

**Title: Taming Cancer: Is It Possible?***Dr. Levente Kovacs*, Zoltán Sági, Dániel András Drexler and Johanna Sági*Professor
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The key of scientific success in every field nowadays depends on interdisciplinary design, in medical treatment as well. Imagine if the optimal administration (dosage, delivery method and frequency) of anticancer drugs can be calculated, it would improve efficiency, decrease treatment cost and minimize side effects. This optimal administration can be solved by using a controller in a closed-loop, similar to the artificial pancreas concept developed in diabetes. The idea is to measure the tumor volume, create a pump for drug administration, and design control algorithms for specific tumor types. Hence, a personalized approach would be possible. This novel approach may lead to a breakthrough in cancer therapies.

Previously we have investigated the effect of antiangiogenic drug administration methods by bevacizumab (Avastin). The usual administration is via intravenous infusion; once every 2-3 weeks. Our hypothesis was that the effectiveness of a lower dosage with a quasi-continuous therapy can be comparable with the recommended (protocol-based) therapy. To prove this, we carried out an animal experiment, where immunocompromized (SCID) mice were investigated with human colorectal adenocarcinoma (HT-29) xenografts. Control group members (5 mice) received no treatment; case1 group members (10 mice) received one 200 µg bevacizumab dose (as a treatment for 15 days); while case2 group members (10 mice) received 1.11 µg bevacizumab daily for 15 days (the total dose of case2 group members is the one-twelfth dose of case1 group members). ANOVA test showed significant difference between the means of control, case1 and case 2 groups ($p = 0.041$, using 0.05 level of significance). Tukey's HSD test resulted in significant difference between case1 and case2 groups ($p = 0.038$). This means that the daily treatment with one-twelfth total dose resulted in significantly smaller tumors than the protocol-based treatment. Though in this study not a calculated optimal drug delivery method was used, the results are still better than the delivery's results applied nowadays. We believe that it proves the importance of finding the optimal delivery dosage and method in cancer therapy, which can be realized using an automated, controller-driven treatment.

Biography

Levente Kovács received his Ph.D. from the Budapest University of Technology and Economics in 2008. His fields of interest are modern control theory and physiological controls, with more than 300 international articles and h-index 14. He is a Professor and Vice Dean for Education at Óbuda University Hungary and Head of the Physiological Controls Research Center. He is IEEE Hungary Section and IEEE SMC Hungary Chapter Chair. In 2015 he is a Recipient of the highly prestigious ERC StG grant of the European Union.