

the Department of Health and Social Security and the trade associations concerned. This scheme provides for containers of, or invoices accompanying, unsterilised bone meal to bear special labels warning users against the inclusion of the material in animal feedingstuffs.

BOVINE TUBERCULOSIS

General. No change in the intervals between routine tuberculin tests was made during 1971. The reactor incidence, expressed as a percentage of the total number of cattle in all herds tested, was 0.038 per cent. Table 1 shows the continued progress made over the past 2 years. The West Penwith area of Cornwall remained a stubborn problem and the testing of herds in this area at 6-monthly intervals continued.

'Affected' Cattle. The Tuberculosis Orders 1964 provide for the notification and slaughter of cattle found to be affected with certain forms of tuberculosis. One animal, which was found to be excreting tuberculous material from the uterus, was slaughtered as being 'affected' as defined in these Orders; the case occurred in Midlothian.

Bovine tuberculosis found in abattoirs. One hundred and seventy four cases of suspected tuberculosis in animals of homebred origin were reported from abattoirs. Of these 37 were confirmed as due to bovine tuberculosis and tracing disclosed reactors on 14 farms. In animals of Irish origin 132 suspected cases were reported; 91 of these were diagnosed as bovine tuberculosis and 62 cases where full information was available were reported to the Irish authorities. (A total of 5,480 fat cattle and 415,364 store cattle were imported from the Republic of Ireland either direct or via Northern Ireland).

Slaughter of reactors and contacts and compensation. Compensation for reactors slaughtered remained at 75 per cent of market value with a maximum payment of £120. Full market value was paid for animals classified and slaughtered as contacts. In all 2,166 animals were slaughtered by official arrangements and £207,560 paid in compensation; an average of £92 per head for reactors and £117 per head for contacts. Salvage on the sale of carcasses amounted to £120,547. Thirty two animals were slaughtered privately.

Milk and dairies legislation. Approximately 2,850,000 cattle in 61,184 herds were clinically inspected during the year. The vast majority of these inspections was carried out at the time of the herd tuberculin test.

1971

Table 1
Incidence of tuberculosis as disclosed by tuberculin tests 1970-1971

Year	Total number of cattle in herds tested	No. of cattle tested	No. of herds tested	Reactors slaughtered		Herds with reactors		No. of contacts slaughtered		No. of herds with visible lesion reactors		No. of herds with no visible lesion reactors*	
				No.	As a % of total cattle in herds tested	No.	As a % of herds tested	No.	%	No.	%	No.	%
1970	5,049,790	3,885,130	85,820	2,081	0.041	879	1.024	406	566	0.660	313	0.364	
1971	4,771,848	3,499,452	75,451	1,834	0.038	805	1.067	364	562	0.744	243	0.318	

* No visible lesion reactor—an animal reacting to the tuberculin test which at slaughter shows no macroscopic evidence of infection.

PIG RESPIRATORY DISEASE

Haemophilus parahaemolyticus infection. *Haemophilus parahaemolyticus* has been shown to cause a severe pleuropneumonia in pigs. A modified complement fixation test for *H. parahaemolyticus* was developed. The serological response to *H. parahaemolyticus* was followed in a group of experimentally infected pigs. The test became positive 2 weeks after infection and was still positive 10 weeks after infection. A group of pigs experimentally infected with *Mycoplasma hyopneumoniae* was followed over the same 10 week period but did not develop reactions to the test. The sera from pigs in 8 herds with respiratory disease and 10 herds without respiratory disease that had been subjected to careful bacteriological examination and were known to be free from *H. parahaemolyticus* infection were all negative. 363 out of 1,122 sera collected from abattoirs throughout Great Britain were positive as were 5 out of 150 sera taken from pigs being exported. Infection may be fairly widespread.

Recently, 8 isolates of *H. parahaemolyticus* were obtained from 40 pieces of trachea taken from a batch of 200 pigs being killed at a local abattoir.

Interaction between viruses and bacteria in experimental respiratory disease in pigs. In the first experiment in this series pigs were infected with either *Pasteurella multocida* alone or with *Pasteurella multocida* and *Reovirus* type 1. In common with other workers it was found that *Pasteurella multocida* was unable to establish itself even in the nasal cavities. However, the pigs were carrying a nasal infection of *Haemophilus parasuis* and these bacteria spread into the lungs of the pigs infected with the reovirus. In the virus infected pigs the number of *Haemophilus* found per gram of apical lobe was 1.5×10^8 2 days after infection: none was found in the pigs killed 7 days after infection; 1.5 and 10^8 *Haemophilus* per gram were present in pigs killed 10 days after infection and a small number of tiny colonies were found 14 days after infection. By 14 days post infection this effect had almost disappeared.

Two attempts were made to repeat this experiment. In the first *Haemophilus* was reisolated only from the noses of the pigs.

In the second, although *Haemophilus* was not present in high titre in the lungs it was reisolated from some of the associated lymph nodes in both the virus-infected and bacteria-infected groups of pigs.

Thus, there is some evidence that reovirus may interfere with bacterial clearance from the lungs but this requires further investigation.

SYSTEMATIC BACTERIOLOGY

Work continues in characterising and compiling comparative data on bacterial cultures received for identification. A total of 250 cultures was submitted for identification by the VI Centres during 1971; 5 cultures were non-viable on

receipt and 30 cultures could not be satisfactorily identified. In addition, primary plate cultures were examined for a number of laboratories within the CVL requiring the identification of organisms isolated.

Thirteen cultures of *Listeria* were received for serotyping; 6 from cattle, 5 from sheep and one each from pig and fowl. The isolates from sheep included a *Listeria monocytogenes* type 5. Three isolates of this type which had not been reported previously in Britain have now been examined.

An imported horse reacting to the mallein test was slaughtered and subjected to detailed examination. A pseudomonad biochemically resembling *Ps. mallei* was isolated. It had no serological resemblance to that organism.

TUBERCULOSIS

The total number of specimens examined amounted to 1,116 including 125 from Scotland.

Cattle. Tissue specimens were received from 1,015 animals of which 513 (50.54 per cent) had no visible lesions and the remaining 502 (49.46%) had various kinds of lesions. From 15 no visible lesion reactors, 12 bovine type strains and 3 avian type strains were isolated. The isolation rate amounted to 2.9 per cent.

Of the 502 specimens with lesions 190 (38 per cent) were from animals classified as tuberculin reactors and 312 (62 per cent) from cattle slaughtered for reasons other than the positive result of the tuberculin test; the proportion of specimens from animals slaughtered as tuberculin reactors decreased as compared with the previous year. From 190 specimens of reactor animals, 104 bovine and 11 avian type strains were isolated, whilst of the 312 animals other than tuberculin reactors 115 yielded *M. bovis* and 48 *M. avium*. One atypical strain was isolated and 2 samples revealed bovine and avian dual infection. The rate of isolation of tubercle bacilli from the 502 specimens with lesions amounted to 55.7 per cent. In stained sections of 6 specimens with lesions, acid fast organisms were found, but no mycobacteria were isolated.

Altogether 297 strains of tubercle bacilli were isolated from cattle: 233 (78.5 per cent) were classified as *M. bovis* and 64 (21.5 per cent) as *M. avium*. The bulk of the 64 avian type strains derived from animals other than tuberculin reactors. Approximately 1 out of 4.6 isolates was *M. avium* as compared with 1 out of 6.4 in 1970.

One of 62 milk samples yielded *M. avium*. From 19 porcine specimens, 10 avian and 1 bovine type strains were isolated. Tissues from 11 badgers were sent from one Division: 8 yielded *M. bovis* and a further 3 bovine strains were isolated from 5 badger faecal samples. Human type tubercle were isolated from 4 monkeys, all from the same zoo.

Acid-fast bacteriology and serology. Specimens examined numbered 110 but there were only 6 isolations. A total of 133 cultures was examined, the great

majority of which were of *M. avium*. About half of these cultures were from the diagnosis section, chiefly from cattle, and the major part of the rest were from a collection of isolates from that section retained over the last 7 years because of unusual characteristics, pending the availability of a typing facility. A surprisingly high proportion of the latter are *M. intracellular* (Battey bacilli). Two avium-like isolates were from sheep but we have yet to find a true *M. avium* from this species.

The sensitivity of oxalate medium in the detection of *M. smegmatis* was investigated, and it was shown that in milk, without other species of bacteria present, a single organism in the inoculum (about 0.07 ml) is sufficient to give a positive reaction; an assessment of the sensitivity with contaminants remains to be carried out. The problem of positive reactions from some samples of colostrum was overcome by increasing the buffering capacity of the medium. Serological studies of *M. smegmatis* have confirmed that one of the types is very different from the others, while they differ one from another antigenically by perhaps only single factors.

Work continued on bovine reactor sera from Gloucestershire. It has now proved possible to demonstrate antibodies to *M. bovis* in these sera but it has yet to be proved that these antibodies are specific or significant.

Antigens for the whole-blood stained antigen agglutination test for *M. avium* antibodies were prepared. They do not detect infection as early as the tuberculin test, at least in experimental infections, but will continue to detect it after the birds have become anergic to tuberculin. The main use for these antigens will be in birds with no satisfactory site for the tuberculin test, especially waterfowl and zoo birds; it may prove useful in small zoo animals or even in pachyderms.

BIOCHEMISTRY

Chemical Pathology

Aflatoxin metabolism. Experimental evidence suggests that besides microsomal pathways there are soluble (cytoplasmic) liver enzymes capable of metabolising the toxin. In avian and rabbit livers an enzyme converts aflatoxin B₁ to aflatoxicol and aflatoxin B₂ to dihydro-aflatoxicol. These reductive reactions have been shown to be NADPH₂ dependent and the potential importance of this pathway lies in the fact that it presents an alternative site of action in the liver cell deflecting aflatoxin from chronic toxic attack on the endoplasmic reticulum. In the duck, commonly used as an *in vivo* assay system for aflatoxin, the soluble and microsomal pathways are in competition but as it has now been established that the soluble pathway is reversible, it seems likely that the highly active microsomal transformation to the hemiacetal (Annual Report 1969, page 53) is the more important. This metabolite binds more firmly to protein than aflatoxin itself and may be the true 'acute toxin'.

Bright blindness in sheep. Bracken feeding has been shown to produce this disease. A decrease in lactate dehydrogenase (LDH) activity and a change in the LDH isoenzyme pattern of the retina was previously shown to occur in field cases. The same changes have been demonstrated in experimental cases produced by feeding bracken.

Experimental Johne's disease. Using mechanical and ultrasonic techniques, live *Mycobacterium avium* organisms, strain D4ER, have been disintegrated and preparations of protoplasmic protein made. Dermal allergic responses to this protoplasmic protein preparation of *M. avium* were then assessed in homologously sensitised guinea pigs.

Quantities of a recently isolated field strain of *M. johnei* have now been cultured and a similar technique will be applied to disrupt these organisms. Preparations from this strain will then be compared with those of the laboratory adapted strains currently used for johnin PPD production for specificity in allergic skin tests.

Iron toxicity. In anaemia prophylaxis in the piglet intraperitoneal, intramuscular or intravenous therapeutic doses of iron (as iron-dextrose) result in raised plasma calcium and inorganic phosphate concentrations concurrent with increases in the level of circulating iron. The ability to mobilise calcium is marked in piglets 8 or more days old and it also occurs in adult pigs. To investigate the mechanism of calcium mobilization, the parathyroid hormone calcitonin, which prevents the release of bone calcium, was injected simultaneously or soon after the intravenous administration of iron. When injected simultaneously calcium mobilization was blocked. When given after calcium mobilization had already occurred a fall in plasma calcium was produced.

Neurochemistry. A neurochemical study of the development of the central nervous system (CNS) of the pre- and post-partum piglet is in progress. This parallels a similar study already completed for the lamb and is to provide background information against which pathological changes can be assessed. The range of procedures used in earlier studies has been extended with the development of methods for

- 1 assay of cerebroside synthesis,
- 2 electrophoretic characterisation of myelin proteins,
- 3 characterisation and analysis of the fatty acids of individual lipid fractions, and
- 4 the determination of phospholipids, sulphatides and hydroxy- and non-hydroxy-cerebrosides.

These methods are being applied to studies of cerebrosinal hypomyelinogenesis in piglets, type AII trembler piglets, Border disease in calves and lambs and delayed swayback of lambs.

Table 1

Stock slaughtered and compensation paid 1964-1971

	1964		1965		1966	
	No.	£	No.	£	No.	£
Foot-&-mouth disease*						
Cattle	—	—	154	18,299	5,964	520,820
Sheep	—	—	—	—	38,607	399,971
Pigs	—	—	—	—	718	11,975
Goats	—	—	—	—	2	20
Total foot-&-mouth disease	—	—	154	18,299	45,291	932,786
Fowl Pest†						
Poultry	1,668	908	—	—	—	—
Swine Fever						
Pigs‡	110,922	1,517,124	42,141	578,535	8,098	109,274
Bovine tuberculosis						
Cattle						
(a) Affected animals	7	356	8	448	4	274
(b) Reactors and dangerous contacts	5,637	384,901	3,732	269,882	3,531	251,299
Total bovine tuberculosis	5,644	385,257	3,740	270,330	3,535	251,573
Brucellosis						
(Accredited Herds)						
Scheme Reactors	—	—	—	—	—	—
Incentives Scheme Reactors¶	—	—	—	—	—	—
(Area Eradication)						
Scheme Reactors and dangerous contacts	—	—	—	—	—	—
Total brucellosis	—	—	—	—	—	—
Total of compensation	—	1,903,289	—	867,164	—	1,293,633

* In some years the figures for compensation include small amounts paid for carcasses destroyed in slaughterhouses, etc.

