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THERAPEUTIC EFFECT OF INHALATION OF A
MORPHOCYCLIN AEROSOL DURING EXPERI-
MENTAL STAPHYLOCOCCUS INFECTION IN
WHITE MICE

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Wright-Patterson Air Force Base, Ohio

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THERAPEUTIC EFFECT OF INHALATION OF A
MORPHOCYCLIN AEROSOL DURING EXPERIMENTAL
STAPHYLOCOCCUS INFECTION IN WHITE MICE

M. D. Paykin

(Scientific Supervision by
Senior Scientific Colleague
A. A. Medvedkova)

In order to study the chemotherapeutic effectiveness of inhalation of morphocyclin aerosol (morpholymethyltetracycline) we constructed a chamber with a volume of 20 liters, permitting simultaneous experimentation with 50 mice. The morphocyclin was applied in the form of a 5% solution in distilled water. The antibiotic solution was atomized in the chamber by an AI-1 aerosol inhalator with a 30 liter/min capacity. Preliminary observations showed that the mice withstood well inhalation of morphocyclin in the chamber for two hours. For the chemotherapeutic studies inhalation of the animals was continued for 90 min.

The concentration of morphocyclin in the blood and lungs of the mice was determined immediately after 90 min of inhalation. The determination was carried out by diffusion into agar; material from six mice was used for each determination. It was established that the morphocyclin concentration in the blood under these conditions equals 0.75 ± 0.05 units/ml, while that in the lungs is 6.1 ± 0.6 units/g (average from two determinations).

The experimental model of pneumonia was brought about by intranasal introduction of a suspension of a highly virulent strain of Staphylococcus albus to mice under a light ether narcosis. Three groups of mice, each animal weighing 10-12 grams, were used in the experiment; one group received no treatment (control group), the second received morphocyclin in a dose of 60 units per mouse intraperitoneally, and the third group was treated by the inhalation of morphocyclin. Treatment was begun immediately after infection. After three days the surviving mice were sacrificed and their lungs subjected to macroscopic examination. The therapeutic effect was evaluated in terms of the degree of injury inflicted on the animals by progressive pneumonia [1]. The results of the experiment are shown in Table 1.

Table 1. Therapeutic effect of inhalation of aerosol and intraperitoneal introduction of morphocyclin during experimental staphylococcal pneumonia.

Infecting dose (10^6 micro- bodies per mouse)	Degree of damage from progressive pneumonia		
	Untreated	Treated	
		By inhalation	By intraperit. admin.
500	14/15	1/15	6/15
250	7/15	0/15	2/15
125	3/15	0/15	0/15

Remark: Numerator shows number of mice in group damaged by progressive pneumonia; denominator shows total number of mice in group.

It is evident that during localization of the staphylococcal infection in the lungs inhalation of the antibiotic gives a better effect than intraperitoneal administration.

In order to reproduce a generalized staphylococcal infection, mice weighing 12-14 grams were infected with a suspension of the same strain of staphylococcus in semiliquid agar. An initial 24-hour bouillon culture of staphylococcus was diluted 2, 4, and 8 times with physiological solution and also condensed by centrifuging 2 and 4 times. The suspension of staphylococcus was

administered to the mice in a volume of 0.5 ml. Treatment was carried out immediately after infection. One group of mice received morphocyclin in a dose of 60 units per mouse internally; a second was treated with inhalation of an aerosol, while a third group - the control group - received no treatment. Observation was sustained for 10 days. The effect of the therapy was evaluated in terms of survival.

The experimental results are shown in Table 2.

Table 2. Therapeutic effect of inhalation of an aerosol and internal administration of morphocyclin during experimental staphylococcal sepsis.

Infecting dose 10 ⁶ micro- bodies per mouse	Death rate		
	Untreated	Treated	
		By inhalation	By intraperit. admin.
64	10/10	4/10	0/10
32	10/10	3/10	0/10
16	9/10	4/10	0/10
8	0/10	2/10	2/10
4	6/10	1/10	0/10
2	0/10	0/10	0/10

Remark: Numerator shows number of deaths in the group, while denominator shows total number of mice in the group.

From the table it is clear that in the septic process the internal administration of morphocyclin is significantly more effective than inhalation administration; however, inhalation of morphocyclin nonetheless shows an expressed therapeutic effect, dependent on the severity of the process (infecting dose).

Conclusions

1. Inhalation of morphocyclin by mice for 90 min creates a bacteriostatic concentration of the antibiotic in the blood and in the lungs.

2. Inhalation of morphocyclin is highly effective during experimental staphylococcus pneumonia in mice,

3. Inhalation of morphocyclin has a therapeutic effect during experimental staphylococcal sepsis in mice.

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