ON THE IMMUNITY OF RABBITS IN WHICH HIGH-INTENSITY ULTRASONIC WAVES HAVE CAUSED RESOLUTION OF THE BROWN-PEARCE TUMOR

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Retained immunity is known to occur after spontaneous tumor resolution in animals, and subsequent reimplantations of the tumor are not successful [1, 2, 5, 6, 7]. However, every tumor resolution does not create immunity in animals. For example, the resolution of implanted tumors which can be brought about by the action of chemical and hormonal preparations and roentgen rays do not make the animal immune to reimplantations of the tumor.

It has already been established that the action of highly intense ultrasonic waves 60-80% of the cases, causes the resolution of Brown-Pearce tumors in rabbits [4]. In many cases, the disintegration and resolution of metastases which had not been treated by the sound waves were observed.

Are rabbits in which the action of high-intensity ultrasonic waves has caused the regression of tumors then immune ? The purpose of this work was to investigate this question.

EXPERIMENTAL METHODS

The investigation was done with 34 rabbits in which Brown-Pearce tumors had been resolved due to the action of high-intensity ultrasonic waves. The rabbits were treated with the sound by G. D. Andreevsky's with the aid of the high-powered, ultra-acoustic apparatus designed by A. K. Burov [3]. We used a frequency of 750-1500 kilocycles, a power of 34-150 w /cm^2 and an exposure of 1 $^1/_2$-75 seconds.

EXPERIMENTAL RESULTS

Resolution of the original tumor, implanted in a muscle or testicle of the rabbits, occurred at different intervals after the action of the high-intensity ultrasonic waves (Table 1).

TABLE 1

Time of Brown-Pearce Tumor Resolution in Rabbits After Sound Treatment

Time of tumor resolution after sound treatment (in months)	1	2	3	4	5	6	Total No. of rabbits
Number of rabbits with resolved tumor	3	17	7	2	2	3	34

* Deceased.

In most of the rabbits, as Table 1 shows, the tumor was resolved 2-3 months after the sound treatment; however, in some animals, the tumor was resolved during the first month, while, in others, the resolution process lasted as long as 6 months. The tumor usually became slightly larger before its resolution.

The rabbits' resistance was tested by one or two reinoculations of the Brown-Pearce tumor. The tumor was implanted once in all of the rabbits (34). The tumor was implanted twice in 13 of the rabbits. The tumors were reimplanted in various ways: in the testicle, intramuscularly and intraperitoneally. In order to prove the implantation, healthy rabbits (the control) were injected with the tumorous tissue. The tumorous suspension was injected in a dose of 1 ½ - 2 ml in a dilution of 1:3 into both the experimental and control animals. The rabbits were observed for 2 years and carefully examined daily, with a detailed pathologico-anatomical examination at the end of the 2-year period.

The tumors were reimplanted at various intervals after the resolution of the sound-treated tumors (Table 2).

TABLE 2

Time After Resolution of Sound-Treated Tumor at Which Brown-Pearce Tumor Was Reimplanted in Rabbits

Time of reimplantations (in months)	1	2	3	4	5	6	7	8	9	10	11	12	Total No. of rabbits
Number of rabbits with one reimplantation of tumor	3	2	4	9	9	2			4			1	34
Number of rabbits with two reimplantations of tumor						2	2	1		1	6	1	13

As Table 2 shows, in most of the rabbits the tumor was reimplanted once, 4-5 months after the resolution of the original, sound-treated tumor. The interval between the first and second implantations was 5-7 months.

Our observations showed that in the 34 rabbits with the Brown-Pearce tumors which had been resolved after sound treatment, the reimplantation of the tumor, which was done at intervals varying from one month to one year after the resolution of the original tumor, was not successful. The tumor was not implanted by either the single or the double injection of the tumorous suspension (Table 3). This could be especially clearly observed in the rabbits with the tumor implanted in the testicle, where, by palpation, it was easy to trace the implantation of the tumorous suspension. With all the implantation methods we used (intramuscular, intraperitoneal, intratesticular), we could find neither necroses nor cicatrizations in either the place of implantation or the locations of the possible metastases (lymph nodes, internal organs) by pathologico-anatomical examination. The injection of the tumorous suspension into the healthy rabbits resulted in implantation in 100% of the cases and in the subsequent development of the tumorous process (12 out of 14 rabbits died from total metastasization), see Table 3.

TABLE 3

Results of Tumor Reimplantations

Animal group	Implantation	No. of rabbits	Tumor not implanted	Rabbits which died from metastases
Experimental	Once	34	34	0
	Twice	13	13	0
Control	Once	14	0	12

The work carried out allows the conclusion that the resolution of a Brown-Pearce tumor in rabbits after short exposure to high-intensity ultrasonic waves creates a lasting immunity in the animals to reimplantations of the rumor.

SUMMARY

The problem of whether rabbits with a tumor resolved by ultrasonic waves would develop resistance to new inoculations was studied.

Reimplantations of tumors into rabbits which had an implanted tumor resolved a month or a year previously under the action of ultrasonic waves were not successful.

We may draw the conclusion that resolution of a Brown-Pearce tumor caused by ultrasonic sound waves makes rabbits resistant to new inoculations.

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* Original Russian pagination. See C. B. translation.