† See footnote to Table 3.

‡ This figure included as provisional in 1968 is now final.

§ Includes pigs slaughtered for diagnostic purposes.

|| The Brucellosis (Accredited Herds) Scheme commenced in 1967 and its progress was restricted by the foot-and-mouth disease outbreak.

¶ Compensation is not paid under Brucellosis Incentives Scheme.

Table 1—continued

1967		1968		1969		1970		1971	
No.	£	No.	£	No.	£	No.	£	No.	£
196,804	21,522,125	18,096	2,092,231	—	—	—	—	—	—
97,253	1,180,028	11,582	132,363	—	—	—	—	—	—
113,267	1,823,465	5,259	97,530	—	—	—	—	—	—
50	585	7	71	—	—	—	—	—	—
407,374	24,526,203	34,944	2,322,195‡	—	—	—	—	—	—
88,095	48,203	987	467	4,862	3,425	65,320	91,119	19,683	23,139
—	—	—	—	—	—	—	—	215	2,257
1	56	2	94	1	113	—	—	1	61
3,249	231,107	2,312	185,554	2,773	227,621	2,473	208,945	2,165	207,499
3,250	231,163	2,314	185,648	2,774	227,734	2,473	208,945	2,166	207,560
1	90	1,079	128,551	2,458	295,651	4,044	499,468	2,813	360,988
—	—	—	—	—	—	3,360	—	19,949	—
—	—	—	—	—	—	—	—	603	11,232
1	90	1,079	128,551	2,458	295,651	7,404	499,468	23,365	372,220
—	24,805,659	—	2,636,861	—	523,385	—	799,532	—	605,176

EEC Matters

The report for 1971 recorded the satisfactory concessions secured by the United Kingdom in the Treaty of Accession in relation to veterinary Directives which were already in operation in the Community. As Accession Day approached an increasing part was played by the United Kingdom in Community consideration of new measures under preparation. Two veterinary Directives were finalised by the Community towards the end of 1972. These dealt with specific animal health precautions for intra-Community trade in fresh meat, and animal and public health precautions for imports of livestock and fresh meat from third countries (i.e. countries outside the Community). These Directives, on which the Community had been working for many years, were understandably related to the situation of the six original member States of the Community. Because of this the proposals raised difficulties for the United Kingdom as well as for other acceding States. It was agreed that these Directives should be adopted for application to the six original member States only. Special concessions were secured for the new member States. In relation to imports of livestock and meat from third countries the new member States were authorised to continue their own national rules for 5 years. Similarly, the new member States were authorised to retain for 4 years in relation to imports of fresh meat from other member States, their own national rules concerning protection against foot-and-mouth disease and swine fever. In the case of Northern Ireland, the second of these concessions will apply for 5 years, in so far as their rules for protection against foot-and-mouth disease are concerned.

While these arrangements are in operation, there will be a review by the Commission, with which the United Kingdom will be associated, as a result of which proposals will, as necessary, be made to the Council for the future operation of the Directives.

These arrangements are in line with those already recorded in Articles 104-106 of the Treaty of Accession and they ensure that the essential animal health requirements of the United Kingdom will be safeguarded.

Other Diseases

1972

ANTHRAX

There were 82 outbreaks of anthrax in Great Britain; 55 in England, 5 in Wales and 22 in Scotland. A total of 88 cattle and one pig died in these outbreaks. There were no deaths in sheep. Investigation into the outbreaks suggests the following probable sources of infection:

Feeding stuffs	68
Tannery effluent	4
Persisting infection from previous years	7
Obscure	3
	—
	82
	—

Most cases involved the death of only one animal. However, 4 cows died in an outbreak of anthrax at a Research Institute. The report of the investigating epidemiology team showed that 3 of the animals probably contracted the disease after gaining access to the area where the first cow had died and where blood had been shed. Anthrax organisms were isolated from the soil at this site for some weeks after the first cow died.

BOVINE TUBERCULOSIS

General. Routine tuberculin tests continued during 1972 with no change in testing intervals. The reactor incidence expressed as a percentage of the total number of cattle in all herds tested was 0.035 per cent. Table 1 shows the continued decrease in reactor incidence since 1970.

During the year a departmental team conducted an inquiry into the persistent bovine tuberculosis problem in the West Penwith area of Cornwall. The report on the team's findings and recommendations was published in July.

'Affected' cattle. No cases of 'affected' animals as defined in the Tuberculosis Orders 1964 were reported.

Bovine tuberculosis found in abattoirs. One hundred and nine cases of suspected

tuberculosis in animals of homebred origin were reported from abattoirs. Of these 25 were confirmed as being due to bovine tuberculosis and tracing disclosed reactors on 17 farms. In animals of Irish origin 125 suspected cases were reported, 110 of these were diagnosed as bovine tuberculosis and 58 cases where full information was available were reported to the Irish authorities.

Slaughter of reactors and contacts and compensation. The Tuberculosis (Compensation) Amendment Order 1972 and the Tuberculosis (Compensation) (Scotland) Amendment Order 1972 came into operation on 1 June 1972. These Orders increased the maximum compensation payable for a reactor from £120 to £180, i.e., three-quarters of the market value of the animal with an upper valuation limit of £240. Full market value continued to be paid for dangerous contact animals. A total of 1,846 animals was slaughtered by official arrangements and £243,633 compensation was paid, an average of £128 per head for reactors and £153 per head for contacts. Salvage on the sale of carcasses amounted to £135,425. Twenty two animals were slaughtered privately.

BRUCellosis

Voluntary schemes. Response to the Brucellosis Incentives Scheme continued at a very satisfactory rate, with a monthly average of over 2,000 applications giving a total membership of 71,925 herds. Over 94 per cent of members of the Brucellosis (Accredited Herds) Scheme, which was closed to new applicants in 1970, have elected to transfer to the new Scheme. Under both Schemes a total of 50,953 herds had achieved accredited status by the end of the year and a further 21,918 herds were qualifying for registration. The total of 72,871 herds participating in voluntary accreditation represented over half of all testable cattle in the national herd.

To encourage continuing participation in the Incentives Scheme, it was announced on 19 May that owners of accredited herds will be eligible, after their period of entitlement to incentives expires, to receive compensation at the rate of 75 per cent of the value as an accredited animal (subject to a maximum payment of £180 for each animal) for any reactor slaughtered under the rules of the Scheme. It was announced at the same time that the maximum compensation payable under the Brucellosis (Accredited Herds) Scheme was increased from £160 to £240; also, that owners remaining in that Scheme would retain existing benefits until 31 March 1980 and would thereafter be eligible for the terms available to herds under the Incentives Scheme after expiry of their incentives period.

Following the announcement of compensation terms under the Incentives Scheme for incentive-expired herds it was agreed that Artificial Insemination Centres—which had already been granted accredited status—should be invited to apply for registration as accredited under the Incentives Scheme so that they could benefit from the compensation terms from 1 April 1976. Accordingly, invitations to individual centres were issued towards the end of the year.

Incidence of tuberculosis as disclosed by tuberculin tests 1970-72

Year	Total number herds tested	No. of cattle tested	No. of herds tested	Reactors slaughtered		Herds with reactors		No. of contacts slaughtered	No. of herds with visible lesion reactors		No. of herds with no visible lesion reactors ¹	
				No.	As a % of total cattle in herds tested	No.	As a % of herds tested		No.	%	No.	%
1970	4,049,700	3,885,130	85,820	2.081	879	1.024	313 ^a	406	313 ^a	0.364 ^a	566 ^a	0.660 ^a
1971	3,971,848	3,499,452	75,451	2.154	895	1.067	243 ^a	300	243 ^a	0.318 ^a	562 ^a	0.744 ^a
1972	4,519,210	3,222,329	70,862	2.198	731	1.032	246	300	246	0.347	485	0.684

¹ No visible lesion reactor—an animal reacting to the tuberculin test which at slaughter shows no macroscopic evidence of infection.
^a These figures were incorrectly transposed in the 1971 edition.

Table 1

Stock slaughtered and compensation paid 1965-1972

	1965		1966		1967	
	No.	£	No.	£	No.	£
Foot-and-mouth disease ¹						
Cattle	154	18,299	5,964	520,820	196,804	21,522,125
Sheep	-	-	38,607	399,971	97,253	1,180,028
Pigs	-	-	718	11,975	113,267	1,823,465
Goats	-	-	2	20	50	585
Total foot-and-mouth disease	154	18,299	45,291	932,786	407,374	24,526,203
Newcastle disease						
Poultry	-	-	-	-	88,095	48,203
Swine fever						
Pigs ²	42,141	578,535	8,098	109,274	-	-
Swine vesicular disease						
Cattle ⁷	-	-	-	-	-	-
Sheep ⁷	-	-	-	-	-	-
Pigs ⁷	-	-	-	-	-	-
Goats ⁷	-	-	-	-	-	-
Total swine vesicular disease	-	-	-	-	-	-
Bovine tuberculosis						
Cattle						
(a) Affected animals	8	448	4	274	1	56
(b) Reactors and dangerous contacts	3,732	269,882	3,531	251,299	3,249	231,163
Total bovine tuberculosis	3,740	270,330	3,535	251,573	3,250	231,219
Brucellosis Cattle (Accredited Herds)						
Scheme Reactors	-	-	-	-	1	90 ⁴
Incentive Scheme Reactors ⁵	-	-	-	-	-	-
(Area Eradication) Scheme Reactors and dangerous contacts	-	-	-	-	-	-
Total brucellosis	-	-	-	-	1	90
Total of compensation	-	867,164	-	1,293,633	-	24,805,659

¹ In some years the figures for compensation include small amounts paid for carcasses destroyed in slaughterhouses, etc.

² This figure included as provisional in 1968 is now final.

³ Includes pigs slaughtered for diagnostic purposes.

⁴ The Brucellosis (Accredited Herds) Scheme began in 1967 and its progress was restricted by the foot-and-mouth disease outbreak.

Table 1—continued

	1968		1969		1970		1971		1972	
	No.	£	No.	£	No.	£	No.	£	No.	£
	18,096	2,092,231	-	-	-	-	-	-	-	-
	11,582	132,363	-	-	-	-	-	-	-	-
	5,259	97,530	-	-	-	-	-	-	-	-
	7	71	-	-	-	-	-	-	-	-
	34,944	2,322,195 ⁶	-	-	-	-	-	-	-	-
	987	467	4,862	3,425	65,320	91,119	19,683	23,139	-	-
	-	-	-	-	-	-	215	2,257	-	-
	-	-	-	-	-	-	-	-	133	22,559
	-	-	-	-	-	-	-	-	180	3,360
	-	-	-	-	-	-	-	-	3,579	75,560
	-	-	-	-	-	-	-	-	1	12
	-	-	-	-	-	-	-	-	3,893	101,491
	2	94	1	113	-	-	1	61	-	-
	2,312	185,554	2,773	227,621	2,473	208,945	2,165	207,499	1,846	243,633
	2,314	185,648	2,774	227,734	2,473	208,945	2,166	207,660	1,846	243,633
	1,079	128,551	2,458	295,651	4,044	499,468	2,813	360,988	921	157,707
	-	-	-	-	3,360	-	19,949	-	26,945	-
	-	-	-	-	-	-	603	11,232	10,334	1,511,147 ⁶
	1,079	128,551	2,458	295,651	7,404	499,468	23,365	372,220	38,200	1,668,854
	-	2,636,861	-	523,385	-	799,532	-	605,176	-	2,013,978

⁵ Compensation is not paid under Brucellosis Incentives Scheme.

⁶ Includes retrospective compensation for some reactors slaughtered in 1971.

⁷ These animals were slaughtered because this disease was at first thought to be foot-and-mouth disease.

The control and eventual eradication of SVD depend on the continuation of the present policy of prevention of the introduction of disease from abroad, the prevention of re-cycling of disease in waste food and the co-operation and vigilance of all those engaged in the pig industry.

ANTHRAX

There were 41 outbreaks of anthrax in Great Britain; 30 in England, 4 in Wales and 7 in Scotland. This is the lowest number ever recorded in one year. In 40 of these outbreaks a total of 42 cattle and 2 pigs died. The remaining outbreak occurred in a zoological collection in Scotland and resulted in the deaths of 3 animals; 2 cheetahs and a lion. There were no outbreaks in sheep.

Investigations into the outbreaks suggest the following probable sources of infection:

feedingstuffs	26
feedingstuffs or wool shoddy	1
wool shoddy	1
bone meal	1
persisting infection from previous years	2
obscure	10

Three cases involved carcasses opened at knackeries and in 2 of these it was necessary to trace and destroy parts of carcasses that had been or were being distributed to premises in other counties.

