

Transmissible Gastroenteritis (TGE) of Swine: Canine Serum Antibodies against an Associated Virus

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SUMMARY

Sera of weaned puppies from a hysterectomy-derived, specific pathogen free (SPF) closed dog colony did not contain antibodies against a TGE-associated virus or a serologically related one, but sera from puppies and older dogs from open kennels did. The higher antiviral titers in serum of older dogs suggested that these animals had suffered either persistent or recurrent infections. Seventy-two puppies had no contact with swine, indicating that the virus was able to propagate independently of contact with swine.

RÉSUMÉ

Le sérum de chiots libres de germes pathogènes (S.P.F.), obtenus par hystérectomie et gardés en isolement, ne contenait aucun anticorps contre un virus de gastro-entérite contagieuse ou un virus de caractère sérologique voisin. Cependant le sérum de chiots de d'animaux adultes provenant de chenils non isolés en contenait. Les taux élevés d'anticorps chez les chiens adultes permettent de croire que ces animaux avaient souffert d'infestation persistante ou récurrente. Soixante-douze chiots n'avaient eu aucun contact avec des porcs; ce qui suggérerait que le virus peut se propager même en l'absence de contacts directs avec les porcs.

INTRODUCTION

A cytopathic virus associated with TGE has been isolated by Harada *et al* (4), McClurkin (5), Cartwright *et al* (2), Bohl and Kumagai (1), and Witte and Easterday (8). We concluded from results of studies carried out in this laboratory that these isolates are serologically similar, and they produce signs of TGE in pigs.

Serological studies reported by these investigators indicated that the virus was associated with outbreaks of TGE in swine populations. Cartwright *et al* (2) found that 11% of the pigs in areas where TGE had been reported showed a marked rise in antibody titer to the virus. In contrast, all of the 350 porcine sera collected in areas where no TGE had been reported were negative for antibodies against the virus. Similar results have been reported by Harada *et al* (4) and Bohl and Kumagai (1).

Haelterman (3) reported that the feces of dogs and foxes which had been fed TGE virus-infected pig tissues produced TGE when fed to pigs aged one to two weeks. The sera from these dogs and foxes neutralized the disease-producing capacity of TGE virus-infected tissue for pigs. Although no signs of disease were observed in dogs and foxes, these findings suggested that they might play a role in the epizootiology of TGE.

McClurkin and Norman (6) reported selected characteristics of a virus associated with TGE. This virus was consistently found in natural TGE virus-infected pig tissues, and cell cultures containing the virus produced signs of TGE in week-

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TABLE I. Results of Neutralization Studies with Canine Sera and TGE-Associated Virus

Group number	Number of dogs	Number of dogs with indicated serotiter						
		0	10	32	64	128	256	512
1	7	7	0	0	0	0	0	0
2	4	0	0	4	0	0	0	0
3	26	0	0	0	26 ^a	—	—	—
4	7	1	0	0	0	0	4	2
5	72	3	29	0	40	0	0	0

^aThe highest dilution tested.

old pigs. However, the virus did not stimulate, in swine, antibodies which neutralized the disease-producing capacity of natural TGE virus-infected tissues for pigs. Sows inoculated with this TGE associated virus failed to adequately protect their pigs against illness after an exposure to natural TGE virus-infected tissues. It was suggested that the cytopathic virus was always associated with TGE, but that there might be a second unrecognized agent present which could also be a part of the etiology of TGE.

In the light of Haelterman's work with dogs, a study of the role of dogs in the epizootiology of TGE and of the TGE-associated virus was undertaken.

MATERIALS AND METHODS

SERA

Serum samples were obtained from 116 dogs. Group 1 consisted of seven samples from weaned beagle puppies eight to ten weeks old and two mature dogs from a closed colony.¹ Group 2 consisted of four samples from ten-week-old puppies from a privately-owned kennel. Group 3 consisted of 26 samples from adult dogs of mixed breeding.² Group 4 consisted of seven samples from adult beagles.³ Group 5 consisted of 72 samples from beagle puppies six to ten weeks of age purchased from three different commercial suppliers of laboratory animals.⁴ Complete records were

kept on these puppies concerning their dams and date of birth. These puppies had no contact with swine at any time since birth. Blood samples were collected the day the puppies were received in the laboratory.

