Hendrickson O D et al., J Food Microbiol Saf Hyg 2018, Volume 3
DOI: 10.4172/2476-2059-C3-015

A lateral flow immunoassay for simultaneous determination of antibiotics in dairy products

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Statement of the Problem: Widespread use of antibiotics in animal husbandry for therapeutic and prophylactic purposes can lead to their transmission along the food chain and the accumulation of residual amounts in the food products. The systematic intake of antibiotic-containing food can result in various adverse effects and result in the emergence and spread of multiresistant forms of microorganisms. Therefore, there is a need for an efficient mass screening of food products for antibiotic content.

Methodology: In this study, for the detection of ciprofloxacin (CIP) and chloramphenicol (CAP) as relevant antibiotics of fluoroquinolone (FQ) and amphenicol groups, a multiplex immunochromatographic test system has been developed. The assay was carried out in a direct competitive format using gold nanoparticles as a label for specific antibodies.

Findings: After the optimization, the developed analysis allowed for the detection of CIP and CAP within 15 min with instrumental detection limits of 20 pg/mL and 0.5 ng/mL, respectively, and a visual detection limit of 5 ng/mL for both antibiotics. The assay showed cross-reactivity (69-160%) to 19 antibiotics in the FQ group. The developed test system was used to detect the antibiotics in a panel of dairy products. The obtained results indicate that it can determine CIP and CAP with high analytical characteristics. The analytical recoveries of CIP and CAP in milk samples ranged from 83-120%.

Conclusion & Significance: The analytical characteristics of the developed test system meet the requirements of sanitary and hygienic control in the Russian Federation and EU countries and allow its use for the detection of antibiotics in milk and dairy products.

Recent Publications:

1. Wei C F et al. (2016) Synergism between two amphenicol of antibiotics, florfenicol and thiamphenicol, against Staphylococcus aureus. Vet. Rec. 178(13):319.
2. Zhang G F et al. (2018) 4-Quinolone derivatives and their activities against Gram positive pathogens. Eur. J. Med. Chem. 143:710-723.
3. Mund M D et al. (2017) Antimicrobial drug residues in poultry products and implications on public health: a review. Int. J. Food Prop. 20(7):1433-1446.
4. Manyi Loh C et al. (2018) Antibiotic use in agriculture and its consequential resistance in environmental sources: Potential public health implications. Molecules. 23(4). Pii:E795.
5. Bell B G et al. (2014) A systematic review and meta-analysis of the effects of antibiotic consumption on antibiotic resistance. BMC Infect. Dis. 14:13.

Biography

Hendrickson O D pursued her PhD at A N Bach Institute of Biochemistry of the Russian Academy of Sciences, Moscow, Russia. She is currently a Senior Researcher in the Immunobiochemistry Laboratory of Federal Research Center "Fundamentals of Biotechnology" of the Russian Academy of Sciences. Her scientific interests include quantitative studies of immune complexes' formation, interaction of nanoparticles with biomolecules, structural bases of interactions with bioreceptors, biosensor systems, development of new immunochemical methods for the detection of biologically active compounds, nanobiosafety issues, methods for quality control and safety of food and feed, etc. She has published more than 30 papers in reputed journals.

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