BOVINE TUBERCULOSIS

Routine tuberculin tests continued during 1973 with no change in testing intervals. Table 1 shows the reactor incidence compared with 1972. The recommendations made by the Departmental team of inquiry into the persistent bovine tuberculosis problem in the West Penwith area of Cornwall were accepted and have been implemented wherever possible. Thus the discriminating standard of tuberculin test interpretation was continued in West Cornwall and synchronised testing at 3-monthly intervals was introduced in those areas having the highest reactor incidence during the previous 3 years. Intensive investigations into the incidence of tuberculosis in wildlife and in particular in the badger continued. Tubercle bacilli of the type causing disease in cattle (*M. bovis*) was identified by the Central Veterinary Laboratory, Weybridge in badger material submitted routinely from Cornwall, Gloucestershire and Wiltshire (Table 2). In addition, a special survey of badger material collected from 102 randomly selected West Penwith farms was carried out.

Table 1
Incidence of Tuberculosis as Disclosed by Tuberculin Tests 1972 and 1973
Great Britain

Year	Total number of cattle in herds tested	No. of cattle tested	No. of reactors	Reactors slaughtered		Herds with reactors		No. of reactors		No. of herds with visible lesion reactors		No. of herds with no visible lesion reactors	
				No.	As a % of total cattle in herds tested	No.	As a % of herds tested	No.	%	No.	%	No.	%
1972	4,819,210	3,223,229	66,991	1.568	0.035	731	1.022	300	246	0.347	485	0.684	
1973	4,966,572	3,469,523	66,670	1.574	0.032	367	0.825	410	218	0.317	349	0.508	

1973

Table 2
Results of examinations for *M. bovis* carried out at the CYL during 1973
on badger material submitted from the counties indicated

County	Badger samples collected from farm premises		Badger samples collected from non-farm premises e.g., road accidents		Farms from which badger samples were collected in 1973		Farms from which badger samples were collected in the first time during 1973		
	Total	Negative	Total	Negative	Total	Negative	Total	Negative	
Cornwall									
Special Survey—West Penwith	102	98	Nil	1	102	4	98	80	3
Routine—West Penwith	303	265	2	1	144	19	125	81	16
Examinations—Rest of county	83	75	4	4	39	5	34	39	5
TOTAL	488	438	6	1	285	28	157	200	24
Gloucestershire	161	135	31	12	19	106	17	89	14
Wiltshire	48	44	2	1	25	4	21	17	3

'Affected' Cattle

No cases of 'affected' animals as defined in the Tuberculosis Order 1964 were reported.

Bovine Tuberculosis Found in Abattoirs

One hundred and thirty-three cases of suspected tuberculosis in animals of homebred origin were reported from abattoirs. Of these 36 were confirmed as due to bovine tuberculosis and tracing disclosed reactors on 8 farms. In animals of Irish origin 72 suspected cases were reported; 44 of these were diagnosed as bovine tuberculosis and 26, where full information was available, were reported to the Irish authorities.

Slaughter of Reactors and Contacts and Compensation

A total of 1,955 animals were slaughtered by official arrangements and £344,617 compensation was paid, an average of £152.11 per head for reactors and £225.74 per head for contacts. Salvage on the sale of carcasses amounted to £166,340. Twenty two animals were slaughtered privately.

BRUCELLOSIS**Compulsory Eradication**

During the year the programme for the compulsory eradication of brucellosis was extended to include the following areas:

- 1 January: parts of the counties of Caernarvon, Carmarthen, Montgomery, the remainder of the county of Cardigan, the county of Merioneth;
 - 1 July: the remainder of the counties of Ross and Cromarty, and Inverness, the counties of Caithness, Sutherland, Nairn;
 - 1 November: parts of the counties of Lancashire, Yorkshire, West Riding, the remainder of Orkney;
- the counties of Norfolk, East and West Suffolk, Ayr, West Sussex.

The East Anglian eradication area, i.e., Norfolk and East and West Suffolk, was scheduled originally for commencement on 1 April but due to outbreaks of swine vesicular disease and the diversion of veterinary staff to deal with this disease, had to be postponed until 1 November.

Further areas were scheduled to commence in 1974 and in summary these comprised:

- 1 March 1974: a small part of the county of Glamorgan;
 - 1 July 1974: parts of the counties of Banff, Perth;
- the remainder of the county of Stirling;
- the counties of Moray, Fife, Clackmannan, Kinross;

4 November 1974: part of the county of Denbigh;

the remainder of the counties of Carmarthen, Caernarvon, Montgomery;

the counties of Pembroke, Brecon, Radnor, Anglesey, Cambridge and Isle of Ely, Huntingdon and Soke of Peterborough, Essex.

In 1986 of the herds in Great Britain which were subject to compulsory testing during the year, 28 per cent of the cattle were declared reactors at the first attempt at the first qualifying test.

Since the commencement of full compulsory powers in November 1972 a total of 2,933 herds have been subject to compulsory measures, of which 1,738 are still qualifying or awaiting a first compulsory test and 1,195 have been accredited.

By the end of the year 98.7 per cent of all herds, whether in the voluntary schemes or being dealt with compulsorily, were accredited in the initial Scottish areas; the percentages for the initial English and Welsh areas were 94 per cent and 92 per cent respectively.

Compensation

During the year the Departments have slaughtered in the eradication areas under compulsory measures 11,804 reactors and 6,527 dangerous contacts, at a total cost of £3,638,037 in compensation. These totals include, in addition to cattle slaughtered under compulsory arrangements, dangerous contacts in the Brucellosis (Accredited Herds) Scheme (B(AH)S) herds and in the Brucellosis Incentives Scheme (BIS) herds in the areas.

Voluntary Schemes

By the end of the year 82,836 herds, 50.58 per cent of all testable herds in Great Britain, were participating in one of the voluntary schemes. In terms of testable stock, this represents 56.18 per cent of the national herd. Most of these herds, 81,967, were participating in the BIS. The B(AH)S was closed to new applicants in March 1970 and the majority of members transferred to the BIS. Only 869 herds remain within the B(AH)S.

During the year 27,914 reactors were removed from BIS herds. No compensation is payable in respect of these and the owner must remove them at his own expense. Compensation totalling £71,418 was paid for 321 reactors under the B(AH)S.

Overall Progress

Progress under both voluntary schemes and compulsory legislation at 31 December 1973 is summarised in the following Table:

BACTERIOLOGY

The Mastitis Awareness Campaign

This campaign was launched in July to bring to the notice of dairy farmers the economic loss resulting from mastitis and to show that a simple control routine has been proved to be effective in most herds. The control is essentially based on 2 factors. New infection with mastitis organisms is prevented by dipping the teats after milking in a suitable disinfectant. Existing infection is eliminated by prompt treatment of clinical cases and of every cow at drying-off. Thus every farmer can apply the control system since all treatment is carried out routinely except where a severe case occurs and it is necessary to determine the causal organisms.

In July 1973 surveys indicated that teat dipping was used in only 17 per cent of herds but the proportion has now risen to 34 per cent. Dry period treatment is being carried out in more than 50 per cent of herds. When the figures are looked at according to herd size the results are even more encouraging because it is the owners of small herds who show least response to the campaign. In the larger herds 60 per cent of owners have adopted control methods and this means that approximately half the cows in Great Britain are included in the mastitis control programme.

Monitoring of the results of control can only be done economically by cell-counts of bulk-milk. There are signs that the campaign is having an impact as there has been a reduction in the average cell-count of over 1,000 herds involved in large-scale field trials.

Tuberculosis in badgers

As a result of the intensive eradication procedure introduced during World War II the proportion of the national cattle herd suffering from tuberculosis has been reduced from an initial 25 per cent to the present level of some 0.04 per cent. In spite of this spectacular effect bovine tuberculosis remains a problem in some clearly defined areas in the South West Region. Various

investigations of the commonly recognised sources of infection failed to reveal a possible origin and a wild life reservoir of infection was considered to be a possible explanation for its persistence.

In the spring of 1971 a dead badger was found on a farm where tuberculosis in cattle had recently been established. Post-mortem examination of the badger revealed lesions of tuberculosis and the organisms isolated were of the type that causes the disease in cattle. Further investigations of the badger population from these areas showed that the agent of bovine tuberculosis could also be found in faeces. Intensive examinations of badger material were carried out on farms where the presence of reactor cattle had recently been established. In addition, random surveys of limited areas were carried out in an attempt to assess the extent of the local problem.

Altogether, until the end of 1973, more than 1,200 samples of materials from badgers were examined of which 142 were found to contain tubercle bacilli. Further studies are being carried out on badger material from infected farms and random surveys in limited areas continue. Experimental work is in progress on the pathogenicity of badger isolates for calves. It is also intended to challenge badgers with a bovine isolate.

Cerebrocortical necrosis

Cerebrocortical necrosis (CCN) is a disease involving the central nervous system of young ruminants although occasionally older animals may be affected. The condition was first described in Britain in 1959 by the Pathology Department after they had examined a large number of cases over a period of years.

A major step in the understanding of the cause of the disease was the finding that thiamine (vitamin B₁) could be used with considerable success in the treatment of affected animals, the response often being quite dramatic even in animals thought to be dying. It is usually assumed that synthesis of thiamine by ruminal microflora provides an adequate supply of this vitamin, and it was, therefore, surprising to find that ruminants could apparently suffer from a state of thiamine deficiency. The attempted development of thiamine deficiency in pre-ruminant animals by feeding a thiamine-low diet failed to produce any evidence of CCN. The condition was, however, successfully induced in ruminant and pre-ruminant calves and sheep following dosage with amprolium, a thiamine antagonist; such compounds act by competing with thiamine thereby interfering with thiamine-dependent enzymic reactions.

ANIMAL HEALTH 1973

Table 1
Stock slaughtered and compensation paid 1966-1973

	1966		1967		1968	
	No.	£	No.	£	No.	£
Foot-and-mouth disease*						
Cattle	5,964	520,820	196,804	21,522,125	18,096	2,092,231
Sheep	38,607	399,971	97,253	1,180,028	11,582	132,363
Pigs	718	11,975	113,267	1,823,465	5,259	97,530
Goats	2	20	50	585	7	71
Total foot-and-mouth disease	45,291	932,786	407,374	24,526,203	34,944	2,322,195
Newcastle disease						
Poultry	—	—	88,095	48,203	987	467
Swine Fever						
Pigs†	8,098	109,274	—	—	—	—
Swine Vesicular disease						
Cattle‡	—	—	—	—	—	—
Sheep‡	—	—	—	—	—	—
Pigs	—	—	—	—	—	—
Goats‡	—	—	—	—	—	—
Total Swine Vesicular Disease	—	—	—	—	—	—
Bovine tuberculosis						
Cattle						
(a) Affected animals ...	4	274	1	56	2	94
(b) Reactors and dangerous contacts ...	3,531	251,299	3,249	231,107	2,312	185,554
Total bovine tuberculosis ...	3,535	251,573	3,250	231,163	2,314	185,648
Brucellosis						
Cattle						
Accredited Herds Scheme Reactors	—	—	1	90	1,079	128,551
Incentives Scheme Reactors ¶	—	—	—	—	—	—
Compulsory Eradication Arrangements—Reactors and dangerous contacts**	—	—	—	—	—	—
Total brucellosis	—	—	1	90	1,079	128,551
Total of compensation ...	—	1,293,633	—	24,805,659	—	2,636,861

* In some years the figures for compensation include small amounts paid for carcasses destroyed in slaughterhouses etc.

† Includes pigs slaughtered for diagnostic purposes.

‡ These animals were slaughtered because this disease was at first thought to be foot-and-mouth disease.

ANIMAL HEALTH 1973

Table 1—continued

	1969		1970		1971		1972		1973	
	No.	£	No.	£	No.	£	No.	£	No.	£
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—
4,862	3,425	65,320	91,119	19,683	23,139	—	—	—	—	—
—	—	—	—	215	2,257	—	—	—	—	—
—	—	—	—	—	—	133	22,559	—	—	—
—	—	—	—	—	—	180	3,360	—	—	—
—	—	—	—	—	—	3,579	75,560	87,839	2,221,382§	—
—	—	—	—	—	—	1	12	—	—	—
—	—	—	—	—	—	3,893	101,491	87,839	2,221,382§	—
1	113	—	—	1	61	—	—	—	—	—
2,773	227,621	2,473	208,945	2,165	207,499	1,846	243,633	1,955	344,617	—
2,774	227,734	2,473	208,945	2,166	207,560	1,846	243,633	1,955	344,617	—
2,458	295,651	4,044	499,468	2,813	360,988	921	157,707	321	71,418	—
—	—	3,360	—	19,949	—	26,945	—	27,914	—	—
—	—	—	—	603	11,232	10,334	1,511,147††	18,331	3,638,037	—
2,458	295,651	7,404	499,468	23,365	372,220	38,200	1,668,854	46,566	3,709,455	—
—	526,810	—	799,532	—	605,176	—	2,013,978	—	6,275,454	—

§ Provisional figures.

|| The Brucellosis (Accredited Herds) Scheme commenced in 1967 and its progress was restricted by the foot-and-mouth disease outbreak.

