Alkaline Phosphatase Changes in Chicken Tissues During Newcastle Disease Virus Infection

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Extensive studies have been performed on host metabolic alterations resulting from infection by microorganisms. The activity of alkaline phosphatase (AP) in mouse tissues was found to be increased in small intestine and serum but decreased in liver during *Diplococcus pneumoniae* infection (G. Lust and W. R. Beisel, Clin. Res. 13:296, 1965). During an arbovirus infection of mice, changes in the enzyme activity were less striking B.W.J. Mahy et al. (Virology 23:528, 1964) also found no change in serum AP activity of mice infected with several viruses. Our report deals with the marked alterations in tissue and serum AP activities of chickens infected with Newcastle disease virus (NDV).

The chickens were handled, and infected with NDV, as described previously (R. L. Squibb, J. Nutr. 82:242, 1964). The assay of microsomal AP of pooled samples was patterned after the method of G. Y. Shinowara, L. M. Jones, and H. G. Reinhardt (J. Biol. Chem. 142:921, 1942). Liberated inorganic phosphate (Pi) was measured, and protein was quantitated by the Biuret method (W. Q. Wolfson et al., Am. J. Clin. Pathol. 18:723, 1948). Results were expressed in international enzyme units (IU), i.e., micromoles of Pi liberated per minute, per milligram of protein.

In Fig. 1, the results are presented as percentage of control activity. The uninfected control AP activity of each sample was arbitrarily assigned a rating of 100%. Control AP activity for liver, serum, and small intestine was $5.45 \times 10^{-4}$, $3.24 \times 10^{-3}$, and $1.24 \times 10^{-1}$ IU per mg of protein, respectively. The liver enzyme activity began to increase slowly until it reached approximately 40% above control levels 6 days after injection of the pathogen. In the small intestine and serum, the AP activity decreased markedly and in each case was only about 20% of the normal level after 6 days. By use of organ-specific inhibition tests, it was previously shown (G. Lust and W. R. Beisel, Clin. Res. 13:296, 1965; Proc. Soc. Exptl. Biol. Med. 124:812, 1967; that in mice the increased serum enzyme activity during infection arose primarily from the small intestine. During this virus infection of chickens, the intestinal activity was diminished. The greatest changes were observed when these animals exhibited overt clinical symptoms, on days 4, 5, and 6 post-inoculation. However, even during the incubation period of the disease (days 2 and 3), marked changes in AP activity of these two tissues and serum were found.

The enzyme activity of the serum paralleled that of intestine. During this virus infection, a progressive decrease in AP activity was observed in both, whereas an increase in activity was noted during a bacterial infection. Since changes in AP activity occurred before overt illness was apparent, they may be attributed to the presence of infection rather than being secondary to metabolic derangements in a sick animal. The mechanisms responsible for alterations in tissue enzyme activity are being sought in additional investigations.

![Fig. 1. Changes of alkaline phosphatase activity in chicken tissues and serum during Newcastle disease virus infection. Each point represents a pool of eight individual specimens. A pool of uninfected control samples was assayed for each point.](http://aem.asm.org)