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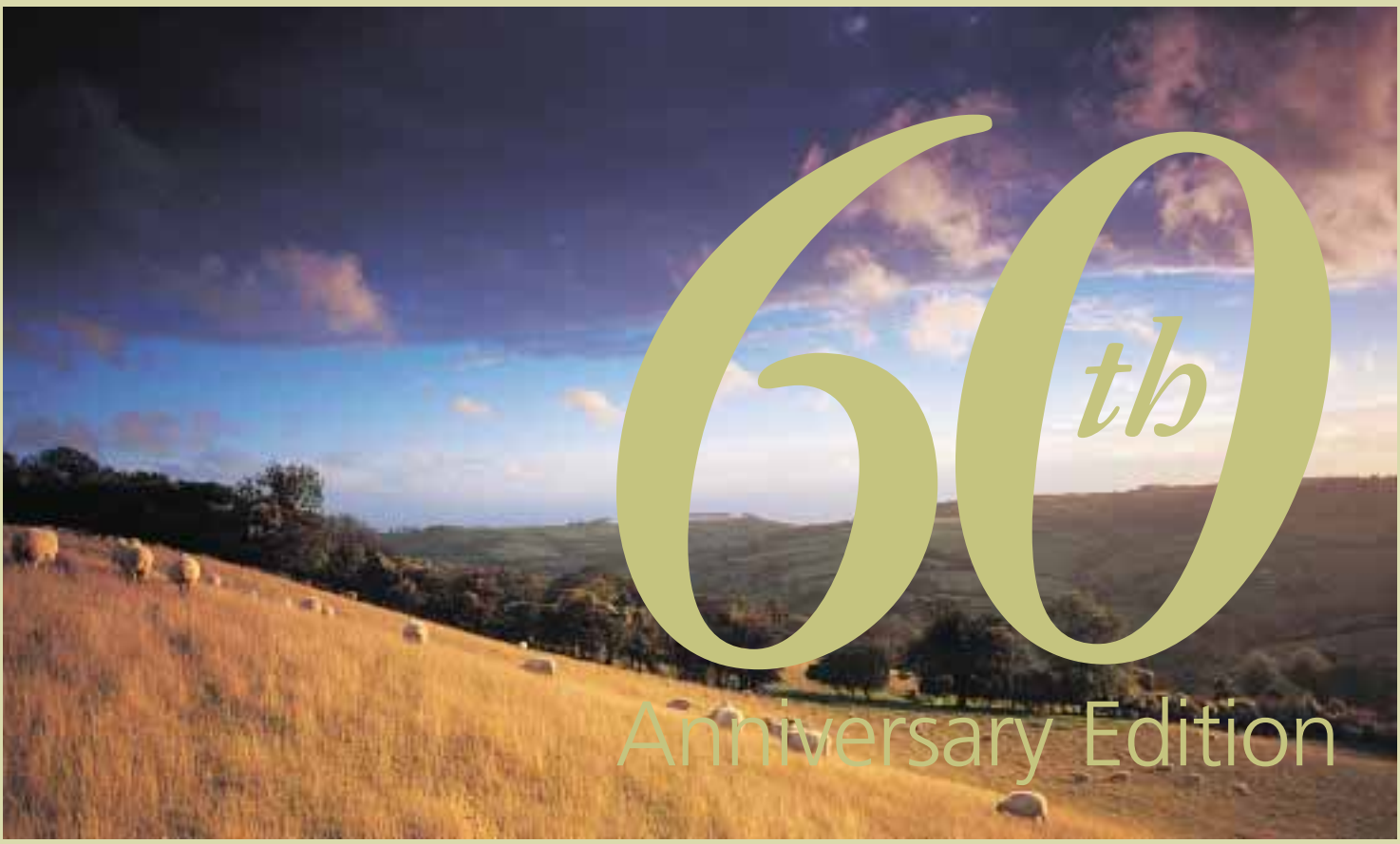
State Veterinary Journal

SVJ

November 2005



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The *State Veterinary Journal* is an official journal of the Department for Environment, Food and Rural Affairs, and is the UK journal specialising in state veterinary medicine.

Its aim is to provide a channel of communication between the Service and those who help it in its work. It covers the fields of:

Disease control
Animal welfare
Public health
Consumer protection

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If you would like further information on any of the topics addressed in this issue please contact your Animal Health Divisional Office.