† Compensation is not paid under Brucellosis Incentives Scheme.

** Includes contacts in voluntary scheme tests.

†† Includes retrospective compensation for some reactors slaughtered in 1971.

Overall Progress

The total numbers of herds accredited, and qualifying, under the official arrangements at 31 December were as follows:

	<i>England and Wales</i>	<i>Scotland</i>	<i>Great Britain</i>
Qualifying	10,030	1,729	11,759
Accredited	61,795	20,520	82,315
Total	71,825	22,249	94,074
As a %	54.22%	79.78%	58.66%

Do-It-Yourself Movement Permits

The pilot scheme in Carmarthenshire proved successful in simplifying—both for herd owners and for the Ministry—the arrangements for providing documents for the movement of accredited cattle. The procedure was therefore extended to the rest of England and Wales. An owner of an accredited herd (except a dealer) is normally issued with a licence (which is renewable) and an associated book of permits to enable him to make 20 separate movements of accredited animals. This facility is withdrawn if the herd has become re-infected, or suspected of being re-infected.

British Register of 'Officially Brucellosis-Free' Herds

EEC Directive 64/432 (as amended) which governs intra-Community trade in livestock prescribes detailed tests and procedures for the classification of herds as either 'officially brucellosis-free' or 'brucellosis-free'. Whilst the EEC Treaty of Accession provides for the continuing use of United Kingdom procedures for designating herds as 'brucellosis-free' (i.e., equivalent to 'accredited') the Directive requirements must be followed to achieve the classification of 'officially brucellosis-free'. The Directive also lays down that non-slaughter stock for export (i.e., breeding and production stock) must have originated from a herd 'officially brucellosis-free' unless the importing Member State has agreed to permit cattle to come from herds classified as 'brucellosis-free'.

Some Member States indicated that they were prepared to grant a derogation under certain circumstances.

A British Register of Officially Brucellosis-Free Herds was accordingly set up to assist British herd owners to continue to trade with EEC countries by exporting breeding and production cattle. To qualify for entry on the register a herd must already have achieved accredited status either under the voluntary schemes or under compulsory eradication, contain no animal which has been vaccinated against brucellosis within the preceding 3 years, and have been free of clinical signs of brucellosis for 6 months. In addition, all animals in the herd aged 12 months or more, including steers, must have passed a prescribed programme of blood tests at the EEC standards.

1974.

The New Forest, Hampshire

The New Forest contains about 44,500 acres of land and a large number of commoners have grazing rights.

In 1954 a byelaw was made which, *inter alia*, required young heifers to be vaccinated against contagious abortion before being turned out in the Forest. A special survey in 1973, linked with blood tests of eligible animals, revealed a very low incidence of disease among animals depastured in the Forest. As compulsory eradication in the area was not envisaged for some time, the commoners decided to proceed by applying for all the animals to be treated as one herd under the Brucellosis Incentives Scheme. A new byelaw came into effect on 1 October which required all herd owners who wished to depasture their animals in the Forest to join the Scheme. Qualifying testing commenced on 1 October.

Free Calf Vaccination Service

The setting up of the British Register of Officially Brucellosis-Free Herds did not constitute a change in the official programmes for the eradication of brucellosis, including vaccination. Although vaccination is precluded in 'officially brucellosis-free' herds, it is considered that in general the vaccination of young stock with S19 vaccine provides an important safeguard against brucellosis at the present stage of eradication in this country and will continue to be necessary for some years.

The number of breeding calves vaccinated during the year in Great Britain was 1,124,901.

TUBERCULOSIS

A review to consider the adoption of 3-year testing intervals was completed and the arrangements detailed below took effect from 1 April:

<i>Interval</i>	<i>Testing Intervals</i>	<i>Area</i>
1. 3-YEAR TESTING	All counties in England and Wales except:	Avon Cornwall Devon most of Dorset Gloucestershire Northumberland Somerset part of Tyne and Wear

antibody classes to the serological activity of the whole serum. So far, it has been shown that the indirect haemagglutination test detects a single type of antibody which is produced for a short time only, early in an infection. Consequently this test fails to detect an immune response in animals with established disease. The microscopic agglutination test detects not only the same class of antibody but a second type which is produced later in the infection. The complement fixation test is also being evaluated.

In the past it was not possible to study leptospirosis in experimentally infected animals at the laboratory because of the lack of pathogenic isolates. However, when the strain of Pomona was isolated from a vole it was used in such experiments and disease was readily produced by inoculation of calves and sows. These experimental infections will enable a more rapid evaluation of diagnostic tests and preventive measures. The introduction of the fluorescent antibody test will ease the problem of demonstrating small numbers of leptospire in tissue and urine.

Future plans include an extension of attempts to isolate leptospire from domestic animals and wildlife, surveys of blood samples taken from aborting cattle and pigs and attempts to produce abortion in cattle experimentally with strains of the Hebdomadis serogroup.

Tuberculosis in wildlife

The discovery of tuberculosis in badgers in certain restricted areas in the south west of England has resulted in further surveys being carried out to determine the extent of the infection in badgers and other wildlife. Cattle in these areas have been found to have a much greater incidence of tuberculosis than the national average in spite of the application of control measures that have proved successful elsewhere.

The bovine type of tubercle bacilli has been demonstrated in more than 120 out of 700 badgers examined. This organism was also demonstrated in over 70 out of 1,200 samples of badger faeces. The infected badgers were confined to the southern part of Gloucestershire, parts of Cornwall, Wiltshire and Dorset.

A large number of other species of wildlife, which included field and bank voles, wood mice, house mice, shrews, weasels, moles, rats, foxes, squirrels, mink and hedgehogs were also examined. The bovine type of tubercle bacillus was isolated from 2 rats and 2 moles.

Ten strains of bovine tubercle bacillus isolated from badgers have been compared, in experimental infections of calves, with a strain isolated from cattle. Eight of the badger isolates were of equivalent virulence to the cattle isolate but 2 strains were less virulent.

A small colony of badgers has been established at the laboratory to study the course of tuberculosis in badgers, methods of diagnosing it in living badgers, the natural spread of the disease in badgers and its spread from badgers to cattle. Husbandry problems have been largely overcome and the badgers are gaining weight on a diet of dog biscuits, cooked calf meat, milk, eggs and peanuts. The badgers have proved to be docile and easy to handle.

The tuberculin test has been used on a number of badgers but often fails to detect infection. A blood test is being evaluated as an alternative but as yet the only reliable test is the isolation from faeces of the causal tubercle bacillus which can be achieved only in more advanced cases.

Detection of carriers in salmonellosis in cattle

Adult animals that recover from *Salmonella dublin* infection may become constant faecal excretors of the organism or latent carriers. Because these carriers cannot be identified by faecal examination nor by conventional serum agglutination tests, they may be an unexpected source of infection to other animals later in life when they may excrete the organism during "stress" caused by concurrent illness or pregnancy. Obviously, if these animals are to be identified serologically it is necessary to develop and evaluate more sensitive serological testing procedures. During the past year the indirect haemagglutination test (IHA), the complement fixation test (CF) and the antiglobulin test (AG) have been evaluated in experimentally infected animals and in serum samples obtained during outbreaks of disease. The CF test indicates recent infection in adult cattle and is a useful adjunct to the serum agglutination test. Although the IHA test was of limited value, the AG test linked to the IHA test appears to be a sensitive method for the detection of antibodies and further investigations are being carried out to evaluate the tests on a herd basis.

Sera from animals naturally and experimentally infected with *S. dublin* are being fractionated into immunoglobulin components and tested for agglutinating activity using flagellar and somatic antigens. Density gradient centrifugation has suggested that somatic agglutinins are largely associated with the fast sedimenting 19S immunoglobulins. The flagellar agglutinins appear to be more heterogeneous since activity is found both in the 19S and 7S immunoglobulin classes.

Bulk-milk cell counts as an indicator of sub-clinical mastitis

During the past 2 years milking cows in 25 herds situated in the south east of England were quarter-sampled once every 5 weeks and the samples examined bacteriologically to determine the level of sub-clinical mastitis in each herd. On the same day as the samples were collected, milk samples were also taken from

in the United Kingdom. The vaccines differed in degree of attenuation and protective capacity. Some vaccines caused bursal damage and others gave a low level of protection against challenge. However, challenge did not significantly affect the bursa/body weight ratio in birds given effective vaccines that had little effect on the size of the bursa. Such vaccines administered at one day of age caused minimal interference with subsequent vaccination against Newcastle disease.

Marek's disease vaccine. Previous work had suggested that the potency of a vaccine may be reflected in the rate at which the vaccinal virus appears in the birds' blood stream. The effect of maternal antibody is now being investigated. The results at this stage indicate that progeny from immune parents develop viraemia more slowly but this effect is noticed only with reduced vaccine doses.

Clostridial vaccines and sera. Work on the proposed British multicomponent standard for Clostridial vaccines has shown that this freeze-dried preparation is stable and produces a high level of antitoxin response in rabbits to all 5 components which can be determined by this method. Confidence in this standard has been confirmed by its performance as a reference preparation in biological assays carried out for the control of potency of commercial Clostridial vaccines.

A programme begun in 1972 to produce stable preparations of Clostridial toxins for use in routine testing of vaccines and antisera was completed.

Vaccines for sheep. Studies of the serological responses of mice and guinea-pigs to foot rot vaccines indicated that, while the mouse is not a satisfactory animal for potency tests, the complement fixation test in guinea-pigs is promising. Further work using guinea-pigs, rabbits and sheep is in progress.

The potency test for ovine enzootic abortion vaccine is under investigation, in an attempt to devise a simpler test that correlates with the protective effect of the vaccine in sheep.

Variations in response to vaccination in sheep with respect to age, breed and time have been noted during routine control testing of contagious pustular dermatitis vaccines. These differences are being investigated in an attempt to standardise the potency test used in the monitoring of commercial vaccines.

Potency specification of bovine tuberculin and the test in cattle

Further evaluations have been made of the results of the various field trials and laboratory assays of bovine tuberculin.

A concentration of 1.0 mg per ml of bovine tuberculin has been shown to provide an adequate diagnostic dose in cattle and, when used with avian tuberculin at 0.5 mg per ml, to give an even balance of differentiation in all types of sensitisation. Appropriate rules of interpretation have been formulated for an avian/bovine comparative test.

Distribution of international standards

A total of 171 requests for 22 international biological standards and ancillary preparations were received from 43 countries.

Routine monitoring of immunological products

Samples from 2,735 batches of vaccines, diluents or antisera were received during the year. Chemical and immunochemical tests were introduced for the first time.

Of the samples of licensed products tested, 5 failed the sterility test, 22 failed tests for antigen content and 16 failed tests for potency.

Inspection

A total of 26 inspections was carried out, almost completing the first round of inspections under the Medicines Act.

DISEASES OF BREEDING

A large measure of the work of the Department was associated with servicing the Brucellosis Eradication programmes. Many of the research and development projects also have a close connection with these schemes. At the end of the year about 56 per cent of the herds in the United Kingdom were within the voluntary and compulsory schemes and this was reflected in the 1974 blood test work load of the Department. Just over 300,000 samples (247,000 in 1973) were subjected to both serum agglutination tube (SAT) and complement fixation tests (CFT). At the beginning of the year most of the samples came from Veterinary Investigation Centres where they had been screened using the Rose Bengal plate test (RBPT). Later an increasing proportion of samples came direct to the Department and were subjected to the automated RBPT on the new ADAM (agglutination detection by automated methods) unit. All blood samples taken in the extensions of the compulsory eradication programmes which began in Wales and East Anglia at the beginning of November were tested on this machine and it is now playing a full part in the routine testing of blood samples within the Brucellosis Eradication Schemes.

Table 1

Stock slaughtered and compensation paid 1967-1974

	1967		1968		1969	
	No.	£	No.	£	No.	£
Foot-and-mouth disease*						
Cattle	196,804	21,522,125	18,096	2,092,231	—	—
Sheep	97,253	1,180,028	11,582	132,363	—	—
Pigs	113,267	1,823,465	5,259	97,530	—	—
Goats	50	585	7	71	—	—
Total foot-and-mouth disease	407,374	24,526,203	34,944	2,322,195	—	—
Newcastle disease						
Poultry	88,095	48,203	987	467	4,862	3,425
Swine Fever						
Pigs	—	—	—	—	—	—
Swine Vesicular disease						
Cattle†	—	—	—	—	—	—
Sheep†	—	—	—	—	—	—
Pigs	—	—	—	—	—	—
Goats‡	—	—	—	—	—	—
Total Swine Vesicular Disease	—	—	—	—	—	—
Bovine tuberculosis						
Cattle						
(a) Affected animals ...	1	56	2	94	1	113
(b) Reactors and dangerous contacts ...	3,249	231,107	2,312	185,554	2,773	227,621
Total bovine tuberculosis...	3,250	231,163	2,314	185,648	2,774	227,734
Brucellosis						
Cattle						
Accredited Herds Scheme						
—Reactors	1	90	1,079	128,551	2,458	295,651
Incentives Scheme						
—Reactors¶	—	—	—	—	—	—
Compulsory Eradication Arrangements—Reactors and dangerous contacts**						
—	—	—	—	—	—	—
Total brucellosis	1	90	1,079	128,551	2,458	295,651
Total of compensation	—	24,805,659	—	2,636,861	—	526,810

*In some years the figures for compensation include small amounts paid for carcasses destroyed in slaughterhouses etc.

