

CONCERNING THE VITAMIN C THERAPY OF WHOOPING-COUGH

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The treatment of pertussis in the last 30 years has not shown noticeable progress, and it is worthwhile to regard treatment and prophylaxis from a new viewpoint. I found that specific relationships exist between vitamin C and bacillus pertussis. A part of these investigations has already been published in Japanese. The essentials are reported here:

I. Influence of vitamin C on bacillus pertussis.

1st. Bacteria growth: Vitamin C (Redoxon, L-ascorbic acid sodium (P_H 6,4 to 6,6]) was added to solid culture medium (P_H 7,0) with different pathogenic bacteria like Pneumococcus, influenza bacilli, coliform bacilli, dysentery bacilli, typhus bacilli, diphtheria bacilli, staphylococcus, streptococcus, meningococcus, *B. pyocyaneus*, *B. subtilis*, *B. prodigiosus*, and bacillus pertussis. It was stated that the growth of only the whooping cough bacillus was specifically retarded by vitamin C, while all other bacteria remained almost uninfluenced. The larger the amount of vitamin C, the clearer the disturbance of the growth of the pertussis bacillus; from a gradual alteration of the bacillus body, to the appearance of regressive metamorphosis, and finally to killing. Vitamin C has therefore a bactericidal effect on the pertussis bacillus. The influenza bacilli, which are difficult to differentiate bacteriologically, were compared in detail to the pertussis bacillus. No development disturbances by vitamin C of the bacillus could be observed, also no regressive modifications or other influences. The fact that the two types of bacteria indicate a clear difference in the influence of vitamin C, can be regarded as method for distinction.

2nd. Virulence: It could be proven by bioassay [animal studies] that pertussis bacillus modified in culture to which vitamin C had been added (1,2—1,8 mg Redoxon per 1 ccm), possessed a strongly reduced virulence compared to pertussis bacillus serving as a control.

3rd. blood picture: The investigation of the blood picture of rabbits injected intravenously with pertussis bacillus showed strong leukocytosis 3 days after the injection, with relative lymphocytosis (60—80%), returning to normal after a week. On the other hand the blood picture showed probable leukocytosis after treatment with modified pertussis bacillus, but no lymphocytosis. The lymphocytes amounted to only 35—50% and only moderate neutropolynuclear leukocytosis appeared.

II. Influence of vitamin C on the pertussis toxin.

The toxin received from my pertussis bacteria culture possesses sufficient toxicity that after intracutaneous injection trials with rabbits and guinea pigs causes clear development of inflammation. This reaction can clearly be suppressed, however, by prior addition of vitamin C to a certain quantity of toxin. The larger the quantity of vitamin C, the larger the detoxification effect. Furthermore, this intracutaneous reaction to the pertussis toxin is clearly reduced in animals pre-treated with vitamin C injections in comparison to controls.

Based on these test results, I used vitamin C in the treatment of children sick with pertussis, and to be sure with very good success. It concerns 81 children.

Investigation method. Patients diagnosed with pertussis at the health center and pediatric clinic of the Kyoto Imperial University were examined. Among them were simple cases of pertussis, cases of pertussis with bronchitis and pertussis with pneumonia, and more such accompanied by assorted other complications. The observation of the children was carried out in different stages.

For the treatment of pertussis I used vitamin C Redoxon "Roche" (L-ascorbic acid sodium) in injectable solution, 0.1 g per Ampoule.

Those sick *only* with pertussis were treated exclusively with the vitamin C preparation. Also with patients with pertussis complicated by bronchitis or pneumonia, every other specific handling of the pertussis was discontinued and only the generally symptomatic treatment was performed. Accounting for the degree of illness and the age of the children, intravenous or intramuscular injections [were given as follows:] in light cases 50—100 mg; in moderately severe 100—150 mg; and in severe over 200 mg once daily (sometimes twice). Injections started at first daily; after improvement of the symptoms, each 2nd day; in all 5—6—12 injections. After progress of about 1—3 weeks the symptoms picture was determined and the blood picture was examined. Attention was particularly paid to: strength of the convulsive cough, lip cyanosis during coughing, attacks with breathing difficulty, occurrence of vomiting, as well as degree of the recurrence and number of the cough attacks; furthermore on general symptoms: liveliness, appetite, sleep and disposition. The blood picture was examined at least 3 times.

