

THE THERMAL AND NON-THERMAL EFFECTS OF THE ULTRASONIC WAVES
ON THE ELECTRICAL POTENTIAL DIFFERENCE ACROSS THE RAT STOMACH
WALL

A. Szlachcic

Department of Biophysics, Institute of Physiology, Medical
Academy, Kraków

In previous studies conducted in our laboratory it had been found a harmful effect of the ultrasonic waves /US/ on the experimental peptic ulcers. Also changes in the gastric secretion have been observed. The aim of this study was to elucidate if US exert any influence on electrical potential difference /PD/ across the stomach wall.

It is known that the considerable fall in the absolute PD value is caused by various chemical agents e.g. aspirin, alcohol and bile acids but there is very limited information yet on the action of physical factors, especially US, on PD.

The experiments were performed on anesthetized rats in three series: A - US acted through the intact abdominal wall, B - eviscerated stomach in physiological saline bath was exposed to the action of US, B_T - the same condition as in B but in the constant temperature. The therapeutic intensities and frequencies of US were used.

Immediately after start of US action a rapid decrease of PD value was observed in all three series of experiments. The amplitude of this fall was proportional to the intensity of US and it was equivalent 15-20% for the highest intensities. After 5-10 min /from the start of US action/ an increase of PD value occurred in A and B series but did not occur in B_T . This rise was followed with increase of temperature of abdominal cover or physiological saline in experiments A and B respectively. When US action had been stopped the rapid rise of PD /persisting for 10-15 min/ was observed in all kinds of experiments.

It is concluded that the changes of PD observed immediately after the start or after the end of the ultrasonic waves action are probably caused by the non-thermal effects of US /e.g. by the changes in the back-diffusion of differentions and in the mechanisms of the ion pumps/ and the increases of PD value appearing after 5-10 min from the start of US action may have the thermal origin.