†Includes pigs slaughtered for diagnostic purposes.

‡These animals were slaughtered because this disease was at first thought to be foot-and-mouth disease.

Table 1—continued

1970		1971		1972		1973		1974	
No.	£	No.	£	No.	£	No.	£	No.	£
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
65,320	91,119	19,683	23,139	—	—	—	—	—	—
—	—	215†	2,257†	—	—	—	—	—	—
—	—	—	—	133	22,559	—	—	—	—
—	—	—	—	180	3,360	—	—	—	—
—	—	—	—	3,579	76,013	87,839	2,221,382	89,036	2,661,830§
—	—	—	—	1	12	—	—	—	—
—	—	—	—	3,893	101,944	87,839	2,221,382	89,036	2,661,830§
—	—	1	61	—	—	—	—	—	—
2,473	208,945	2,165	207,499	1,846	243,633	1,955	344,617	2,177	292,319
2,473	208,945	2,166	207,560	1,846	243,633	1,955	344,617	2,177	292,319
4,044	499,468	2,813	360,988	921	157,707	321	71,418	194	52,023
3,360	—	19,949	—	26,945	—	27,914	—	17,022	—
—	—	603	11,232	10,334	1,511,147	18,331	3,638,037	28,868	6,857,059
7,404	499,468	23,365	372,220	38,200	1,668,854	46,566	3,709,455	46,084	6,909,082
—	799,532	—	605,176	—	2,014,431	—	6,275,454	—	9,863,231§

§Provisional figures.

¶The Brucellosis (Accredited Herds) Scheme commenced in 1967 and its progress was restricted by the foot-and-mouth disease outbreak.

¶Compensation is not paid under Brucellosis Incentives Scheme.

**Includes contacts in voluntary scheme tests.

††Includes retrospective compensation for some reactors slaughtered in 1971.

Two outbreaks occurred on a farm with a previous history of anthrax; a bull died in the first outbreak and 4 cows in the second. In 4 outbreaks carcasses were opened at knackeries.

BRUCELLOSIS

Compulsory Eradication

The reorganisation of Local Government in Scotland which became effective on 16 May and involved the replacement of all Scottish counties (including the 4 counties of cities) by 3 Islands Areas and 9 Regions (comprising 53 districts) did not necessitate any changes to the boundaries of the compulsory eradication areas which had been declared before that date.

During the year, the following areas were brought into the compulsory eradication programme:

On 1 April: the former counties of Dumfries, Kirkcudbright and Wigtown;

On 1 July: the former counties of Peebles, Selkirk and the remainder of Perthshire;

On 1 November: the former county of Roxburgh, the counties of Bedfordshire, Hertfordshire, Surrey and Berkshire (excluding Reading Livestock Market); the remainder of Cumbria; parts of Clwyd, Oxfordshire, West Sussex, Somerset and Devon; and north-eastern, western and southern parts of Greater London.

Two thousand five hundred and sixteen herds were brought into the compulsory arrangements in 1975. In the first round of testing these herds were found to contain 28 per cent reactors. The total number of animals slaughtered compulsorily in all the eradication areas was 50,975 (27,270 reactors and 23,705 contacts) for which compensation of £11,098,546 was paid.

Voluntary Schemes

At the end of the year there were 95,001 herds in the voluntary schemes, all but 743 of which were in the Brucellosis Incentives Scheme (B15). This total represented 59.71 per cent of all testable herds, and 57.24 per cent of all testable stock. There were 15,532 reactors removed from BIS herds and 70 from herds in the Brucellosis (Accredited Herds) Scheme for which compensation of £14,392 was paid.

Overall Progress

At 31 December, the numbers of herds undergoing qualifying tests and those which had reached accredited status under both voluntary and compulsory arrangements (together with the total of these as a percentage of all testable herds) were as follows:

1975

	<i>England and Wales</i>	<i>Scotland</i>	<i>Great Britain</i>
Qualifying	9,981	2,061	12,042
Accredited	69,769	21,803	91,572
Total	79,750	23,864	103,614
% of Testable Herds	60.10	90.39	65.12

Attested Area

The first attested area in Great Britain was declared during the year, comprising the Shetland Islands, the Western Isles, and the former counties of Argyll and Bute (now forming the District of Argyll and Bute, part of the District of Lochaber and part of the District of Cunninghame).

British Register of 'Officially Brucellosis-Free' (OBF) Herds

At 31 December there were 12 herds which had qualified for entry on the Register of OBF herds in accordance with EEC Directive 64/432 (as amended).

The New Forest, Hampshire

Qualifying testing under the BIS and the removal of reactors for slaughter continued during the year.

Dartmoor National Park

In order to determine the level of brucellosis infection in cattle in Dartmoor National Park, and to assist in selecting the most suitable programme for eradicating the disease, free herd blood tests were offered in August to 573 owners outside the voluntary schemes, of whom 171 accepted. Of the 150 herds tested by 31 December, 82 were clear and 68 contained reactors. In all, 6,186 animals were tested, of which 700 (11 per cent) were reactors. The reactor rate per herd varied from 1 per cent to 58 per cent.

The test results indicated a low level of infection in herds in some areas of the National Park. Plans were drawn up by the Ministry for groups of herd owners to co-operate in order to reach accreditation on a voluntary basis.

Free Calf Vaccination Service

The number of breeding calves vaccinated during the year in Great Britain was 929,144.

TUBERCULOSIS

Adoption of Bovine, instead of Human, Tuberculin in the Comparative Tuberculin Test.

A joint Working Group representing Great Britain, Northern Ireland and the Republic of Ireland studied the implications of adopting bovine tuberculin as required under the terms of EEC Directive 64/432 (as amended).

In these 3 countries the results of a series of field trials over a number of years showed that, when used with avian Protein Purified Derivative (PPD) tuberculin in a comparative tuberculin test, bovine PPD discriminates more efficiently between tuberculous and non-tuberculous cattle than does the human type. The field trials also confirmed that because of the high incidence of non-specific infection a comparative test is still essential in the British Isles.

For these reasons, and in order to harmonize with the use of bovine tuberculin in the EEC Directive, the Working Group recommended that all tuberculin testing of cattle in the 3 countries should, in future, be carried out by means of an avian/bovine comparative test. This recommendation was implemented on 1 March.

It was anticipated that the greater sensitivity and specificity of this test could result in a significant increase in the incidence of reactors during the 3 years required to complete one round of testing of the national herd. However, this was not borne out by the results for 1975 when the incidence of reactors was 0.038 per cent of all cattle in herds tested (compared with 0.034 per cent in 1974) which included the first 10 months (1 March–31 December) when bovine tuberculin was in use.

The method of carrying out the test, site of injection and dose volume of tuberculins remain unaltered and reactions to each tuberculin continue to be measured by increase in skin-fold thickness after 72 hours.

Testing Programme

Routine testing was carried out in 61,325 herds comprising a total of 4,412,134 cattle.

Slaughter of Reactors and Contacts

During the year, 1,598 reactors and 249 contacts were slaughtered under official arrangements and compensation of £285,381 was paid. Of these, 1,122 reactors and 174 contacts, involving compensation of £189,604, were in the South West Region. In addition, 68 reactors were slaughtered privately.

'Affected' Cattle

Two cases of 'affected' animals were dealt with. Only one was confirmed as bovine tuberculosis on laboratory examination.

Bovine Tuberculosis found in Carcasses

Of the 224 suspected cases reported in 1975, the existence of bovine tuberculosis

*Incidence of Tuberculosis as Disclosed by Tuberculin Tests 1973, 1974 and 1975
Great Britain*

Year	Total number of herds in herds tested	Number of cattle tested	Number of herds tested	Reactors slaughtered		Herds with reactors		No. of herds with visible lesion reactors		No. of herds with no visible lesion reactors	
				No.	As a % of cattle in herds tested	No.	As a % of herds tested	No.	%	No.	%
1973	4,962,572	3,469,523	68,670	0.032	567	0.825	410	218	0.317	349	0.508
1974	4,818,534	3,346,935	65,435	0.034	564	0.862	553	185	0.282	379	0.579
1975	4,412,134	3,002,214	61,325	0.038	784	1.278	249	227	0.370	557	0.908

was confirmed in 147 carcasses, of which 62 were identifiable as the carcasses of cattle imported from the Republic of Ireland and 6 as from Northern Ireland. In 3 other confirmed cases it was possible only to say that the carcasses were of Irish origin. Laboratory results are outstanding in 16 cases. The figures of confirmed cases for the year ended 31 December 1974 were 144 (UK), 70 (ROI) and 3 (NI). The appropriate tracing action and reports to the Irish authorities were made as necessary.

Incidence of Bovine Tuberculosis in the Republic of Ireland

Tripartite discussions with officials from Northern Ireland and from the Republic were continued in an attempt to solve the problem of the high incidence in the UK of reactors on farms and infected carcasses in abattoirs that were of ROI origin, compared with the equivalent national incidence in home-bred stock. This problem (which was not resolved during 1975) was heightened by a dispute between the ROI Government and private veterinary surgeons resulting in the discontinuance of routine tuberculin testing of herds in the Republic as from March.

Problems in South West England

The incidence of reactors compared with total animals in herds tested was again higher in the South West (0.100 per cent) than for the remainder of Great Britain (0.016 per cent). The figures for 1974 were 0.081 per cent and 0.015 per cent respectively.

Bovine Tuberculosis in Badgers

The high incidence of reactors in the South West compared with the rest of Great Britain was again an important feature, and further evidence was obtained showing the link between herd breakdowns in some parts of the South West and the existence of infection in local badger populations. During the year *M. Bovis* was isolated from 71 out of 481 badger carcasses and from 19 out of 478 faeces samples. It was clear that the badger species is highly susceptible to the disease. Many of the carcasses with positive results had extensive lesions, mainly in the lungs, but in some the kidneys were severely affected. A number of cases with infected bite wounds were also seen.

Three hundred and forty-three animals of other wild life species including foxes, rats, voles and other small rodents, moles and weasels were also examined during 1975. Of these *M. bovis* was recovered from 2 foxes and 3 rats but in these cases the post-mortem findings suggested that the disease is not progressive in them, that they are relatively resistant to infection with *M. bovis* compared with badgers and play no part in the epidemiology of the disease in cattle.

Legislation

Contact was maintained with the major conservation organisations and arrange-

ments were made for a Private Members' Bill on conservation matters to include an amendment to the Badgers Act 1973 to enable Ministers, when issuing licences under that Act to permit the killing of badgers to prevent the spread of disease, to authorise the use of poison for this purpose. The reason for this amendment was to enable hydrogen-cyanide gas to be used for the gassing of badger sets by Ministry staff or persons under Ministry control in districts where the tuberculous-badger problem exists. This method is the most humane and efficient method known for destroying badgers in their sets, but is prohibited by the Protection of Animals Act 1911 and the Protection of Animals (Scotland) Act 1912. The Bill received the Royal Assent as the Conservation of Wild Creatures and Wild Plants Act 1975 in August.

Gassing Operations

The new Act enabled a programme to exterminate badgers in the problem districts to be commenced. 'Fire-brigade' operations were planned under the direction of the Chief Regional Officer in districts where the Regional Veterinary Officer advised that a badger problem existed. These necessitated the recruitment and training of staff and provision of special equipment and by the end of the year these operations had commenced in Avon. 'Fire-brigade' operations were also commenced at a farm in Dorset, under the direction of the Ministry's Pest Infestation Control Laboratory (PICL). In addition, experimental projects were planned under the direction of PICL. These commenced in October in an area around Thornbury in Avon where, in addition to the routine gassing of sets around 'breakdown' farms, it was planned to keep the whole area clear of badgers for a period of at least a year in order to determine whether such action would ensure that when re-colonisation is permitted the disease risk had been eliminated. The PICL also commenced a long-term project involving field investigations into badger movements and behaviour. This is being carried out at Woodchester Park in Gloucestershire.

Consultative Panel

A Consultative Panel on Badgers and Tuberculosis was appointed by the Minister in September 1975 to keep under review:

- a. the evidence relating to bovine tuberculosis in badgers, including its incidence and its relationship to bovine tuberculosis in cattle; and
- b. the operations to be undertaken by the Ministry in order to eradicate bovine tuberculosis from badgers and to monitor its existence in the badger population.

The Panel comprised experts in badger biology, wildlife conservation, animal welfare, bovine tuberculosis, veterinary science and farming interests. It first met in September when it reviewed the evidence then available on the relationship between bovine tuberculosis in the badger and the occurrence of the disease in

cattle and recognised that a serious problem existed. The Panel confirmed the action proposed by the Ministry for dealing with the problem. In conjunction with its second meeting in November the Panel visited the Ministry's Veterinary Investigation Laboratory at Gloucester and saw a demonstration of gassing on a farm near Thornbury.

Other Wildlife Legislation

The power contained in the Wild Creatures and Wild Plants Conservation Act 1975 to authorise the gassing of badgers does not permit right of entry to land for this purpose. Furthermore, the badger problem has emphasised the lack of adequate powers to control any other disease in wildlife (other than rabies) that is of significance to farm livestock. Accordingly, after consultation with the Nature Conservancy Council (NCC) and other Government Departments concerned, clauses were included in the Agriculture (Miscellaneous Provisions) Bill to permit Ministers to make Orders providing for the slaughter of specified wildlife in designated areas in order to prevent the spread of a specified disease to farm animals and poultry. Various safeguards have been included in these provisions, including an obligation to consult the NCC whenever it is proposed to make an Order. Powers of entry to authorised staff have also been included. The Bill had reached Committee stage in the House of Commons by the end of 1975.

FOOT-AND-MOUTH DISEASE

Legislation controlling the importation of livestock, meat and meat products has continued to prove successful in keeping Great Britain clear of foot-and-mouth disease (FMD). The last confirmed case of FMD in this country was in June 1968.

During the year 166 cases of suspected FMD were investigated by veterinary staff; 149 of these were on farms and 17 at slaughterhouses. It was possible to clear 111 cases as negative on the first visit but 55 cases required 2 or more visits before a conclusive negative answer could be given. As in previous years all vesicular conditions in pigs reported from farms where there was no known connection with confirmed cases of swine vesicular disease (SVD) were treated as suspect cases of FMD. The number of suspected cases reported was half that of the previous year and no doubt reflects the improved SVD situation in 1975. Of the 166 suspected cases 128 were in pigs and 38 in cattle. Emergency restrictions on the movement of cattle, sheep, pigs and goats within 5 miles of a suspected case of FMD were imposed on 26 occasions during the year.

Although this country has been free from FMD for 7½ years contingency plans are maintained and are constantly being reviewed to ensure preparedness for any future outbreak, and training programmes involving veterinary and support staff take place at regular intervals.

NEWCASTLE DISEASE AND FOWL PLAGUE

Both Newcastle disease and fowl plague remain notifiable diseases. Reliance is placed on the correct use of approved vaccines, both live and inactivated, to control Newcastle disease. In England and Wales when Newcastle disease is confirmed no restrictions are applied, but the occupier of the infected premises is asked to adopt a voluntary code of practice designed to reduce the risk of the disease spreading. In Scotland, infected premises are placed under restrictions, which are only withdrawn after an adequate period has elapsed following recovery of the birds or total depopulation of the premises.

A compulsory slaughter policy would be applied if fowl plague should occur and compensation would be paid.

Incidence of Newcastle Disease

There have been only 7 outbreaks of Newcastle disease confirmed during 1975 as compared to 35 in 1974. Three of the outbreaks were related and associated with an importation of psittacines. The other 4 outbreaks, one of which was in Scotland were unconnected.

A table showing the vaccinal status and size of affected flocks is on page 18. Only 2 of the flocks involved were fully vaccinated, but these represented just over 53 per cent of the total stock affected.

Uptake of Newcastle Disease Vaccines in Great Britain

Disappointingly, the distribution of live vaccines has dropped during the year to 553.9 million doses, as compared to 772.8 million doses during 1974.

Publicity

National, regional and local publicity campaigns were again promoted to encourage the use of vaccines and the observance of hygiene measures.

RABIES

Legislative Changes

Two new Rabies Orders came into operation on 5 February 1975 under the legislative provisions of the Diseases of Animals Act 1950 (as amended by the Rabies Act 1974). These were the Rabies (Control) Order 1974 and the Rabies (Importation of Dogs, Cats and Other Mammals) Order 1974. The Control Order replaced the Rabies Order of 1938 and the Import Order updated and superseded the Importation of Dogs and Cats Orders 1928-1970 and the Rabies (Importation of Mammals) Order 1971.

Preventive Veterinary Medicine and Improved Livestock Production

LIVESTOCK BREEDING AND ARTIFICIAL INSEMINATION

Bull and Stallion Licensing

The Regulations concerning bulls and stallions remain unchanged; all bulls and stallions requiring licences have to have a veterinary examination.

Examinations of bulls are carried out by veterinary surgeons in private practice who are members of a Panel established by the Royal College of Veterinary Surgeons and the British Veterinary Association. As before, there are arrangements for appeal to an independent referee in the case of refusal, revocation or suspension of a licence. Of the bulls examined by the Panel in England and Wales during 1975, 14,247 were licensed, 316 were refused, but 10 of these were subsequently passed on appeal. In Scotland 5,141 were licensed, 59 were refused, although one later passed on appeal.

Of the stallions examined by the Panel appointed by the Minister in England and Wales during 1975, 894 were licensed, 50 were refused, but 8 of these were subsequently passed on appeal. In Scotland 138 examinations were carried out and 10 licences were refused.

Artificial Insemination of Cattle and Pigs

Before approval of bulls and boars for AI use each animal must undergo a veterinary examination by a Ministry veterinary officer to comply with the Regulations.

Thereafter, animals standing at Centres received routine examinations and tests; Regulation 6 licences (England and Wales) and Regulation 5 licences (Scotland) are issued to persons other than those maintaining an AI Centre and these permit storage and distribution of semen through the AI organisation. All boars are kept on Centres. Veterinary officers are also responsible for the approval of Centres and Sub-Centres and periodic inspection of the premises. They also carry out examinations of staff who collect, process and store semen and carry out inseminations.

Table 1
Veterinary Examination of Bulls and Boars

	For AI Centres	For Regulation 6 licences	For Regulation 5 licences	Total
Bulls examined:				
England and Wales	387	234	—	621
Scotland	30	—	30	60
TOTAL	417	234	30	681
Boars examined:				
England and Wales	49	—	—	49
Scotland	8	—	—	8
TOTAL	57	—	—	57

Table 2
Routine Tests Applied to Animals at AI Centres

	Brucella Tests		Tuberculin Tests	
	Pass	Fail	Pass	Fail
Cattle:				
England and Wales	2,221	—	Records now kept at Animal Health Divisional Offices	
Scotland (also includes TB figures)	163	—	163	—
TOTAL	2,384	—	163	—
Boars:				
England and Wales	81	—	81	—
Scotland	—	—	—	—
TOTAL	81	—	81	—

Sixty days after arriving at AI Centres all bulls are resubmitted to the tuberculin

test, brucellosis blood test and the serum neutralising test for infectious bovine rhinotracheitis.

Table 3
60-Day Testing of Bulls at AI Centres

	Brucella Tests		Tuberculin Tests		IBR	
	Pass	Fail	Pass	Fail	Pass	Fail
Cattle:						
England and Wales	355	1	355	—	347	8
Scotland	29	—	29	—	23	6
TOTAL	384	1	384	—	370	14

The 14 bulls that failed the IBR test all proved clinically healthy. In addition 189 privately owned bulls standing on farms in England and Wales were tested and 20 in Scotland. There were no IBR restrictions imposed on any AI Centre.

Table 4
60-Day Testing of Boars at AI Centres

	Brucella		Tuberculin	
	Pass	Fail	Pass	Fail
Boars:				
England and Wales	57	—	57	—
Scotland	—	—	—	—
TOTAL	57	—	57	—

Continental Breeds for Artificial Insemination

During the past year there have been several importations of bulls from the Continent for use in AI, which are as follows:

	Number imported	Number approved for use in AI
Blonde d'Aquitaine	3	2
Charolais	21	8
Friesian (Black & White)	19	10
Friesian (Red & White)	5	—
Limousin	1	1
Maine Anjou	1	1
Meuse Rhine Issel	3	—
Simmental	6	6

Miscellaneous

AI Review: Revised proposals for our changes in controls over AI were circulated to the industry during the year.

Ova Transplants: Consideration of controls on fertilised ova transplantation has continued during the year.

Stallion Licensing: During the past year meetings were held with the industry to discuss the stallion licensing procedure.

Enzootic bovine leucosis tests: All animals standing at cattle AI Centres were tested and passed.

Semen Quarantine Stores: All processed bovine semen is subjected to 28 days quarantine. In all but one Centre, this is carried out in a special purpose built unit. Work on this one Centre's building is progressing.

PIG HEALTH SCHEMES

The Pig Health Scheme continues to ensure that satisfactory standards of health control are maintained in herds from which animals are sent to central testing stations of the Meat and Livestock Commission under the Commission's Pig Improvement Scheme. Routine herd visits have been carried out by veterinary officers and owners' own veterinary surgeons, and assistance given with disease problems and general questions of housing and management. The number of herds in the Scheme, or which are being considered for membership, has remained fairly constant.

Membership of the Pig Health Scheme at 31 December 1975

Full Members	206
Probation	28
Applications under consideration	30
	—
	264
	—

POULTRY HEALTH SCHEME

There has been a further small reduction in the membership of the Poultry Health Scheme which now includes 1,000 breeding and hatching establishments compared with 1,500 in 1970 and 2,000 in 1966. This decline in membership reflects the concentration of the poultry industry into fewer but larger flocks. By laying down

that are thiamine antagonists. Amprolium, an artificial compound which is a known thiamine antagonist, had been shown to produce symptoms and lesions identical to those in CCN, and this led to the search for a naturally occurring thiamine antagonist in the rumen of calves suffering from CCN.

Several compounds have now been found that act as activators to the thiaminase and result in the production of the antagonists sought. The most potent is 1-pyrroline formed in the rumen as a transient intermediate in the bacterial breakdown of naturally occurring substances such as putrescine, ornithine, and glutamic acid. The product formed by this activator during the thiaminase reaction is 1-(4-amino-2-methylpyrimidine-5-ylmethyl)-1-pyrrolinium chloride hydrochloride and has been isolated from the rumen and from the brain of CCN cases. This compound is suspected to be involved in the production of CCN and work to test this is continuing.

BIOLOGICAL PRODUCTS AND STANDARDS

Production

Brucella abortus (strain 19) vaccine

The number of doses issued was 1,011,700, a decrease of 14.4 per cent from the 1974 figure.

Work has continued, using the small experimental fermenter, in trying to identify the essential factors required for the optimum growth of *Brucella abortus* S19 cells. By replacing the yeast in the Weybridge medium with various vitamins and salts a reasonable cell count was achieved with no evidence of dissociation after a ten day cycle. The work continues.

Tuberculins

The total volume of avian and mammalian tuberculins produced was 4,755 litres, 23 per cent more than in 1974. Issues of tuberculins for use in the Bovine Tuberculosis Eradication Scheme in the UK increased by 16 per cent and those to the Republic of Ireland by 5.5 per cent.

On 1 March, the type of tuberculin for use in cattle was changed from that prepared from human strains of the tubercle organism to that prepared from a bovine strain. Bovine tuberculin has been shown to give fewer non-specific reactions in field use. The change also brings us into line, in respect of type of tuberculin, with the EEC Directive.

A comparison has been made between the method of potency testing specified in the Directive, which involves sensitising guinea-pigs with living tubercle organisms,

and the Weybridge method, which uses killed organisms. The latter method not only gave more consistent and more precise results but the results in the guinea-pig test were much more closely correlated with those obtained in cattle.

The studies of the use of Tween 80 as a stabilising agent for the dilute solutions of tuberculin used for Mantoux testing in man have been concluded. It has been shown that these solutions are still fully potent after storage at 4°C for 2 years.

Other products issued included

Fifteen thousand one hundred and ninety-two doses of Johne's disease vaccine; 430 litres of concentrated *Brucella* cells were supplied to the Diseases of Breeding Department for antigen production compared with 165 litres supplied in 1974 and reflected both an increase in stocks and greater usage under the Brucellosis Eradication Campaign; 2,475 doses of mallein. Overall, the production of microbiological media increased by 8.15 per cent due to the extra demands at both the CVL and by VI Centres. Production comprised 89,233 tubes, 119,710 plates, 2,937 Roux flasks, 148,667 other containers and 4,743 litres of media in bulk.

CONTROL AND STANDARDISATION

Bovine respiratory disease vaccines

Both living and killed vaccines, prepared from a variety of pathogenic organisms, are used in the control of this group of diseases. Such vaccines may be given either by injection to stimulate the production of antibodies in the bloodstream or intranasally to stimulate immunity in the respiratory tract itself. A programme of work has been started to devise tests for monitoring the continued effectiveness of successive batches of such vaccines.

A preliminary experiment was carried out by vaccinating intranasally, rabbits, guinea-pigs, hamsters and mice, with a living preparation of bovine para-influenza 3 (PI₃) virus. Rabbits and guinea-pigs responded best to vaccination. Serum haemagglutination inhibition (HI) antibodies were present before vaccination and remained constant throughout the four week observation period. Nasal HI antibody appeared 4-7 days after vaccination indicating a local immune response and tests for cell-mediated immune responses looked promising, positive results being obtained at 7-14 days post vaccination. The mice had only a nasal antibody response and the hamsters a doubtful cell-mediated response and were thus considered unsuitable laboratory test animals for a possible potency test. Further experiments with rabbits and guinea-pigs are in progress.