Results

The observation of 81 children yields that in 66 cases, at the earliest 4—5 and at the latest after 6—8 injections, i.e. 1—2 weeks after start of the treatment: reduction of lip cyanosis in coughing attacks; attacks with breathing difficulty, vomiting and recurrence disappeared; also the number of cough attacks diminished. Patients became lively, had good appetite and the convalescence progressed very satisfactorily. The best therapeutic successes concerned complication-free cases; above all the therapy was successful with relatively promptly handled patients, i.e. about 1 week after transition to the convulsive stage. Also in patients taken later in treatment, a good result was observed. With the children treated in the early catarrhal stage, the convulsion stage usually still developed, but was shortened compared to the normal progression.

Of special mention were 3 serious cases of pertussis pneumonia in artificially nourished babies, for which previous treatment methods, vaccine treatments etc., are rarely successful, and which were deemed as having lethal outcome. Through our therapy, the children were clearly improved after 2—3 weeks and finally healed.

The blood picture of patients with pertussis (or pertussis and bronchitis), that showed before treatment a 60 to 90 percent lymphocytosis, displayed 1 week to 10 days after start of the

vitamin C injections a reduction of the lymphocytes of 40—60% and a percent increase of the neutrophils and low-grade neutrophily. The leukocyte count showed slight increase in cases of the early convulsion stage after this treatment, but in the majority of the cases in the 2nd week of the convulsion stage, a reduction was found. The blood picture of the pertussis patients with pneumonia was somewhat different, namely that the treatment gradually lowered the leukocyte count and the percentage of the polynuclear leukocytes. The transition to lymphocytosis was approached; in other words, one found an approximately normal blood picture.

The few cases in which no therapeutic success was observed were usually concerning those with other complications. Either it emerged from the children's family history that cases with asthma, tuberculosis etc. were present, or even that the children had allergic illnesses, an asthmatic, exudative and scrofulous constitution, tuberculosis, measles, influenza, severe tonsillitis, or it concerned children with innate nervousness.

Summary

Among 81 cases with which vitamin C therapy was tried, in 34 cases a clear improvement of the symptoms or perfect healing was obtained, in 32 cases improvement of the symptoms, while in 15 cases effects were indeterminate.

Accordingly the vitamin C therapy can be viewed as an effective specific therapy. This therapy, which even with the use of excess vitamin C doses exhibits no side effects compared to other treatments, has the advantage that it can be applied to pertussis in infancy, where so far success with specific vaccine injections is achieved with difficulty because of insufficient production of immune bodies.

The explanation of the clinical success of the vitamin C therapy lies in the fact that among the different pathogenic bacteria the growth of *B. pertussis* is suppressed specifically by vitamin C and is finally killed; also that vitamin C will detoxify the pertussis bacterial toxin. Whether secondary modifications in the organism resulting from vitamin C injections additionally promote healing, is yet to be examined.

In summary I would like to report on investigations of the prophylaxis of pertussis. Although the toxicity of pertussis bacillus grown on media with added vitamin C is clearly reduced compared to the original bacterial culture, and in animal trials and in blood picture variations appear as described in the treatment of pertussis, yet sufficient immunity could be obtained thereby. The serological investigation of the rabbit immune serum of the weakened bacteria showed that the agglutination- and complement linkage reactions were the same as the original bacteria. Animals which were injected several times with the weakened pertussis bacteria, could be received alive. Even our injection of the animals with weakened bacilli in multiples of the minimal lethal dose of original bacilli did not lead to the death of the animals, which speaks clearly for the antitoxin action of the weakened pertussis bacteria and which can be regarded as a pilot test of the prophylaxis of the animal infection. Investigations of immunity through these altered pertussis bacteria after incorporation of living bacilli are under way.

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[Translator's Notes: As with all inter-language conversions, some liberty was necessarily taken with cases, tenses, plurals and sentence construction.]

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