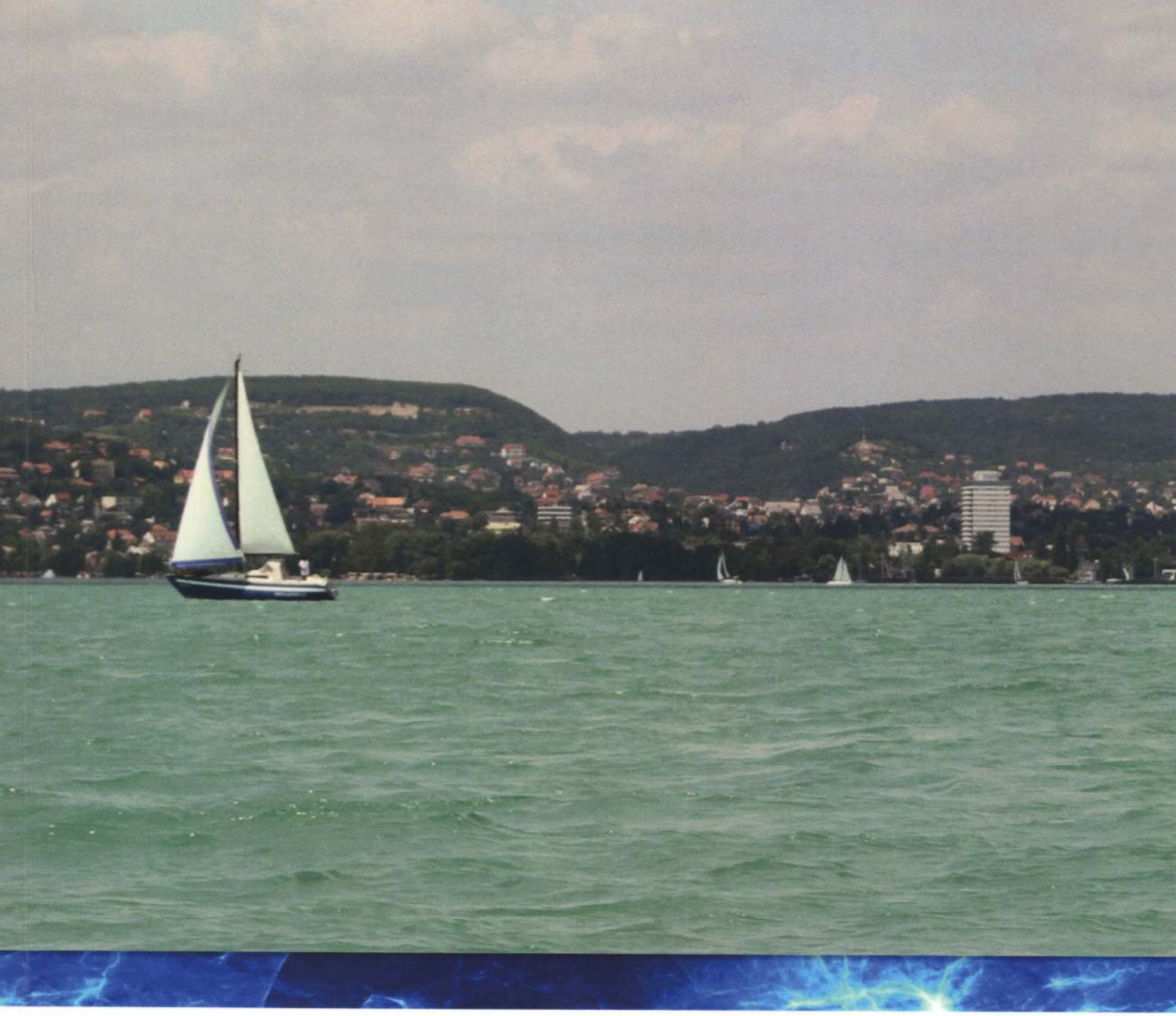

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BIO-DECONTAMINATION OF E. COLI ON INNER WALL OF A THIN TUBE USING PULSED CORONA DISCHARGE

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A low temperature plasma is a useful tool for decontamination of surfaces, especially for thermally sensitive materials for which conventional methods such as autoclave and dry heat cannot be used. In the case of small diameter long tubes used in medicine as catheters or endoscopic multi-purpose tubes, flowing afterglow/post discharge can be forced through and decontaminate the inner wall [1, 2].

