Evaluation of the *Salmonella* meat-juice ELISA in the UK situation.

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**Summary.** The *Salmonella* ELISA produced at VLA, comparable to the Danish mix-ELISA, was shown to be an effective means of identifying highly infected farms but it failed to identify all individual pigs excreting salmonella at slaughter. A major limitation of the test, however, is its inability to distinguish important zoonotic serovars.

The range of *Salmonella* serovars detected by the mix-ELISA was increased by including somatic antigens from *Salmonella* Kedougou, the third most prevalent serovar isolated from pigs in Great Britain, without compromising the integrity of the results.

Interstitial fluid ELISAs (kidney, heart and liver) offered no benefits over neck-muscle in terms of sensitivity and specificity. It is unlikely that these tissues would be used as they have greater commercial value than neck-muscle.

**Keywords:** *Salmonella*, pigs, serology, ELISA, UK.

**Introduction:**
The aim of the study was to assess the suitability of the Danish mix-ELISA antigen combination in relation to the predominant salmonella serovars isolated from pigs in the UK, to extend the antigenic range of the test accordingly and to apply the test to alternative tissues. The importance of zoonotic serovars, such as *Salmonella* Typhimurium (STM) DT104, was also taken into account.

**Materials and Methods:** An indirect *Salmonella* O-group B/C, LPS ELISA was produced with slight modification according to the method of Nielsen et al., 1995. The test was developed, with the assistance of the Danish Veterinary Laboratory (DVL), and evaluated using serum and meat-juice samples from experimentally infected pigs, from pig herds and from slaughter pigs at abattoirs. Eighteen crossbred pigs were inoculated orally ($10^8$ organisms) with *Salmonella* serovars most commonly isolated from pigs in Great Britain and two uninoculated pigs served as controls. Heart muscle, kidney and liver samples were also taken from
these animals and, after freezing and thawing, the resultant tissue fluid was analysed in the mix-ELISA using fixed dilutions, based on the mean results of eight animals tested. The fixed dilutions used were: kidney 1:40, heart 1:100 and liver 1:80 as compared to serum 1:400 and neck 1:30.

To evaluate the meat-juice ELISA (OD %>40) in the abattoir, 20 neck-muscle and 20 unmatched faecal samples were collected at slaughter from each of 14 herds at one UK high-throughput abattoir, to compare the within-herd serological and bacteriological prevalence. Meat-juice was obtained from muscle samples as described by Nielsen et al., 1998. The cut-off of OD %>40 was used in the interest of providing comparable data. Bacteriological examination of faecal samples was carried out according to the method of Davies et al., 1999.

The range of the mix-ELISA test was extended (designated trimix-ELISA) by adding Salmonella O-group G₂ LPS extracted using the hot phenol method of Westphal et al, 1952.

Results: The ELISA produced at VLA achieved 92.1 % agreement with the Danish mix-ELISA, based on 40 meat-juice samples submitted to the DVL for validation. Abattoir studies: Herds from which STM (or other O-group B serovars) was detected bacteriologically had ≥25 % prevalences of serological reactors in the mix-ELISA. Herds in which STM (or other O-group B serovars) was not detected bacteriologically gave negative results in the mix-ELISA.

Seroconversion in experimentally infected pigs peaked at around three weeks pi and diminished with time (4-6 wks pi) below the detection level of the ELISA, at the OD %>40 cut-off value, despite consistent recovery of the immunising organism from faecal samples throughout the 8 week duration of the experiment and at post mortem.

S. kedougou infected pigs were detected in the trimix-ELISA without affecting the results for sera containing antibodies to O-group B and C, Salmonella serovars. Interstitial fluid ELISAs – heart, kidney, liver and neck muscle - had specificities of 100% and sensitivities of 100% at the OD %>40 cut-off value as compared with the serum ELISA. The sensitivities of all interstitial fluid ELISAs were reduced to 80, 72, 67 and 80 % respectively, at the OD %>10 cut-off value as compared with the serum ELISA.

Discussion/conclusions: Comparison of bacteriological and serological (mix-ELISA) within-herd prevalences at the abattoir demonstrated a strong association between the two screening methods at the herd level. This was not the case for individual animals. A separate National survey of individual pigs at slaughter in the abattoir showed an inverse relationship between meat-juice ELISA and bacteriological results (Dalziel et al., 1999).
The antigenic range of the test can be extended, however, extra costs arising from this are not justified in the current UK situation. In most cases a single O-group B ELISA would be sufficient to detect the majority of currently relevant UK Salmonella serovars.

Other tissues offered no benefits over neck-muscle in terms of sensitivity and specificity and their greater commercial value would preclude them from use. The limitations of the meat-juice ELISA, as with most serological approaches, are the delayed antibody response after infection, the imprecise relationship between the presence of antibody and current excretion and the inability to differentiate between important zoonotic Salmonella serovars such as STM DT104 and other O-group B Salmonella serovars. STM DT104 may remain unrecognised as the test is based on detecting a high prevalence of serologically positive pigs over time so if the within-herd prevalence remains low to moderate no action would be taken.

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References:


