer has been established. Since numerous researchers have been attempting to develop anticancer therapies, R&D on various promising treatment regimens is ongoing. In particular, the progress of research on drug delivery systems (DDS) based on nanoparticles, such as liposomes and micelles, to reduce the side effects of chemotherapy has been remarkable. The development of Doxil, polyethyleneglycol-modified liposomes encapsulating doxorubicin, is a well-known example applied in clinically in several countries.

Research on nanoparticles for cancer treatment is also underway in Japan. For example, micelles for anticancer therapy developed by Kataoka's group are at the clinical trial stage. Many researchers are investigating other types of nanoparticle for use in anticancer therapy, and their results are being published in a variety of journals. Furthermore, the combination of nanoparticles with other technologies such as physical methods is being examined to improve the therapeutic effect.

This Current Topics section is dedicated solely to development research on anticancer nanoparticles and anticancer therapy using nanoparticles, focusing on the results of four groups of world-renowned scientists. Their research involving novel types of nanoparticles for cancer treatment based on new concepts, including effective combinations of nanoparticles with other therapeutic technologies such as chemotherapy and physical methods is reviewed. The first review is entitled "Nanoparticles consisting of tocopheryl succinate are a novel drug-delivery system with multifaceted antitumor activity" by Drs. Susumu Hama and Kentaro Kogure (Kyoto Pharmaceutical University). As an ideal carrier for combination therapy using several drugs, it is thought that a DDS itself should have antitumor effects in addition to the ability to deliver drugs to tumors. Thus, α -tocopheryl succinate (TS), a succinic acid ester of α -tocopherol, was investigated as a unique antitumor agent, because TS itself can form nanoparticles. In the first

review, nanoparticles consisting of TS as a novel DDS with multifaceted anti-tumor effects for combination therapy are introduced.

The second review is "Systemic delivery of small RNA using lipid nanoparticles" by Drs. Tomohiro Asai and Naoto Oku (University of Shizuoka School of Pharmaceutical Sciences). Gene silencing mediated by RNA interference (RNAi) effectors such as small interfering RNA and microRNA in clinical therapy is expected to have a beneficial impact on the treatment of many diseases. The second review details recent progress in research on systemic delivery systems for RNAi therapeutics.

The third review is "Selective delivery of oxaliplatin to tumor tissue by nanocarrier system enhances overall therapeutic efficacy of the encapsulated oxaliplatin" by Drs. Amr S. Abu Lila, Hiroshi Kiwada, and Tatsuhiko Ishida (University of Tokushima). Oxaliplatin is currently approved for standard treatment of metastatic/advanced-stage colorectal cancer. A successful outcome of cancer therapy using oxaliplatin requires selective delivery to tumor tissues. The third review focuses on the utilization of various DDS such as liposomes, polymeric nanocarriers, and carbon nanotubes for the selective delivery of oxaliplatin to tumors and enhancing its therapeutic efficiency.

The fourth review is "Combination of nanoparticles with physical stimuli toward cancer therapy" by Drs. Shintaro Fumoto and Shigeru Kawakami (Nagasaki University). The efficacy of the nanoparticulate system itself is generally insufficient for safe, effective treatment of cancer. Thus, additional strategies are necessary to improve delivery and cellular uptake of nanoparticles. In the fourth review, the combination of nanoparticles with various physical stimuli such as electric pulses and ultrasound to improve targeted delivery of nanoparticles is described as additional strategies.

The review articles in this Current Topics section are valuable reading for researchers in the field of anticancer therapy. I sincerely appreciate all the authors for their contributions.