In our experiments, an atmospheric pressure argon pulsed corona discharge was propagated in a thin (8 mm inner diameter) 49 cm long quartz tube on its inner wall. Argon flow in this tube was 3.5 – 5.5 slm. Positive high voltage pulses (25 kV peak, 2.2 µs width, 25 ns rise and fall times, 500 or 1000 pulses per second) were applied to a tungsten needle electrode placed at the tube inlet. The grounded electrode was placed at the tube outlet. *Escherichia coli* was used as a model organism for evaluation of bacterial survival in the discharge. Two 10 µl droplets of bacterial suspension (10^8 bacteria/mL) were deposited inside the tube at 2 cm and 44 cm distance from the tungsten tip. The bacteria were exposed to the discharge for 5, 10 and 20 min. The gas flow without discharge was used as a control experiment. For 10 and 20 min exposure times adding water vapour (720 ppm, Figure 1) caused a significant enhancement of the microbiocidal activity of the discharge by about 1 log. Similar effect of water was observed in previous surface decontamination experiments with DC corona [3]. In argon only flow, we suppose the bactericidal effect due to the action of excited Ar*. In argon with water vapour admixture, the formed OH radicals, UV B radiation (OH* emission at 308 nm) and to a lesser extent formed H_2O_2 contributed to the effect.

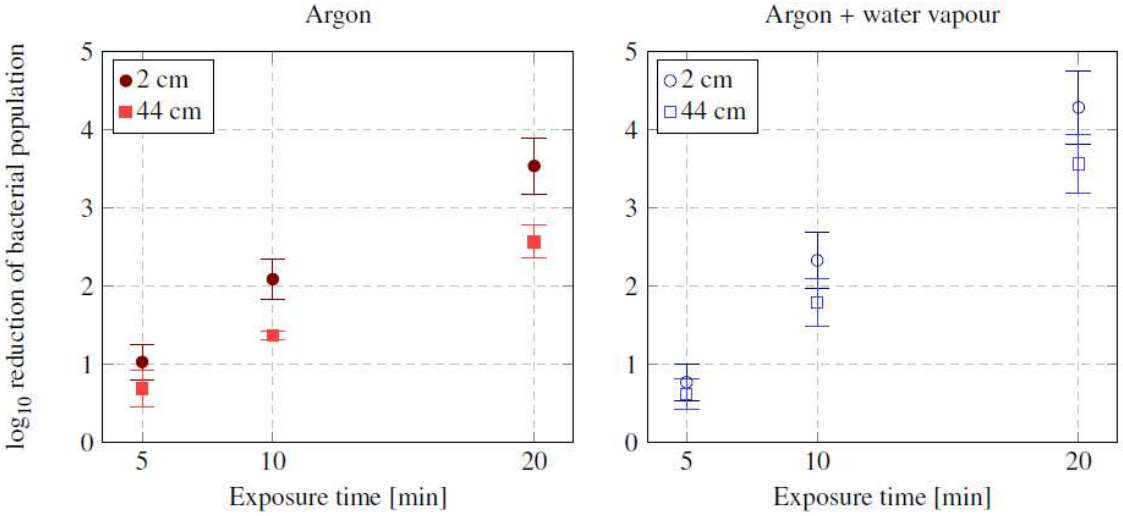

Fig. 1: $\log_{10}$ reduction of *E. coli* population after plasma treatment in dry argon atmosphere and argon with 720 ppm of water admixture (mean±SEM)

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