STUDIES ON VERO (SHIGA) AND LT TOXIN PRODUCING *ESCHERICHIA COLI* INFECTIONS IN ANIMALS AND MAN

A thesis submitted for the

Degree of Doctor of Philosophy

of

The University of Peradeniya

(Faculty of Medicine)

by

Aqa Mohammad Tohki (D.V.M; M.Phil)

Dept of Microbiology; Faculty of Medicine

University of Peradeniya

Peradeniya; Sri Lanka.

1988

ABSTRACT

A study was undertaken to investigate the role of enterotoxigenic Escherichia coli in animals and human diarrhoeal disease with special emphasis on cattle, in Sri Lanka.

Two approaches were adapted to study the epidemiology of Verocytotoxin and heat-labile toxin producing Escherichia coli.

A) A cross-sectional study where faecal samples from cattle, goat, pigs and man were screened for Verocytotoxin (VT) and Heat-labile (LT)-producing E.coli, and serum samples were tested for the prevalence of VT and LT antibodies respectively.

B) A longitudinal study to monitor the prevalence of VTEC and LTEC in calves.

This study revealed that VT-producing Escherichia coli (VTEC) strains were highly prevalent in cattle. In the cross sectional study, 27% diarrhoeic and 4.5% non-diarrhoeic calves shed VTEC in the faeces. In the longitudinal study, all 26 animals with two exceptions, followed for a period of 2-6 months shed VTEC at least once in their faeces. Although a significant association between VTEC and diarrhoea was seen in calves aged less than 10 weeks, the high prevalence of VTEC in healthy calves indicates that further studies are required to definitively incriminate the role of VTEC in calf diarrhoea.

The seroepidemiological study also revealed that VTEC are very commong amongst cattle population in Sri Lanka and that the seropositivity in these animals seems to be in response to VT1 VTEC but not to VT2. No VT neutralising antibodies could be demonstrated in human sera in the present study.

The serotyping and DNA probe results revealed that calf VTEC strains produce VT1; VT2 or both, and that there is a wide diveersity of VTEC serotypes. The longitudinal study revealed an apparent stability of VT genotype (VT1/VT2) in a given serotype.

The distribution of VTEC positive colonies in primary faecal culture plates from 22 calves showed that the detection of positive colonies varied from 1/10 to 10/10 colonies tested. Further, testing a pool of ten colonies gave similar results to that of screening all ten colonies individually. This is an useful approach where multiple colonies are required to be tested in order to detect a low prevalence of VTEC in stools.

Thirteen per cent of a small sample of 20 diarrhoeic goats shed VTEC in their faeces, whilst only 2 % of humans with diarrhoea and 2% of non-diarrhoeic pigs shed VTEC in their faeces. Seroepidemiology for VT in these species also indicatated a low prevalence of VTEC.

While 11 -12 % of cattle (diarrhoeic and non-diarrhoeic) shed LTEC there was no significant association of LTEC with diarrhoea. Screening of faecal samples and the subsequent DNA probe results on LTEC isolated from cattle showed that LT2 (a newly described class of LT) were the only type of LT produced by these strains. This was supported from seroepidemiological data from cattle, where 41 per cent of the sera tested had antibodies to LT2 and only 9 per cent to LT1. LTEC strains were recovered from 38 per cent of diarrhoeic and 16 per cent of non-diarrhoeic pigs and from only 1 per cent of diarrhoeic humans. In contrast, seroepdimiological data from humans indicate a high prevalence of

LT1 antibody (72 %) in human sera. This indicates that LTEC might play a role in diarrhoea in humans in Sri Lanka.