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ARE YOU INTERESTED IN WRITING FOR THE SVJ?

Are you interested in writing for the SVJ?
Articles should be 1,000-3,000 words long, preferably with related illustrations; full instructions for authors are available from any board member. Subject matter should be related to State Veterinary Medicine in its broadest sense, and you do not have to work for the State Veterinary Service to be a contributor to the Journal. Articles for consideration can be submitted through any board member, a full list of which appears above.

EDITORIAL

The very first edition of the State Veterinary Journal (then known as the State Veterinary News) was published in November 1945. This commemorative edition aims to remind our readers of the excellent work done over the past 60 years. During this time, the Journal has recorded the developing history of disease control and animal welfare in Great Britain, and has documented our successes and failures. We have selected a series of articles representing the key points in the last sixty years, and believe that they provide proof that the value of the Journal lies not only in its educational content, but also in its role as the chronicle of history in the making. Please note that, in some cases, the original article has been edited; complete articles are available from the GVJ Production Team at gvj@defra.gov.uk or tel: 020 7904 6966.

Our first article is very brief; it is the foreword from the first ever edition. It is fascinating to note that the objectives for the publication have barely changed in 60 years; the vision of the original Board is still valid.

History may, indeed, repeat itself; the comments from CVOs following the outbreaks of Foot and Mouth Disease (FMD) in 1967-68, on page 8 and 2001 (page 33) are eerily similar, in their recognition of work done and eradication achieved.

While some diseases erupt occasionally with devastating effect, others seem destined to be with us on a more continuous basis. We have included an article on the original isolation of bovine TB from Badgers by Roger Muirhead and Sue Finlay's summary of progress with the Krebs Trial too. The 1953 contribution by WE Macrae reminds us of how much success we had in the past in eradicating bovine TB.
Other success stories include the eradication of Swine Vesicular Disease on page 24, and the history of brucellosis control, which appears on page 26. In each case, the secret of success seems to have been co-operative working between Government vets, together with the involvement of Local Authorities in enforcing control.

The journal has often marked key events in history; a classic example of this is the Camberley case of rabies, on page 14. This is an edited version of the article; the incident proved to be an important turning point for rabies control policy.

By contrast, short contributions on sheep scab and fascioliasis remind us that the journal has not always reported matters of such great importance; nonetheless, the information is of interest to readers, and provides us with a fascinating insight into the past too.

We hope that you find this edition interesting, informative and entertaining; it places the Journal in context across six decades, illustrates how people and times change, slowly but inevitably, and reminds us of how far we have made progress with notifiable disease control. We certainly enjoyed selecting the articles and presenting them to you.

I always greatly appreciate the work done by both the editorial board and the production team. However, on this occasion I would like to say thank you very specifically to Martyn Blissitt and Paul Gethings, without whose contribution of time and effort the commemorative edition would, perhaps, never have been produced at all.

Linda Smith, Editor

CONTENTS

This foreword appeared in the first ever edition of the State Veterinary News, published in November 1945.

Foreword.

The issue of a journal to the staff of the Animal Health Division of the Ministry was decided upon some months ago and an Editorial Board was set up to plan and arrange for publication such articles as were felt would be of interest and value. It is hoped that the journal will provide a means of keeping all members of the staff in closer touch with the work in the various activities of the Division- the Head Office, the Laboratory and the Field. The Editorial Board will welcome any articles from any member of the staff and will give full consideration to their publication. There are many items of interest and importance which members of the staff observe in their daily duties and which should be drawn to the attention of the staff generally; it is hoped that there will be no lack of material forthcoming.

I desire to place on record my appreciation of the work done by the Editorial Board and to wish every success to the State Veterinary News for the future.

D.A.E. CABOT.

FLY-BOMBS AND LIVESTOCK

By E.P. THORNE
(Field)

DURING the German fly-bomb offensive in 1944, unusual sequelae were observed in some cattle which had been exposed to the effects of explosions. Mr. S.P. Hendry, M.R.C.V.S., of Battle invited me to assist in investigating them. Note that they occurred shortly after the publication of Circular 336, which described the Uruguayan outbreaks of foot-and-mouth disease. Although there was never, except at the commencement of the enquiries, any real suspicion of the existence of that disease, the possibility was kept in mind during the clinical examination of affected cattle. Contact, at an early stage in the investigation, was made with Weybridge, and reports from its research officers are embodied in the series of cases described below.

