

Scanography Method for Assessment of Needle Free Injection Dispersion Pattern of Vaccine in Pig Soft Tissues

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Figure 1: Frozen cross-sectional slices of neutered male piglet (body live weight=5.9 kg), vaccinated with Circovac spiked with black ink and NFID Valery. (Lower left: first rostral slice; lower right: second slice-injection site; upper right: third caudal slice). (Original image, flatbed scanner settings: 1200 dpi; 10200X14040 pixel, Jpeg).



Figure 2: Close up of Frozen cross-sectional slice of female piglet (body live weight=18.0 kg), vaccinated with Circovac spiked with black ink and NFID Valery. (Second slice-injection site). (Original image, flatbed scanner settings: 1200 dpi; 10200X14040 pixel, Jpeg).

Description

The term needle free is used to describe an extensive range of drug delivery technologies, which consists of devices that do not use a needle to inject drugs through the skin [1]. Focusing on veterinary medicine, vaccination is a significant component of standard management practices in swine husbandry, and needle-free injection device (NFID) possesses several advantages [2].

This paper describes a simple and effective visual method to study the pattern of dispersion of a NFID injection in animal soft tissues; to the best knowledge of the authors, there are only few reported trials focusing on delivery efficacy assessment and dispersion pattern of needle-free injection devices in animals [3], while available controlled studies trials addresses the elicited immune response of NFID vaccinated animals.

Conventional piglets (body weight=5-20 kg) were vaccinated on the left side of the neck with NFID Valery® injector (Giordano Poultry Plast SPA, Italy), with black colored ink spiked Circovac® (Merial, Lyon, France), 1 cc ink/100 cc vaccine. Piglets were injected with 0.5 ml of the vaccine, according to the data sheet. Immediately after vaccination, piglets underwent euthanasia with the following pharmacological protocol: 0.4 ml IM of Tiletamine+Zolazepam IM (Zoletil® Virbac, FR, after 15 minutes, 3 ml of Pentothal IV and 3 ml of Tanax® IV (MSD Anim Health Srl-Italy).

Freezing of piglet carcasses in vertical recumbency was carried out (48 h; -20°C) and subsequently frozen, cross-sectional slices were obtained (thickness=1cm). The vertical position allowed bilateral symmetry of the carcasses. Images of serial cross sectional slices were acquired by means of an ordinary flatbed scanner protected by a glass plate (Figures 1 and 2).

The proposed method allowed a rapid gross visualization of dispersion pattern and eventual lesions (hemorrhages) and the possibility of digital handling and analysis of images. Moreover this method can represent a model for NFID local safety assessment and comparison between devices or drugs. Finally, this in vivo model can serve as a model for human NFID vaccine delivery.

Statement of Animal Care

The experimental trial was approved by the Animal Experimentation Ethical and Scientific Committee - Alma Mater Studiorum of the University of Bologna; afterwards was submitted to and approved by the Italian Ministry of Health. The study was conducted in accordance with European legislation regarding the protection of animals used for experimental and other scientific purposes (Council Directive 86/609/EEC).

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