Foot rot vaccines

Foot rot is a disabling disease of sheep, in the control of which vaccination plays a

Staffordshire, Northumberland and that part of Tyne and Wear north of the River Tyne. The scheme involves a planned programme of vaccination of adult female cattle in the more heavily-infected herds with the aim of reducing the incidence of the disease in the counties concerned to a level where it can be eradicated completely without an unusually high level of slaughterings. On 1 March the scheme was extended to include all areas where the introduction of compulsory eradication was scheduled to begin in 1979 and 1980.

By 31 December, 2,727 applications had been received and of these 1,283 accepted as suitable for a programme of vaccination. A high proportion of the remainder were not approved because the herds were found to be relatively free from the disease and many were, in fact, able to join the Brucellosis Incentives Scheme.

Producer Retailers

In August 1975 the Minister announced that untreated milk could only be sold after 31 July 1977 if it was produced from accredited herds. At 31 October 1975 there were 567 producers licensed to retail milk who were neither accredited nor in the process of qualifying for accreditation. In April/May, DVOs in England and Wales wrote to all producer retailers in their areas who were currently retailing milk offering them free blood tests and encouraging them to seek accreditation so that they could continue after 31 July 1977. By 31 December only 190 out of a total of 4,839 producer retailers were still outside the voluntary schemes or compulsory eradication arrangements.

British Register of 'Officially Brucellosis-Free' Herds

At 31 December there were 16 herds which had qualified for entry on the Register of OBF herds in accordance with EEC Directive 64/432 (as amended).

Free Calf Vaccination Service

The fall in the number of breeding calves vaccinated with S19 which has occurred since 1973 continued during 1976 and the total vaccinated was 832,151. This was a drop of 10 per cent compared with the figure for 1975.

TUBERCULOSIS

Comparative Tuberculin Test

Test results continued to be carefully monitored in order to establish the effect of the changeover on 1 March 1975 to the use of bovine tuberculin in place of the human type in the comparative test. Although it was expected that this change would result in a significant rise in the incidence of reactors there was only a slight increase during 1975 and up to the end of February 1976. At

1976

that stage the results were reviewed and the interpretation procedures modified. The results for the remaining months of 1976 showed a decline in the incidence of reactors and the rate for the complete year was lower than in 1974.

Testing Programme

Routine testing was carried out in 55,617 herds comprising a total of 3,984,171 cattle.

Slaughter of Reactors and Contacts

During the year 1,058 reactors and 91 contacts were slaughtered under official arrangements and compensation of £243,538 was paid. Of these, 787 reactors and 58 contacts, involving compensation of £170,446, were in the South West of England. In addition 44 reactors of which 17 were in the South West of England were slaughtered privately.

Open market prices for cattle increased substantially during the second half of 1975 and in consequence the statutory upper limit of compensation was raised on 25 February from £180 to £300 for reactors slaughtered compulsorily. Special arrangements were made for this higher limit to apply retrospectively as from 1 November 1975.

'Affected' Cattle

Only one case of an 'affected' animal was reported. This was confirmed as bovine tuberculosis on laboratory examination and the animal was slaughtered under the Tuberculosis Order 1964.

Bovine Tuberculosis in Carcasses

Of the 142 suspected cases reported in 1976 the existence of bovine tuberculosis was confirmed in 56 carcasses of which 32 were identifiable as the carcasses of cattle imported from the Republic of Ireland. None of the carcasses in which the disease was confirmed were cattle imported from Northern Ireland. Laboratory results are still outstanding in 17 cases of which 6 relate to carcasses of animals imported from the Republic. The figures of confirmed cases for 1975 were 79 (Homebred), 6 (NI), 62 (ROI) and 3 were of Irish origin but it was not possible to determine whether they came from the Republic or from Northern Ireland.

It should be noted that the number of cattle imported from the Republic of Ireland in 1976 was less than half the number imported in 1975.

Problems in South West England

Although there was a substantial drop in the rate overall the incidence of reactors as a percentage of animals in herds tested was again higher in the

South West (0.068 per cent) than for the remainder of Great Britain (0.010 per cent). The figures for 1975 were 0.100 per cent and 0.016 per cent respectively.

Incidence of Bovine Tuberculosis in cattle imported from the Republic of Ireland

Because of the comparatively high incidence of infection in cattle imported from the ROI it was decided to amend the relevant order to include the requirement that as from 1 June 1976, all cattle not intended for immediate slaughter, except castrated males, imported into Great Britain from this source must have passed a pre-export tuberculin test.

The dispute between the Irish Veterinary Union and the ROI government ended in the latter part of the year and routine tuberculin testing was resumed.

Bovine Tuberculosis in Badgers

Evidence continued to be found of infection in badgers in certain areas in the South West and of the link between infection in badgers and the disease in cattle herds. During the year *M. bovis* was isolated from 99 out of 568 badger carcasses and from 21 out of 1,173 faeces samples.

Although most of the problem is centred in the South West, evidence of infection in badgers was found in 2 other parts of the country during 1976. In Surrey *M. bovis* was isolated in 2 badger carcasses and in East Sussex in 3 faeces samples.

A total of 1,191 animals of other wildlife species including foxes, rats, voles and other small rodents etc., were examined during 1976. *M. bovis* was isolated in 2 foxes found in the vicinity of known infected badger sets but on post-mortem examination no lesions of tuberculosis were shown. No evidence has yet been found that the disease in the fox plays any part in transmitting the disease to cattle.

Operations to gas badgers in their sets were carried out in the experimental areas in Dorset and North Avon under the direction of the Pest Infestation Control Laboratory and in other problem areas in Avon, Cornwall, Devon, Gloucestershire and Wiltshire under the direction of the Chief Regional Officer. The majority of the gassing operations were 'fire-brigade' cases, i.e., cases linked with herd breakdowns in cattle where gassing was requested by the Divisional Veterinary Officer after evidence of disease in badgers had been established.

The long-term project under the control of PICL involving field investigations into badger movement and behaviour at Woodchester Park in Gloucestershire continued throughout 1976.

Incidence of Tuberculosis as Disclosed by Tuberculin Tests 1975 and 1976
Great Britain

Year	Cattle in herds tested	Cattle tested	Herds tested	Reactors slaughtered		Herds with reactors		Contacts slaughtered		Herds with tuberculous reactors		Herds with no tuberculous reactors	
				No.	As a % of cattle in herds tested	No.	As a % of herds tested	No.	As a % of herds tested	No.	As a % of herds tested	No.	As a % of herds tested
1975	4,412,134	3,002,214	61,325	0.038	784	1.278	227	249	227	0.370	557	0.908	
1976	3,984,171	2,509,145	55,617	0.027	529	0.951	218	91	218	0.952	311	0.559	

The Consultative Panel on Badgers and Tuberculosis met 3 times during 1976 when it considered progress reports by the Ministry on the field and experimental programmes and discussed various policy and operational aspects.

A full account of the operational, experimental and investigational work carried out by the Ministry up to 31 August 1976 was contained in a Report 'Bovine Tuberculosis in Badgers' issued by the Ministry in December.

New Powers to Destroy Wildlife

Royal Assent was given to the Agriculture (Miscellaneous Provisions) Act 1976 in November. Sections 9 and 10 of the Act enable Ministers—after consultation with the Nature Conservancy Council—to make Orders declaring areas in which there is evidence that wildlife have transmitted disease (other than rabies for which separate legislation exists) to farm animals. They include powers of entry to land to investigate suspected disease in wildlife before an order is made and, after an Order has been made, to destroy wildlife and monitor the results. Special provisions are included to ensure that during operations the least possible damage is done to flora, fauna or geological or physiographical features within a statutory nature reserve. Ministers agreed with the Nature Conservancy Council that these arrangements will be extended to all other nature reserves.

FOOT-AND-MOUTH DISEASE

There were no cases of Foot-and-Mouth Disease (FMD) in Great Britain in 1976. As FMD was recorded in many parts of the world, including Western Europe, our legislation controlling importation of livestock, meat and meat products and the processing of waste food of animal origin fed to livestock must have played a significant part in maintaining this freedom. The last case of FMD confirmed in this country was in 1968.

During the year 66 cases of suspected FMD were investigated by the State Veterinary Service, 62 on farm premises and 4 in slaughterhouses. Three of these were finally diagnosed as Swine Vesicular Disease (SVD). The remaining 63 were negative as regards FMD and other notifiable diseases. In 8 of the 66 suspected cases, material was sent to the Animal Virus Research Institute at Pirbright for laboratory tests and in these cases emergency restrictions on movement of livestock within a 5 mile radius were imposed until FMD was eliminated.

The suspected animals were cattle in 29 cases and pigs in 37. Compared with the previous year, the number involving cattle was little changed (38 in 1975) but the number involving pigs was greatly reduced (128 in 1975). As all vesicular conditions in pigs which are reported in a new area and which are

not directly connected with an outbreak of SVD are treated as suspected FMD until FMD can be eliminated, the reduction in pig suspects probably reflects the reduced prevalence of SVD.

Contingency plans are maintained and constantly reviewed to ensure preparedness for any future outbreak. Training programmes for veterinary and support staff are carried out. These have included exercises designed to simulate genuine emergencies initiated without prior warning to the staff involved.

NEWCASTLE DISEASE AND FOWL PLAGUE

Both Newcastle disease and fowl plague remain notifiable diseases. Reliance is placed on the correct use of approved vaccines, both live and inactivated, to control Newcastle disease. In England and Wales when Newcastle disease is confirmed, no restrictions are applied, but the occupier of the infected premises is asked to adopt a voluntary code of practice designed to reduce the risk of the disease spreading. In Scotland, infected premises are placed under restrictions, which are only removed after an adequate period has elapsed following recovery of the birds or total depopulation of the premises.

A compulsory slaughter policy would be applied if fowl plague should occur and compensation would be paid.

Incidence of Newcastle Disease

There were only 6 cases of Newcastle disease confirmed in poultry in England in 1976 and none in Wales or Scotland. Only 2 of the 6 confirmed cases could be described as velogenic forms of the disease and one of these was associated with purchased psittacines. Controls on imports of captive birds were introduced in March 1976 (see Import Section of this Report). Since March 1976, no velogenic case of Newcastle disease has been confirmed in poultry in this country.

Uptake of Newcastle Disease Vaccines

The distribution of live vaccines was 548 million doses during the year, as compared to 553.9 million during 1975. While the uptake of live vaccines varies from month to month, it is encouraging to note that the uptake of inactivated vaccines has not declined significantly in the last 4 years.

RABIES

Rabies Legislation

(i) The Rabies (Compensation) Order 1976 was made on 21 December 1976, to be laid before Parliament early in January 1977. It empowers the Minister

Table 1

	England	Wales	Scotland	Great Britain
Qualifying	10 811	780	326	11 917
Accredited	66 608	25 123	24 179	115 910
Total	77 419	25 903	24 505	127 827
Accredited as percentage of total Testable Herds	67.17	95.21	98.67	77.25

45/20 Vaccination Scheme

On 7 July 1977 the Parliamentary Secretary announced that new applications for membership of the 45/20 Vaccination Scheme would not be accepted after 31 July 1977. Exceptions to this rule would be made only if the use of the vaccine was necessary as a means of containing an outbreak of brucellosis and preventing its spread to neighbouring herds. At 31 December 1977, 1300 herds comprising some 213 000 animals had been vaccinated under the Scheme.

Vaccination in Eradication and Attested Areas

Although vaccination of cattle in eradication and attested areas is generally prohibited it has been permitted in some circumstances, such as the vaccination of calves with S19 vaccine in eradication areas under the Free Calf Vaccination Scheme. The Parliamentary Secretary's announcement of 7 July made it clear, however, that no vaccination whether with S19 or 45/20 vaccines would be permitted in attested areas in Great Britain as from 1 August. This will pave the way for herds in attested areas to be designated 'Officially Brucellosis-Free', within the terms of the EEC regulations on intra-Community trade in live animals, when they no longer contain animals vaccinated during the previous 3 years.

Free Calf Vaccination Service

The fall in the number of breeding calves vaccinated with S19 vaccine continued during 1977 when the total vaccinated was 715 808. This was a drop of 16 per cent compared with the figure for 1976. Part of the drop can be attributed to the ending of the Free Calf Vaccination Service in all attested areas from 1 August 1977.

British Register of 'Officially Brucellosis-Free' Herds

At 31 December there were 24 herds which had qualified for entry on the Register of Officially Brucellosis-Free herds in accordance with EEC Directive 64/432 (as amended).

Producer Retailers

After 31 July 1977 untreated milk could only be sold if it was produced from

accredited herds. This resulted in the majority of those producer retailers where herds were not accredited taking steps to achieve accredited status. By 31 October virtually all herds owned by producer retailers who wished to continue selling untreated milk had been registered as accredited.