FARM 1.

Towards the end of June, 1944, a fly-bomb exploded in a pasture field grazed by the herd and littered a wide area with fragments. Five cows in the herd suffered a sharp decline in milk yield following the incident, but an eight year old shorthorn cow also lost condition. On July 14th, the owner called in Mr. Hendry who, when making a second visit on July 17th, observed lesions on the muzzle.

At the time of my examination on July 17th, her condition was very poor with a temperature of 106.2°F. The upper and inner margins of the right nostril were swollen, painful, tense, and showed numerous small abscess-like lesions up to the size of a sixpenny-bit. Thirty other in-contact cattle were found apparently healthy.

By 21st July, the cow was down and semi-comatose with cold extremities and temperature 101.1°F. The lesions noted on the 17th July had coalesced forming a single gangrenous slough involving the right nostril. The cow died the following night.

Post-mortem—The head was sectioned. Nasal meatuses and turbinate bones showed inflammation of the mucous surfaces. Sub-maxillary and pharyngeal glands were enlarged and congested. Multiple haemorrhages extended over both pleura. The lungs, apart from congestion, were normal in size and consistency with petechiae on the pleural surfaces. A few small caseous lesions of tuberculosis were present in the substance of both lungs. The mediastinal glands appeared somewhat dark in colour and were slightly enlarged. Petechiae were present in the heart substance, particularly in the left auricle. The spleen capsule showed haemorrhages; other abdominal organs appeared normal.

Three further case histories are recounted in great detail; the following table summarises the findings.

The full text of this article appears in the State Veterinary News, Vol 2, no 6, September 1947. If you would like to read the full article as originally published, please contact the Production Team (see inside front cover).

For information, a fly-bomb (V1 or doodlebug) is often described as a winged but pilot-less fuel propelled flying bomb, and was used from June 1944.

In my opinion there is strong presumptive evidence that the causative agent is the dispersal on the grass of explosive from these bombs

SUMMARY OF FINDINGS

Farm, animals and dates of exposure etc	Symptoms and date first seen	Death or disposal	Nasal lesion (external)	Haemorrhagic lesions	Other lesions
Farm 1: 8 year old shorthorn x. Bomb exploded in field which was littered with debris. End June	Drop in milk, high temperature, Obviously ill and loss of condition. Before July 14th	Died July 22nd	+	Nasal cavity, glands of head, mediastinum, heart, spleen and pleurae	-
Farm 2: 8 year old shorthorn. Bomb exploded in next field. July 3rd	Drop in yield and condition, high temperature. July 9th	Died July 23rd	+	External haemorrhage in shoulder and other muscles and in body cavities and head glands	Aborted July 15th. Swollen pale liver
Farm 3: 8 year old Guernsey. Bomb in stream from which cattle drank. Early July	Dejected. High temperature, discharge from inflamed nostrils. July 23rd	Died July 25th	+	Glands of head and mediastinum, pleurae, heart, reticulum, and large length of colon	-
Farm 4: 5-6 bombs during June-September. Heifer and cow	Dullness, loss of condition. August 4th	Killed, date unknown	+ (heifer) - (cow)	Sent to knackers; all trace lost	-
Farm 4: Heifer	Dull, staggering, some eye discharge. August 25th	Died August 29th	+	Nasal cavity, pleurae, lung, pericardium	-
Farm 4: Heifer	Weak, poor condition, high temperature, nasal discharge. August 28th	Killed August 31st	+	Muscles, fasciae, abdomen, small and large intestine	-

Further investigations

Detailed enquiries were made regarding the nature and source of foodstuffs supplied to the affected cattle. No common elements or unusual feeding practices were identified.

The Ministry reported these investigations to the Physiological Section of the Chemical Defence Research Department at Porton, and on the 4th September, 1944, Surgeon-Captain A. Fairly, R.N wrote as follows :

"In my opinion there is strong presumptive evidence that the causative agent is the dispersal on the grass of explosive from these bombs. Most of the explosives in use at present are known to produce dermatitis among the workers. Some cause vesication if handled. With most fillings, the explosive is usually a mixture with a high content of hexanitro diphenylamine present. This is well known to possess vesicant properties. Skin vesication is usually of a delayed character.

