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Editorial
Recombinant Antibodies and Their Potential Applications in Veterinary Medicine

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INTRODUCTION

The age of biotherapy in medicine is more than 30 years, but its introduction to veterinary medicine is relatively new. Many hormonal preparations are being extensively used in management of estrus and fertility in animal husbandry and veterinary sciences but the case is not similar with biotherapeutic antibodies. Production of biotherapeutic recombinant antibodies for different species suitable to be used clinically has been a limiting factor for many years, but discovery of hybridoma technology by Kohler and Milstein[1] heralded a new era for immunotherapy by facilitating production of various non-murine monoclonal antibodies[2]. The production of such type of recombinant monoclonal antibodies has proven to be a tremendous leap in the field of biotherapy due to their potential use in diagnostics, prophylaxis and therapeutics. Orthoclone (Muromonab-CD3) is first monoclonal antibody to get FDA approval for human use in 1992 followed by 80 more monoclonal antibodies approved till today[2-4]. Though the majority of monoclonal antibodies approved for biotherapy are devoted to humans, but advances in veterinary medicine are also exciting and inspiring. Especially, with the launch of first monoclonal antibody approved for veterinary use in the European Union States and United states for the treatment of Canine atopic dermatitis i.e., Cytopoint and lokivetmab, respectively. Cytopoint or lokivetmab neutralizes canine interleukin-31(IL-31) and treats the clinical signs of atopic dermatitis for a single injection angle injection. The IL-31 is the key protein for cell to cell communication and trigger's pruritus, thus neutralizing IL-31only alleviates clinical signs of atopic dermatitis and don't leads to any undue immune-suppression and immune-stimulation.

Success in the use of monoclonal antibody is aiding in the rapid understanding of their limitations and failures also, for example, even after three quarters of clinical trials on monoclonal antibody-drug conjugates on oncological malignancies, only minor success has been achieved in getting minor tissue penetration and target binding[5]. The reason being their cumbersome size and unfavorable chemical framework. To encounter such limitations and failures, various new recombinant antibody fragments (rAb) has been developed. These biotherapeutic recombinant antibodies include a single chain fragment variable (scFv), single-domain antibody or nanobodies, triabodies, tetrabodies and hybrid/chimeric recombinant antibodies. Of these types single chain fragment variable and nanobodies are two categories which has already been introduced and explored significantly in research in veterinary medicine[6]. Already there are some monoclonal antibody fragments approved in the United States like Certolizumab pegol (cimzia)-a anti-TNF alpha pegylated humanized Fab for Crohn disease, ranibizumab (lucentis)a anti-VEGF-humanized Fab for macular degeneration and abciximab (reopro) anti-GP IIb/IIIa chimeric Fab approved for clot prevention in angioplasty[7]. For animal diseases too, initial study has proven to be fruitful like two single chain fragment variables specific for 3ABC antigen has been reported to differentiate vaccinated and non-vaccinated FMD cattle successfully[8]. Similarly, a scFv-anticapsid protein showed better sensitivity in ELISA and western blot as compared to gold standard monoclonal antibodies[9]. Similarly nanobodies against *Brucella mellitensis* and bovine spongiform encephalopathy (BSE) successfully diagnosed Brucella and BSE[10,11]. A nanobodies based detection of *Taenia solium* infection showed no cross reactivity with *T. saginata*, *T. hydatigena*, *T. crassiceps* and *Trichenella spiralis*[12].

CONCLUSION

With the advent of monoclonal antibodies, Biotherapy has emerged as most rapidly developing treatment modalities in human medicine and will show similar skew in veterinary medicine in the coming years. Recombinant antibodies has marked the start of new era in field of therapeutics, providing promising alternative strategies to combat the problem of drug resistance, adverse effects of drugs, drug residue, various stages of cancers and targeted organ therapy. Of course, drugs like cytopoint are the first step to extend this trend to cover more number of animal diseases. No recombinant antibody fragments based product is currently approved for therapeutic use in veterinary medicine but some are in advanced study promising their approval for therapeutics in coming future. Recombinant antibodies like monoclonal antibodies, single chain fragment variables and nanobodies are still in nascent stage in human medicine also but their characteristics give them an edge over all other recombinant anti-bodies siblings and traditional therapies presenting them as future generation of therapy especially immunotherapy for veterinary medicine too.

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