ANALYSIS OF INTEROCITIVE REFLEXES IN EXPERIMENTAL TUBERCULOSIS

Article III

THE EFFECT OF TUBERCULIN UPON REFLEXES FROM THE CHEMORECEPTORS OF
AN ISOLATED LOOP OF THE SMALL INTESTINE IN HEALTHY CATS

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In works published earlier, we presented data regarding the effect of tuberculin on reflexes from carotid
sinus receptors and from the mechanoreceptors of the internal goids (1, 2). We established that the reflexes
from the carotid sinus receptors on the blood pressure were more sensitive to the toxic effect of tuberculin on
animal bodies than were the reflexes from the mechanoreceptors of the goids. We suggested that this differ-
ence was caused by the fact that both the baroreceptors of the carotid sinus and the chemoreceptors of the caro-
tid plexus participated in the reaction to pressure on the carotid artery.

The purpose of the present work was to prove the hypothesis that the reflexes from the chemoreceptors are
less resistant to the toxic effect of tuberculin than are the more stable reflexes from the mechanoreceptors.

EXPERIMENTAL METHODS

The method we used consisted of perfusing an isolated loop of the small intestine. The experiments were
done on cats under urethane anesthesia.

After the celiac cavity had been opened, the small intestine was freed, and a loop of it near Baudin’s
valve 20-25 cm long was isolated from the rest of the intestine, immersed in a vessel with Tyrode’s nutritive
solution and heated to a temperature of 37°. A glass tube was inserted into the distal end of the isolated intesti-
nal loop in order to remove the intestinal contents. Then the neurovascular plexus was freed from the sur-
rounding tissues. The nerves entwining the artery were carefully freed, and the vein and artery ligated. All the
surrounding tissues, including the mesenteric glands, were ligated. A cannula was inserted into the artery in
order to introduce the previously heated, oxygenated Tyrode’s solution. The solution was withdrawn through a
cannula inserted into the vein. Therefore, the only way in which the isolated intestinal loop was still connected
with the body was through the nerves.

The condition of reflex excitability of the chemoreceptor in the perfused portion of the intestine was
determined by the blood pressure and respiration reactions which were effected by adding to the Tyrode’s solu-
tion 1 ml of a nicotine solution (10⁻⁵) or 1 ml of an acetylcholine solution (10⁻⁷, 10⁻⁸), and also by the tempo-
rary replacement of the oxygenated solution with a solution containing carbon dioxide.

The blood pressure in the carotid artery was recorded with a mercury manometer, and the respiration, by
means of a Marey capsule, which was connected to the animal’s trachea by a glass T-tube.

After a background of the original blood pressure and respiratory reflex reactions caused by the introduc-
tion of acetylcholine, nicotine or carbon dioxide into the intestinal perfusion current had been established, the
animal was intramuscularly injected with tuberculin. Old Koch’s tuberculin was injected in a dose of 4-10 ml
8-12 mg of a purified dry preparation diluted with 8-12 ml respectively of a physiological solution. A total of 18 experiments were done. In three experiments, the reflex reactions from the chemoreceptors in response to the three kinds of stimulants—acetylcholine, nicotine and carbon dioxide—were examined. In five experiments, they were activated by two stimulants—acetylcholine and nicotine or acetylcholine and carbon dioxide. In the other ten experiments, either acetylcholine alone or carbon dioxide alone were used as the stimulants. The reflexes from the bladder mechanoceptors were also examined in three experiments. Such composite experiments made it possible to compare the effects of tuberculin on the reflex excitability of the baroreceptor and respiratory centers with the stimulants coming from different kinds of receptors under the same experimental conditions.

EXPERIMENTAL RESULTS

After the tuberculin injection, in 17 experiments the degree of the reflexes from the chemoreceptors on the blood pressure either decreased (by 14.2-87.5%), or the reflexes totally disappeared (5 experiments). Only in one experiment using carbon dioxide as the stimulant did the reflex on the blood pressure increase after the tuberculin injection by 22.1%.

![Fig. 1](image)

**Fig. 1.** Inhibition of reflex from small intestine chemoreceptor and sharp decline of average level of blood pressure after intramuscular injection of 9 ml of tuberculin, with the introduction of a 10^{-4} solution of acetylcholine.

a,b) original reflex; c,d,e) reflex after 10 minutes, 30 minutes and 1 hour following the injection of tuberculin. The curves from top to bottom signify: blood pressure, respiration, indication of stimulation, indication of time (in 5 second marks).

The decrease or disappearance of the reflexes most frequently occurred during the first 10-30 minutes after the tuberculin injection (in 14 out of 17 experiments). In 9 experiments, no greater inhibition of the reflexes from the chemoreceptors than that which occurred during the first 10-30 minutes was observed. The reflex either remained decreased to almost the same degree for the 1-2 hour observation period after the tuberculin injection (Fig. 1) or increased, sometimes even reaching the original level. In 5 experiments out of 14, the reflexes which had decreased during the first 10-30 minutes after the tuberculin injection showed an even greater tendency to decrease during the subsequent observation (Fig. 2).

In 5 experiments out of 17, the reflexes from the chemoreceptors only became inhibited an hour after the tuberculin injection. Up to this time, the reflexes either remained the same as before the tuberculin injection or even slightly increased.

The arterial pressure level did not change much in the majority of experiments. A sharp decline of the average blood pressure was observed shortly after the tuberculin injection in only 2 experiments—45% in both cases (see Fig. 1).