When complete detonation takes place one would not expect to find unchanged explosive on the ground, but with bombs of a large size detonation is not infrequently incomplete. In such cases the particles of explosive dust may readily be inhaled by grazing animals causing rhinitis and burning of the muzzle. The large food and water content in the stomach of the cow, and the fact that it is kept moving, explains the absence of lesions in the alimentary tract." *Toxicity:* "All those explosives are toxic and slow systematic poisoning can be expected. We propose to undertake a few simple experiments on animals but cannot easily reproduce the "fly-bomb conditions."

The experiments proposed by Captain Fairly were completed in October, 1944, but were not successful. As he observed, it was not an easy matter to reproduce fly-bomb conditions for experimental purposes.

DISCUSSION

Whilst some of the animals concerned showed individual features, there are certain common factors : the occurrence of V1 explosions shortly before and overhead or nearby, and the similarity of symptoms in all animals examined.

Where dates are known and the animal was allowed to die, the interval between exposure and death was about 3 weeks. Symptoms were recognised 2-14 days before death.

Bacteriological examinations on animals from Farms 1, 2 and 4 showed no organism which could be incriminated; transmission experiments were negative.

Attempts to reproduce the condition at Porton and at Weybridge were unsuccessful.

In view of the general similarity of the picture, the failure to find another cause and Captain Fairly's observations, it seems probable that all the cases had a common origin in the V1 explosions to which the cattle were exposed. Traumatic reticulitis was a more common problem seen in cattle exposed to fly-bombs.

ADDENDUM - FLY-BOMBS AND LIVESTOCK.

By H.T. MATTHEWS
(Field)

Thorne's article describes one of the forms of damage to cattle following detonation of fly-bombs. For the sake of accuracy it should be recorded that the manifestation described was not a common finding and indeed was not observed elsewhere than in this area, though practitioners in the line of flight of the bombs, from the coast to London, were warned at the time to look out for it. Nor was it seen in stock other than cattle.

When a fly-bomb exploded on or over a farm, there was a natural tendency among owners to attribute all the ills of his livestock to the incident for some time afterwards. Practitioners called in to support the claims often had a difficult task to arrive at sound decisions. Claims were investigated by the Ministry's Livestock Officers and the Animal Health Division was called in to advise occasionally.

"When a fly-bomb exploded on or over a farm, there was a natural tendency among owners to attribute all the ills of his livestock to the incident for some time afterwards"

THE ERADICATION OF BOVINE TUBERCULOSIS IN GREAT BRITAIN

BY W. D. MACRAE
(Headquarters)

This paper originally appeared in the Vol III No 24, September 1953 of the SVJ. This paper has been edited. If you would like to read the full article as originally published, please contact the Production Team (see inside front cover).

It would be true to say that, until the passing of the Agricultural Act of 1937 which empowered the Minister of Agriculture to expend money on the eradication of diseases of animals and to declare eradication areas for that purpose, no serious attempt had been made in Great Britain to control bovine tuberculosis, as a disease of animals, with a view to its eventual eradication.

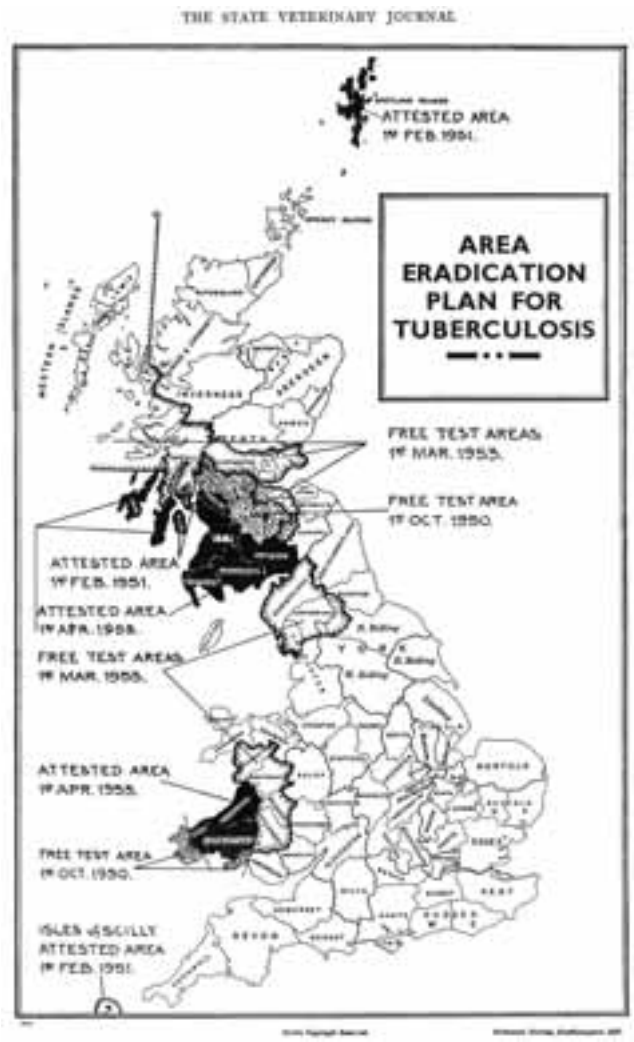
To eradicate the disease in areas where the voluntary response had not been complete in itself it was obvious that the process of eradication must be by stages, viz: -

