

## Accepted Manuscript

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PII: S0304-4017(18)30077-3  
DOI: <https://doi.org/10.1016/j.vetpar.2018.02.027>  
Reference: VETPAR 8611

To appear in: *Veterinary Parasitology*

Received date: 21-9-2017  
Revised date: 9-2-2018  
Accepted date: 10-2-2018

Please cite this article as: Liu T, Huang J, Ehsan M, Wang S, Hong F, Zhou Z, Song X, Yan R, Xu L, Li X, Protective immunity against *Eimeria maxima* induced by vaccines of Em14-3-3 antigen, *Veterinary Parasitology* (2018), <https://doi.org/10.1016/j.vetpar.2018.02.027>

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Protective immunity against *Eimeria maxima* induced by vaccines  
of Em14-3-3 antigen

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## Highlights

- The subunit and DNA vaccines encoding Em14-3-3 were constructed.
- Em14-3-3 could elicit both humoral and cell-based immune responses
- The immunization with rEm14-3-3 and pVAX1-14-3-3 induced IFN- $\gamma$  and TGF- $\beta$  cytokine levels
- Em14-3-3 could be used as an effective antigen candidate for developing vaccines against *E. maxima*.

## Abstract

*Eimeria maxima* 14-3-3 (Em14-3-3) open reading frame (ORF) which consisted of 861 bp encoding a protein of 286 amino acids was successfully amplified and sequenced. Subsequently, the Em14-3-3 ORF was subcloned into pET-32a (+) and pVAX1, respectively. RT-PCR and immunoblot analyses confirmed that the target

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