	EXPOSURES								
		WATER SOURCE		FEEDSTUFFS					
				Pellets		Chopped Hay		High Moisture Corn	Mineral Mix
POPULATIONS	Sick	Pond	Well	A	B	Dry	Green		
HIGH PRODUCERS	X	X	X	X		X	X	X	X
LOW PRODUCERS	X		X	X		X	X	X	X
DRY COWS (at home)	X		X			X	X	X	X
BABY CALVES (at home)			X		X				
DRY COWS #2					X				
HEIFERS #2					X				
YEARLINGS #3									

Figure 4. The population exposure chart for a salmonellosis outbreak in confined dairy cattle indicates four feedstuffs in correspondence with affected subpopulation.

lations have had access to it and all unaffected subpopulations have not. Since exposure and onset are not always in exact correspondence it is sometimes advisable to calculate attack rates in each subpopulation. Exposure factors of high suspicion are those with high attack rates among exposed groups and low attack rates among unexposed groups. Frequently, several exposure factors record hits and the suspicious factors must be further examined in respect to time (onset-exposure intervals) or subjected to toxologic or bacteriologic testing. Frequently, testing of water or feedstuffs is frustrating because these materials are no longer available when investigation occurs or because an obviously incriminated agent is not found. In such cases, experience shows that epidemiologic evidence, however circumstantial, is usually more convincing than negative laboratory tests.

The above procedure was used to narrow the search for sources of infection in an outbreak of acute salmonella typhimurium infection associated with a sudden change in feed (see Figure 4). Although four feedstuffs recorded "hits" (Figure 3) the green chopped hay was the only factor which had been freshly introduced within a reasonable "crude incubation period" and the temporal relationship was convincing although the organism was not found in the incriminated feed.

Careful epidemiologic investigation of outbreaks of both explosive and slowly spreading diseases can be rewarding to the consultant in confinement operations.

References

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Results of Virological Examinations of "Feedlot" Specimens during 1973 at TVMDL

A. K. Eugster, *D.V.M.*
Texas Veterinary Medical Diagnostic Laboratory
College Station, Texas

Effective virological diagnostic services have long been hampered by the time-consuming assay procedures. However, in the last few years great advances have been made and the time lag between request and answer have been shortened. This h· been mostly due to the use of the FA techniques i identifying a viral isolate. We no longer apply, at least on a regular basis, the FA test directly to tissue sections; even so, this would obviously be the fastest way in arriving at a diagnosis. The drawbacks with this method are nonspecific staining and low sensitivity. We inoculate all specimens for virological examination onto fetal bovine cell cultures. These cell cultures are then stained with conjugate two to three and three to five days after inoculation for IBR and BVD, respectively.

The chances of recovering virus are almost always better from an acutely sick animal than from chronically affected animals. Nasal and eye secretions (about 1-2 ml) in the case of respiratory problems and feces (10-50 ml) from animals with enteric symptoms are specimens of choice. These should be submitted well refrigerated or frozen. A blood sample from the same animal should accompany the shipment.

Table 1

IBR-Virus Isolations From Feedlot Animals in 1973

Days in Lot	Vacc. vs. IBR	No. of Isolations	Remarks
0-7	Yes	5	Pneumonia-Tracheitis
0-7	No	4	"
8-14	Yes	3	"
15-21	Yes	2	"
22-50	Yes	1	"
90-95	Yes	2	"
Unknown	No	4	"
Unknown	Yes	3	"
Unknown	Unknown	8	"

Table 2

BVD-Virus Isolations From Feedlot Animals in 1973

Days in Lot	Vacc. vs. BVD	No. of Isolations
0-7	No	5
8-21	No	5
8-21	Yes	2
Unknown	No	3
Unknown	Unknown	2

The results I am going to present are those we obtained during fiscal year 1973 by examining specimens from Texas feedlot animals. All specimens were received for diagnostic purposes and were submitted by practicing veterinarians. We obviously receive specimens only from a fraction of the total viral disease outbreaks. Therefore, these results are by no means comprehensive but perhaps do allow us to extrapolate a bit, although rather "unstatistically."

IBR virus was isolated from 32 cases (Table 1). All cases showed grossly and histologically a pneumonia and tracheitis. *Pasteurella hemolytica* and *multocida* were commonly also isolated from these cases. As far as one could determine from the clinical history, the animals were vaccinated vs. IBR the first few days after arrival at the feedlot. It is not surprising to isolate IBR virus the first week after arrival and/or after vaccination. Ten or 14 days post vaccination however, one shouldn't be able to recover IBR virus. Vaccine virus should no longer be shed and vaccine immunity should have been established. At this time laboratory assistance is frequently requested because a definite diagnosis is required before revaccination is undertaken. A major IBR outbreak occurred in two feedlots three months after vaccination. It is interesting to speculate that this may coincide with the disappearance of IgA or secretory antibodies from the upper respiratory tract. We did not test for nasal antibodies in these cases. On occasion, however, we did isolate IBR from secretions and tissues of animals which had antibodies in their sera.

BVD virus was isolated from 17 cases during 1973 (Table 2). These isolates originated mostly from the intestinal tract but also some from lung tissues.