European Economic Community**EXTENSION OF EEC DEROGATIONS ON METHODS OF TESTING**

Provision was made in the Treaty of Accession to the EEC for the United Kingdom to continue using its existing methods for declaring herds free of brucellosis and for testing cattle imported from the Republic of Ireland to the United Kingdom until the end of 1977. EEC Directive 78/51 of 13 December 1977 extended these derogations until the end of 1978 so enabling the discussions on harmonising the testing procedures which had taken place during 1977 to be continued.

EEC Assistance for Acceleration of Eradication

EEC Directive 77/391 laid down principles under which financial assistance would be available from Community funds for accelerating the eradication of certain animal diseases including brucellosis. On 17 November the Parliamentary Secretary announced the Government's intention to submit a Plan which would enable the United Kingdom to qualify for assistance from Community funds for the acceleration of brucellosis eradication. Under this Plan eradication in the last areas of the country would commence on 1 November 1979, a year earlier than under the existing programme. EEC Directive 78/52 made in December 1977 set out the criteria to which the Plan would have to conform.

TUBERCULOSIS**Testing Programme**

Routine testing was carried out in 54 645 herds comprising a total of 3 857 119 cattle.

Slaughter of Reactors and Contacts

During the year, 753 reactors and 92 contacts were slaughtered under official arrangements and compensation of £205 092 was paid. Of these, 528 reactors and 55 contacts, involving compensation of £133 037, were in the South West of England. In addition 11 reactors, of which 5 were in the South West of England, were slaughtered privately. (See Table 2.)

Open-market prices for cattle increased substantially during 1977 and in consequence the statutory upper limit of compensation was raised on 21 November 1977 from £300 to £342 for reactors slaughtered compulsorily.

Table 2
Incidence of Tuberculosis as Disclosed by Tuberculin Tests 1976 and 1977
Great Britain

Year	Cattle in herds tested	Cattle tested	Herds tested	Reactors slaughtered		Herds with reactors		Contacts slaughtered		Herds with visible-lesion reactors		Herds with no visible-lesion reactors	
				No.	As a % of cattle tested	No.	As a % of herds tested	No.	As a % of herds tested	No.	As a % of herds tested	No.	As a % of herds tested
1976	3,984,171	2,509,145	55,617	1,038	0.037	529	0.951	91	218	0.392	311	0.559	
1977	3,857,119	2,641,279	54,645	1,064	0.020	381	0.699	92	171	0.314	210	0.385	

'Affected' Cattle

No cases of 'Affected' cattle (as defined in the Tuberculosis Order 1964 as amended) were reported.

Bovine Tuberculosis in Carcasses

Of 158 suspected cases reported in 1977 the existence of bovine tuberculosis was confirmed in 65 carcasses of which 35 were identified as the carcasses of cattle imported from the Republic of Ireland. Laboratory results are still outstanding in 14 cases of which 6 relate to carcasses of animals imported from the Republic. The figures of confirmed cases for 1976 were 27 (homebred), 38 (Republic of Ireland). The number of cattle imported from the Republic of Ireland in 1977 was about 25 per cent higher than in 1976.

Problems in South West England

There was a substantial fall in the incidence of reactors expressed as a percentage of animals in herds tested in the South West (0.046 per cent) compared with the position in 1976 (0.068 per cent). Despite this improvement the incidence was still significantly higher than in the remainder of Great Britain where the incidence was 0.009 per cent compared with 0.010 per cent in 1976.

Extension of EEC Derogation of Methods of Testing

Provision was made in the Treaty of Accession to the EEC for the United Kingdom to continue using until the end of 1977 its existing methods for declaring herds officially free of tuberculosis and for the testing of cattle imported from the Republic of Ireland. Directive 78/51 EEC of 13 December 1977 extended these derogations until the end of 1978 so enabling the discussions on harmonising the testing methods which had taken place during 1977 to be continued.

Collaborative Assay of EEC Standards for Bovine Tuberculosis

The United Kingdom participated with other EEC Member States in experiments to determine the optimum diagnostic methods for the detection of bovines infected with *Mycobacterium bovis*. The work, which will continue into 1978, was carried out at the Central Veterinary Laboratory, Weybridge on cattle naturally infected with *M.bovis*, as indicated by their reaction to the tuberculin test used in the United Kingdom. The reactors came from herds in England, mainly in the South West. The cattle are assembled in groups of 8 at the Central Veterinary Laboratory, and kept for at least 4 weeks following the initial tuberculin test, and then tested using the various tuberculins used in the EEC. On completion of the tests, post-mortem examinations are carried out at a local slaughterhouse and samples subjected to laboratory examination.

Bovine Tuberculosis in Badgers

Of 629 badger viscera samples taken by Ministry staff from the South West Region and examined at the Central Veterinary Laboratory and Veterinary Investigation Centres during the year *M.bovis* was isolated in 89 samples and in 7 out of 1171 faeces samples examined. Further evidence of infection in badgers in the South East Region was also obtained. *M.bovis* was isolated from one carcase of 12 from East Sussex, 2 of 14 from West Sussex and none of 11 from Surrey. Faeces samples examined were 140 (5 positive), 13 (1) and 44(0) respectively for each of those 3 counties.

In addition, out of 484 carcasses (3 from Scotland, 48 from Wales and 433 from England) examined after being reported by the public (e.g., road casualties and natural deaths) *M.bovis* was isolated from 5 (i.e., 3 from the South West and 2 from the South East). One hundred and forty-five animals of other wild species, as well as 2 cats and 5 birds, almost entirely from the South West Region, were also examined but *M.bovis* was not recovered.

Gassing of badger sets where there was clear evidence that they were used by infected or contact badgers and linked with herd breakdowns in cattle, continued in the problem areas in Avon, Cornwall, Devon, Gloucestershire and Wiltshire under the direction of the Chief Regional Officer. Gassing under the direction of the Pest Infestation Control Laboratory also continued in the experimental area in North Avon and on a very small scale in another area in Gloucestershire, where long-term studies of badger ecology and behaviour were being undertaken.

After consultation with the Nature Conservancy Council the provisions of Sections 9 and 10 of the Agriculture (Miscellaneous Provisions) Act 1976 were invoked for the first time when the Badgers (Control Areas) Order 1977, which came into effect on 22 November 1977 was made to declare 4 badger-control areas.

A Second Report of the operations and experimental and investigational work carried out by the Ministry during the year ending 31 August 1977 was published, together with an explanatory Memorandum on certain specific points. The conclusions of the Report confirmed earlier findings that no species of wildlife other than the badger was responsible for the persistent spread of bovine tuberculosis to cattle in certain areas and, although too soon to be definite, there were indications that eradication of infected badgers was resulting in a slight reduction of the incidence of the disease in cattle. This was apparent particularly in the results from operations at a problem site in Dorset where gassing had commenced in August 1975 following a history of breakdowns in a herd. No cattle infected with bovine tuberculosis

had been discovered in the herd since January 1976 and the last positive badger carcase and faeces sample were found in March 1976 and June 1975 respectively.

The Consultative Panel on Badgers and Tuberculosis met 3 times during 1977 when it considered reports from the Ministry, reviewed the Ministry's policy and operational and investigational work and advised on specific aspects.

The contribution of the Consultative Panel has been extremely valuable to the Department in planning with the State Veterinary Service and the Science Service of ADAS epidemiological studies and strategic control measures.

FOOT-AND-MOUTH DISEASE

The last recorded outbreak of foot-and-mouth disease (FMD) in Great Britain occurred on 4 June 1968. This satisfactory state of affairs reflects both the improved FMD situation on the Continent and the value of our import controls on live animals and animal products from abroad. The Diseases of Animals (Waste Food) Order 1973, which regulates the feeding of waste food to animals, is a further safeguard against the recurrence of FMD in Great Britain.

During 1977, the State Veterinary Service investigated 53 cases of suspected FMD. Twenty of these were in pigs, 32 in cattle and one in sheep. In 4 cases, the emergency 5-mile standstill regulations were imposed for an average period of 2 days, whilst further investigations were carried out on the premises concerned and pending laboratory results on specimens submitted to the Animal Virus Research Institute at Pirbright.

Contingency plans to deal with any future FMD outbreaks are maintained in readiness and under constant review. Training exercises, involving veterinary and support staff at Headquarters and in the field, were carried out. These exercises included the tracing of a sheep market, arranged without prior knowledge of the staff involved.

FOWL PEST—NEWCASTLE DISEASE AND FOWL PLAGUE**Newcastle Disease**

This is a notifiable disease and is controlled with the aid of voluntary vaccination with approved live and dead vaccines. In the event of an outbreak in England and Wales, no restrictions are applied, but the occupier of the infected premises is asked to adopt a voluntary code of practice designed to reduce the risk of the disease spreading. In Scotland, however, infected premises are placed under restrictions which are removed only after

Enteric Colibacillosis

Neonatal enteric colibacillosis is an important cause of diarrhoea and mortality in lambs and calves during their first week of life. The 1976 report described the purification of *E.coli* K99 antigen from enteropathogenic isolates from calves and lambs, which enables them to colonise the intestine and to cause diarrhoea in susceptible animals. Cell-free K99 antigen was then used to vaccinate ewes; after colostrum intake, their lambs were dosed with a heterologous enteropathogenic strain of *E.coli* B44 possessing the K99 antigen, within 21 hours of birth; one group of 10 lambs received cultures of a mucoid strain and another similar group a non-mucoid form. Two groups of 4 control lambs from non-vaccinated dams were challenged similarly. All 4 control lambs, but none of the lambs from vaccinated dams, developed severe diarrhoea after challenge with the mucoid strain. In the group of lambs dosed with cultures of the non-mucoid strain, none of the lambs from vaccinated dams developed diarrhoea but only 2 of the control lambs had loose faeces. This suggests that the mucoid antigen may enhance the enteropathogenicity of an *E.coli* strain possessing the K99 antigen.

The experiments demonstrated that it is possible to prepare a vaccine against entero-colibacillosis and emphasised the importance of the K99 antigen in the enteropathogenicity of the 'calf-lamb' strain.

Badger Immunology

Tuberculosis in badgers associated with the disease in cattle in parts of the South West stimulated a study of the immune response in badgers to determine the value of immunological tests in identifying infected badgers. Such tests detect either a cell mediated response or a humoral (antibody) response.

The lymphocyte transformation test was used to determine the degree of cell mediated response. In this test a rapid increase in the rate of division of immune lymphocytes on contact with the specific antigen is an indication of cell mediated immunity and the degree of division is related to the degree of immunity. Lymphocytes also undergo rapid division when incubated with substances called mitogens but this is not an immune reaction. By culturing lymphocytes from tuberculous badgers with mitogens it was shown that they are capable of division. However, when these lymphocytes were cultured with tuberculin the expected increase in the rate of division was not observed and in many instances lymphocyte division was suppressed. The degree of lymphocyte suppression increased as the concentration of antigen increased. This suppression of cell mediated immunity probably explains the relatively large number of tubercle bacilli found in the tissues of tuberculous badgers at post mortem examinations and why the tuberculin test is consistently negative in tuberculous badgers at all stages of the disease.

The complement fixation test (CFT) has been used for some time to detect antibodies to *Mycobacterium bovis* and a newer technique, the enzyme linked immunoabsorbent assay (ELISA), was also applied on a more limited scale.

Further assessment of the CFT confirmed the non-specific nature of the whole cell antigens at present being used. However, the test became strongly positive during the terminal stages of the disease and the majority of badgers excreting *M.bovis* in their faeces were positive in this test.

The ELISA technique is designed to give a colour reaction if the serum contains antibodies to the antigen under test, and the amount of colour produced is related to the amount of antibody present. The ELISA is extremely sensitive and when tuberculin or a whole cell sonicate is used as antigen the test is capable of detecting low levels of antibodies to a range of acid fast organisms. Lack of specificity with conventional antigen preparations was demonstrated by the CFT and with the more sensitive ELISA cross reaction was much more evident. The tests may be improved when more specific antigens are available. At present, however, the CFT is of more practical value than the ELISA in determining the disease status of a group of badgers, and both tests are of limited value when considering single serum samples from individual badgers.

BIOCHEMISTRY**Border Disease**

The effects of this virus disease of sheep include death of the foetus and new-born, with characteristic changes in the fleece, and nervous disease in some surviving lambs giving rise to the name 'hairy shaker'. Interest has focused mainly on these effects as the source of economic loss. However, some lambs survive and appear to recover from the nervous effects and others may show no obvious abnormality; it was suspected that these lambs were unthrifty and might be an additional source of economic loss which was being overlooked. A trial to investigate this possibility was undertaken during the year.

Pregnant Dorset Horn gimmers were inoculated with a non-cytopathic strain of Border disease virus and produced lambs individually varying from those with severe tremor combined with a long kempy birthcoat to others apparently normal. Any neurological signs gradually became less severe and at about 10 weeks of age they were undetectable.

Compared with a group of controls, the lambs from infected ewes grew at a significantly slower rate so that at 20 weeks of age the mean body weights were about 20 per cent lower. Carcase weights at this stage were also significantly reduced as was the quality of the carcase as judged by

