

# INHIBITION OF THE ACTION OF TETANUS TOXIN BY VITAMIN B<sub>1</sub>

K. D. Pletsityi

UDC 616.981.551-085.356:577.164.11

Experiments on rabbits showed that preliminary injections of vitamin B<sub>1</sub> and their continuation after injection of tetanus toxin increased the resistance of the animals to tetanus. A more marked protective effect was observed if the tetanus toxin was injected into the rabbits in vitamin B<sub>1</sub> solution. Injection of the vitamin 2 h after the toxin led to a tendency toward an increase in resistance.

**KEY WORDS:** tetanus toxin; vitamin B<sub>1</sub>; protective effect.

Specific methods still remain the only effective means of prevention and treatment of tetanus. However, because of the distinctive character of the pathogenesis of this disease [1], serotherapy yields only modest results. Tetanus accordingly remains in the forefront of infectious diseases with a high mortality. Research in the field of nonspecific prophylaxis and treatment of tetanus thus still remains of urgent importance.

In the course of a study of the effect of large doses of vitamins on natural immunity and resistance to certain infections during the last few years, the writer has investigated the action of vitamin B<sub>1</sub> on the development of experimental tetanus. Only one paper could be found on this question in the literature [2].

The object of this investigation was to study the effect of vitamin B<sub>1</sub> on the course and outcome of experimental tetanus.

**TABLE 1.** Effect of Thiamin on Development of Tetanus Poisoning in Rabbits

Group of rabbits	Total number of animals	State of development of pathological process at end of period of observation			
		No. of rabbits dying	P	No. with general tetanus	No. with local tetanus
I Experimental (toxin injected during vitamin loading)	11	0	<0,05	4	7
Control	11	4		5	2
II Experimental (toxin injected in thiamin solution)	11	0	<0,05	0	11
Control	12	5		3	4
III Experimental (thiamin injected 2 h after toxin)	10	1	>0,05	1	8
Control (physiological saline injected)	10	4		2	4

Department of Pathological Physiology, I. M. Sechenov First Moscow Medical Institute. (Presented by Academician of the Academy of Medical Sciences of the USSR, G. V. Vygodchikov.) Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 79, No. 1, pp. 28-31, January, 1975. Original article submitted July 19, 1973.

© 1975 Plenum Publishing Corporation, 227 West 17th Street, New York, N.Y. 10011. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission of the publisher. A copy of this article is available from the publisher for \$15.00.

## EXPERIMENTAL METHOD

Experiments were carried out on 70 rabbits weighing 2.5-3 kg. Tetanus poisoning was produced by injecting a solution of the dried toxin in a volume of 1 ml. Vitamin B<sub>1</sub> was given as a 6% solution of thiamin bromide. The results were subjected to statistical analysis by the method of alternative variation.

In series I the experimental animals (22 rabbits) received intramuscular injections of 2 ml of a 6% solution of thiamin into the right thigh daily for 3 days before injection of the toxin, and on the 4th day the toxin was injected (also intramuscularly) into the same region; for the next 3 days the same dose of vitamin was injected intramuscularly, but into the left hind limb. In series II (23 rabbits), tetanus was produced by injection of toxin diluted in vitamin B<sub>1</sub> (1 ml of a 6% solution) and no preliminary or subsequent injections of thiamin were given. In series III (20 rabbits), tetanus toxin also was injected intramuscularly into the right thigh of the animals, followed 2 h later by an injection of 2 ml vitamin B<sub>1</sub> into the same region. Thiamin injections were given for the next 2 days, but into the muscles of the left thigh. Control animals received injections of physiological saline by the same program.

## EXPERIMENTAL RESULTS

The results are given in Table 1. Thiamin clearly inhibited the development of tetanus poisoning, for not only did it prevent death of the animals from tetanus but it also delayed generalization of the disease. This action of thiamin was particularly demonstrative in the experiments of series II, in which the toxin was injected into the experimental animals in a solution of the vitamin: in this case none of the animals developed general tetanus. It will be specially noted that no tendency toward generalization of the disease could be observed in any of the rabbits that survived until the end of the experiment and showed evidence of local tetanus.

Another manifestation of the inhibitory effect of thiamin was that the experimental rabbits developed tetanus later than the control: local tetanus developed on the average 1 day later and general tetanus 1.5-2 days later than in the control.

In the writer's opinion the results of the experiments of series III are particularly important. Because of the comparatively small number of animals used, no conclusions can be drawn regarding the therapeutic action of thiamin in tetanus poisoning; however, the tendency observed is very interesting and further investigation of this problem could prove fruitful.

Massive doses of thiamin thus had a definite inhibitory effect on the development of experimental tetanus in rabbits, especially if the pathological process was induced by toxin diluted in thiamin solution. It is difficult as yet to express any definite views regarding the mechanisms of this phenomenon and special experiments must be undertaken for their elucidation.

## LITERATURE CITED

1. G. N. Kryzhanovskii, Tetanus [in Russian], Moscow (1966).
2. N. Nicolice, Zbl. Bakt. I. Abt. Orig., 160, 599 (1954).