IBR and BVD infections in the same animal were observed in three cases (Table 3). In all three cases the calves showed macro- and microscopic lesions typical of BVD, i.e., ulcerative and erosive stomatitis, esophagitis and gastroenteritis. However, upon inoculation of tissue cultures, IBR virus was recovered in very high concentrations from all tissues including the ileocecal tonsil. We were able to isolate BVD virus from the same tissue as IBR virus in one case. BVD virus has been reported to be capable of suppressing the immune system. It is therefore plausible to theorize that in these cases the immune suppressive action of the BVD virus may have allowed a latent IBR infection to become overt.

Table 4 includes serological tests performed on cattle sera of different origin (dairy, range and feedlot). The percent positive figure is lower than commonly reported. This is due to the fact that we employ the MDCF test rather than the SN test for IBR and BVD antibody determinations. We feel that MDCF titers are of more diagnostic value than SN titers on single sera since IgM or "early"

Table 4

Viral Serological Tests Conducted on Texas Cattle During 1973

Virus	Type of Test	Number Tested	% Positive
IBR	MDCF	3318	14.8
BVD	MDCF	1184	10.7
PI-3	HI	772	35.2

Table 3

Double (IBR and BVD) Infection in Feedlot Animals in 1973

Case No.	Days in Lot	Vacc. vs. IBR	Vacc. vs. BVD	Virus Isol.	Remarks
21787	7	Yes	Yes	IBR	Corneal opac. BVD-Serol. pos.
22700	Unknown	Unknown	Unknown	IBR	Histol. lesions consistent w BVD BVD-Serol. pos.
23041	Unknown	No	No	IBR & BVD	Histol. lesions consistent to BVD

Table 5

Unidentified Viruses Isolated From Feedlot Animals in 1973

Case No.	Days in Lot	Source of Virus	Tentative Identification	Clinical History
32458	Unknown	Feces	Parvovirus ?	Diarrhea
12538	1-2 Months	Feces	Parvovirus ?	Diarrhea, sometimes bloody
12744	1 Month	Lung & Trachea	Entero., Herpes ?	Field Diagnosis: IBR
20698	2-4 Weeks	Trachea	Herpes, Entero. ?	Obstructive tracheitis

antibodies fixes complement better than IgG. The MDCF test does not, or only irregularly, "pick up" titers induced by vaccines only.

Most diagnostic laboratories recover occasional viruses which do not seem to fit the existing groups. The viruses listed on Table 5 are only tentatively identified and much more work is needed to characterize these agents.

A virus was recovered from the feces of two outbreaks of diarrhea. Both isolates appear to be of the same type. The fecal cultures in these cases were negative for bacterial pathogens. These viral isolates produce a rather rapid CPE typical of the enteroviruses and do hemagglutinate guinea pig red blood cells. They could possibly be parvoviruses or enteroviruses.

Two similar viruses were recovered from calves which were about one month in the feedlot. The field diagnosis in both cases was an "IBR outbreak."

Both isolates appear to be the same. They are definitely not IBR, BVD, or PI-3 viruses. They could possibly be some other type of herpes virus or even picornaviruses since we have not yet determined their sensitivity to ether.

Panel Discussion

Dr. Hal Rinker, *Chairman*
Spearman, Texas

Question: I would like to ask Dr. Crenshaw why he thinks that cattle ought to come from one source.

Dr. Crenshaw: Why they will have two disease outbreaks? One source cows? Well, I think you have to look at them from the standpoint that modified live vaccines can and will create a feeble response.

Question: Let us assume, Dr. Kahrs, that we have a herd where 75% of them are carrying serum antibodies against IBR. When you bring those calves into the feedlot, would you vaccinate them against IBR or would you not?

Dr. Kahrs: If I knew that 75% carried antibodies, I doubt if we would.

Question: Is there any chance of propagating a modified virus; for example, you set up a trial—you go in and vaccinate half the herd or half the number of animals. Is there any chance of propagating the modified virus to give some of the others immunity? Is there any chance of vaccine virus becoming field virus following vaccination and halfway hiding your results?

Dr. Kahrs: There are two questions here, really. One question is whether vaccinating some of the group will immunize the contact. That is possible. However, with all due respect, every vaccine for the feedlot that has been approved for marketing has supposedly been tested in isolation and negative contact control. The sole isolated documented case of a licensed vaccine, the name of which will never be revealed to me, is probably the exception rather than the rule. But this exception could occur on a large scale! It is unfortunate that we don't know more details about this. It makes me lose some faith, both in biological manufacturers and in the agency that is trusted to keep surveillance. That's one question. The next one is, can vaccine virus escaping from a vaccinated animal immunize the contact animal? It shouldn't happen, and in all probability when you buy a vaccine from a reputable manufacturer, the odds are that you should not have this happen. In fact, you should have a high degree of confidence that it will not happen. Now the other question—will the vaccine, after serial passes from animal to animal to animal, revert to its virulent form? The answer again is, although it is feasibly possible, I would say it is very unlikely. This is an opinion. I have never done this. In order to get license, they do what they call serial or back tests on these vaccines. To me it is the same magnitude of faith I have when I pull up to a stop sign or a crossroad where the other guy has the stop sign—99% of the time he is going to