CYTOPATHIC TGE-ASSOCIATED VIRUS

The Miller isolate, Bohl and Kumagai (1), diluted to contain approximately 150 plaque-forming units per 0.1 ml was used.

CELL CULTURES

A continuous line of porcine testis cells (ST) was used and maintained as described by McClurkin and Norman (6).

SEROLOGICAL TECHNIQUES

Virus neutralization was performed using a constant virus concentration and varying serum dilutions. All serum samples were inactivated at 56°C for 30 minutes before being used. Serum dilutions and virus were mixed and incubated one hour at 37°C. Cell monolayers in 60 x 15 mm plastic Petri plates were inoculated with 0.2 ml of the serum-virus mixture and allowed to adsorb for 30 minutes at room temperature. The cell sheet was then overlaid with agar-media as described by McClurkin and Norman (7), and examined for plaques after 48 hours of incubation.

RESULTS

The results of the neutralization studies with canine sera and TGE-associated virus are given in Table I.

¹This dog colony was originally hysterectomy-derived and has been maintained as an isolated unit by Dr. William Reece, Physiology Dept., College of Veterinary Medicine, Iowa State University, Ames, Iowa.

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³Veterans Hospital, Des Moines, Iowa.

⁴Obtained by Veterinary Biologics Division, National Animal Disease Laboratory, Ames, Iowa.

DISCUSSION

From our work it is evident that dogs are frequently infected with the TGE-associated virus, or with a virus that is serologically related. If the TGE-associated virus is involved, our results are in agreement with Haelterman (3) who claimed that dogs could certainly play a role in the transmission of TGE.

Based on our results, it appears that infection with the TGE-associated virus or with a related virus occurs with greater frequency in dogs than in swine, and is independent of any contact with swine.

When we compare the antibody titers of the puppies in groups 2 and 5 with the titers of the adult dogs of groups 3 and 4, we suggest that the antibody titer increases with age, perhaps indicating either a persistent or a recurrent infection. We conclude from the negative serum samples of the puppies from the closed dog colony (Group 1) that the virus inhibition is due to an antibody arising from a specific infection, and not from a nonspecific inhibitor.

The authors believe that there is enough evidence to implicate dogs in the epizootiology of TGE and recommend that dogs be excluded from areas where swine are farrowed and raised.

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Book Review

HANDBUCH DER VIRUSINFEKTIONEN BEI TIEREN *Volume 4. Edited by Heinz Röhrer. Published by VEB Gustav Fischer Verlag Jena, D.D.R., Jena. 1969. 796 pages. 149 colour and black and white illustrations. 9 tables. Clothbound. Price 90.-M.*

The fourth volume of the handbook of virus infections in animals, which is to be published in five volumes under the editorship of Dr. H. Röhrer, is the third volume in the specialized series. The first volume, published in 1967, contains general information on virology and microbiological methods. The second volume deals with virus diseases localized in the skin, mucous membranes and the respiratory tract. The third volume, published in 1968 is concerned with virus diseases which are septicemic in nature. The present volume considers the virus diseases in which the pathological changes are localized in the central nervous system. These include, amongst others, rabies, Borne disease of horses and sheep, Teschen disease, Talfandisease, Aujeszky's disease, louping ill and various encephalomyelitis.

As in the previous volumes, each disease is discussed under the headings of historical data, distribution, etiology, infectivity, transmission, epizootology, biological characteristics, clinical symptoms, pathological anatomy and histology, immunology, serology, diagnosis, prophylaxis and therapy. The style is consistent throughout, employing the same bibliographical style of presentation, with both colour and black and white illustrations of excellent quality in all the volumes to date.

The list of references, included at the end of the section for each disease, has in several cases been up-dated to include publications for 1968. The list of contents provided at the beginning of the book and the subject and author index at the end are both good.

Volume 4 of the Handbuch der Virusinfektionen bei Tieren, in contrast to previous volumes, is written completely in German which somewhat limits its value as a reference text to those with a knowledge of this language. However, it would still be a useful addition to any reference library. — G. M. Ruckerbauer.