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Advanced technologies for the control of AIV in poultry

H A Kaoud

Cairo University, Egypt

Avian influenza virus (AIV) is an infectious agent of birds and mammals. AIV is causing huge economic loss and can be a threat to human health. Several challenges are limiting the efficiency of integrated intervention strategies for control of HPAIV H5N1 in poultry: 1) Molecular diagnostic tests recently have proven themselves to be invaluable in controlling disease outbreaks around the world; 2) Conventional disease management and control strategies in poultry based on surveillance, stamping out, movement restriction and enforcement of biosecurity measures did not prevent the virus spreading, particularly in developing countries; 3) Limited the efficiency of the vaccines used to prevent outbreaks of HPAIV H5N1 in endemic countries. This paper reviews the alternative and complementary approaches to reduce the current burden of H5N1 epidemics in poultry where new technologies are enabling the following: 1) Rapid diagnosis, detection of influenza viruses and the identification of pathogenicity variants (such as waveguide technology, surface-enhanced localized Plasmon, Immuno-PCR (iPCR), electrically active magnetic (EAM) nanoparticles, microfluidic magnetic microsystem, 'closer to the field' methods, nanobeads amplified QCM immunosensor; 2) Development of a nano-vaccine against Avian Influenza Virus; 3) Nutrigenomic and nano-nutrients technology in the up-regulation of signaling pathways involved in cellular immune response, inflammatory response and anti-microbial protection; 4) Nano-drug designing against viruses which would be important for global biosecurity, Avian Influenza Virus (nano-drugs, nano-disinfectants and nanoviricides are designed to seek a specific virus: type, attach to the virus particle, engulf or coat the virus particle, thereby neutralizing the virus's infectivity, destabilize and possibly dismantle the virus particle, and optionally it may also be made capable of attacking the viral genome thereby destroying the virus completely); 5) The innovative electro-chemical activation water technology (Anolytes) for the Control of AIV in poultry.

ka-oud@link.net

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