Nowadays, we are often surrounded by „all-in-one" technologies and solutions. For example, a telephone serve not only to communicate, but is used as a calendar, music or movie player, and even as a credit card. Following these modern technologies, the authors of the project aim to adapt these concepts to fight cancer.

Neoplastic diseases are currently one of the most common diseases of affluence in the world. Every year, there are many reports on the increasing number of new cancer cases and deaths. At the same time, scientists and physicians make a huge effort to search for new drugs and treatment modalities.

The aim of the project is the **evaluation of the physical and biological properties of the novel multifunctional *GdLip* platform for potential application for diagnosis and therapy of cancer**. The author assume that the platform will provide opportunities for (1) targeted delivery into diseased tissues, (2) imaging of diseased area, (3) drug activation (photodynamic therapy) and (4) monitoring of therapeutic outcome. In medical sciences "all-in-one" solutions are usually called "theranostic" (from Greek "therapeuein" – therapy and "gnostic" – "having knowledge of").

The construction of ***GdLip*** platform is based on a liposome – a spherical particle (bubble) composed of phospholipids that form a wall separating the inside of the bubble from the external environment (Fig. 1). A specific protein, an antibody, will be directly attached to the liposomal membrane (phospholipid wall). An antibody possess the ability to specifically bind to another protein (a receptor), which is present at high concentration on the surface of tumor cells. As an antibody and a receptor are compatible, authors expect that ***GdLip*** will be captured mainly by cancer cells. Further, a contrast agent and a drug substance will be incorporated into phospholipid wall. The first component is responsible for **enhancement of the contrast for magnetic resonance imaging of the tumor**, by changing physical properties of protons of water molecules.

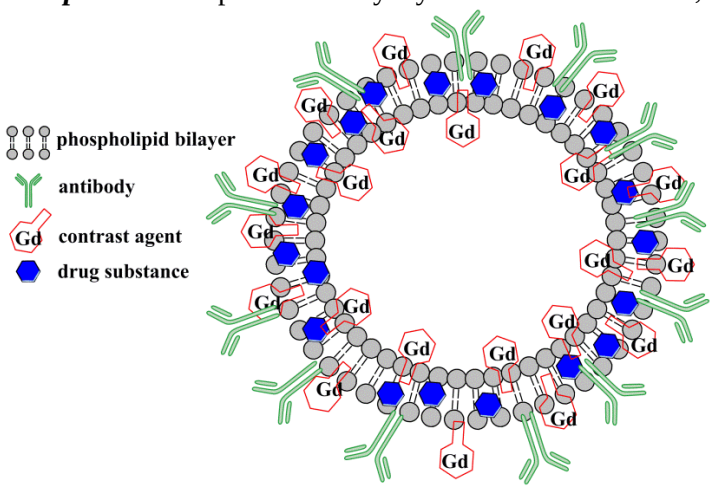

Fig. 1. Structure of GdLip „theranostic" platform - a diagnostic-theraputic agent for simultaneous delivery of antibody, contrast agent and drug substance.

A drug substance after administration, is excited by a laser light and in the activated form is able to **destroy cancer cells**. An excited drug substance have ability to react with oxygen molecule what leads to **formation of reactive oxygen species**, which cause **cytotoxic effect against cancer cells**. Because of specific mechanism, this treatment modality is called – **photodynamic therapy** (Fig. 2).

The authors of the project plan to study the relaxation properties and toxicity of multifunctional liposomes using cancer cell models, imitating structures formed by human cells and *in vivo* animal model bearing tumor. Thus researchers will be able to estimate whether ***GdLip*** may be a useful agent to obtain contrast images of high quality that may be used in clinical practice. And finally, they will ascertain if targeted ***GdLip*** are more selectively delivered to the cancerous cells than to the healthy ones, and are effective in tumor cells inactivation.

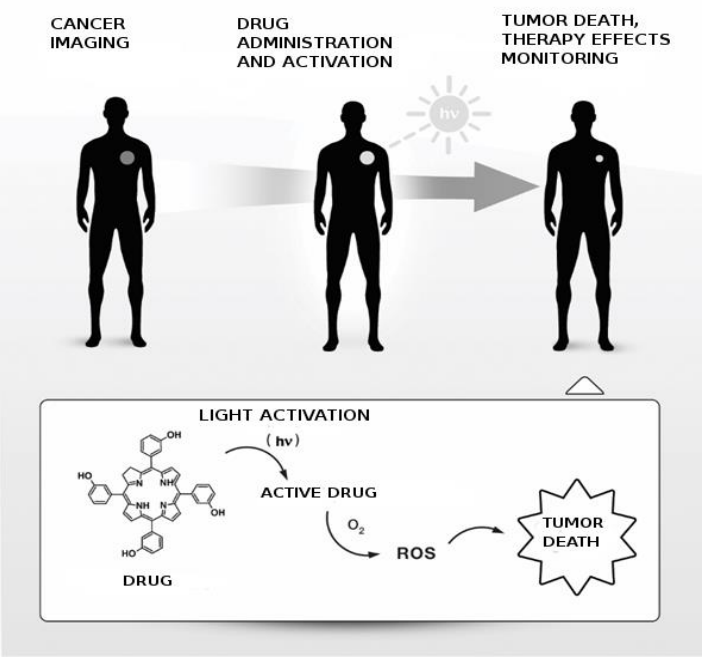

Fig. 2. GdLip as a potential diagnostic and therapeutic agent for cancer imaging and therapy (hv – light, ROS – reactive oxygen species).

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