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Pathological alterations during co-infection of Newcastle disease virus with *Escherichia coli* in broiler chicken

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Respiratory diseases are responsible for major economic losses at poultry farms especially during co-infections of respiratory pathogens. However, the impact of co-infections is not well known, especially in broilers. The current study was aimed to assess the probable synergism of *E. coli* (O78) and velogenic Newcastle disease virus (vNDV-CK-Pakistan-NARC-13N39-2013), in the broiler model. Three-week-old commercial broilers were inoculated with either vNDV, *E. coli* serotype O78 or both agents simultaneously or 3 days apart. The birds were clinically observed and swabbed daily. They were killed at 4 and 14 days after single or dual inoculations and were inspected for gross lesions. Samples of the respiratory organs (trachea, lungs, and air sacs) were taken for histological analyses. All the infected subjects showed clinical signs of varying severity. Co-infected groups showed the most obvious clinical signs, associated with significantly higher mortality and respiratory organ abnormalities, in comparison with the mono-infected groups ($P < 0.05$). There was a non-significant ($P > 0.05$) effect of the inoculation time intervals between vNDV and *E. coli* inoculation (none or 3 days). Microscopic lesions staining supported clinical and macroscopic findings. Higher virus shedding ($P < 0.05$) in oropharyngeal swabs was observed in coinfecting groups than single infected groups. The results revealed that experimental co-infection of *E. coli* and NDV enhances the degree of severity of clinical signs, gross lesions, and death rate and warns that *E. coli* and NDV can cause substantial economic losses by exercising additive or synergistic pathogenic effect in the reproduction of respiratory disease if given simultaneously or three days apart.

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