(1) FREE TESTING STAGE. – This would correspond in time to the period of formal notice of the Ministry's intention to declare an area to be an Eradication Area on a certain date ahead. The duration of this stage would be arbitrary and might be varied according to experience and circumstance. During the period the Ministry would pay for all the necessary tuberculin testing of herds, provided reactors were promptly removed, and any other conditions observed. Bonuses would be paid if herds reached the state of being attested or "supervised" before the end of this stage.

(2) ERADICATION STAGE. – This would follow on directly from the free testing stage and all the herds in the area not already attested or supervised would be tested compulsorily and any reactors slaughtered with payment of compensation. Such herds would not be added to the register of attested herds and the owners would not receive any bonus.

(3) ATTESTED STAGE. – This would follow from the stage of eradication when the disease had reduced to negligible proportions. An attested area would be governed by a Statutory Order with penalties for breach of the regulations. The interval between tests would be extended as circumstances indicated.

A new Attested Herds scheme was introduced on the 1st October, 1950, with a new bonus system, that is to say, twopence per gallon for four years and one penny per gallon for two years or a capitation bonus of £2 and £1 for similar periods.



May 1968 Vol. 23. No. 68

The State Veterinary Journal

Message from the C.V.O.

During the last four months we have been fighting an epidemic of foot-and-mouth disease unparalleled in the history of the Service and although I am writing this while the disease has still not been eradicated, I want to thank all of you for the supreme efforts you have made. Many thanks are due not only to the staffs in the field, the laboratory and veterinary investigation service but also to the many practising veterinary surgeons who so promptly rallied to our aid.

When the present disaster has become part of our history, I am sure that one of the memorable facts will be the increased awareness of the unity of the work of the Department which has been so evident in the co-operation that has been achieved between the different sections of the Ministry, including the agricultural services, administrative, executive, clerical and supporting staff, all under the most difficult circumstances. And none of us will readily forget the stimulus, companionship and help which we have had from our colleagues oversees – Australian, Canadian, Irish, New Zealand and American. Nor shall we forget the support which we have had form the livestock industry in this country.

I notice that this number of the journal is briefer than usual, in fact some sections have been completely omitted, but I hope that when the subsequent number has to be produced we shall be living and working in more normal times.

My best wishes to you all.

“When the present disaster has become part of our history, I am sure that one of the memorable facts will be the increased awareness of the unity of the work of the Department which has been so evident in the co-operation that has been achieved between the different sections of the Ministry.”

THE LAST SHEEP SCAB CASE

By D A J Weedon
(Field)

This paper was originally published in Vol 24 No 72, September 1969.

Summary

This is a more detailed account of the last case of sheep scab to be recorded in Britain and which is mentioned in the official volume "Animal Health, A Centenary" (published in 1965). The case occurred on a lowland farm in Herefordshire in February 1952 (two cases had occurred in the county during 1951). If we consider the counties of Hereford, Brecon and Monmouthshire, which include the Black Mountains, as one area, there were 34 outbreaks there from 1944 to 1952, compared with 227 outbreaks in the North Wales area, and 437 in the Northern English counties.

The last case was a straightforward one – a small lesion on a single sheep, reported by an observant owner, with successful treatment effected by a single dipping of the flock. The origin of infection remained obscure, but it is suggested that it was picked up in the market where the sheep were brought in September 1951.

The last case of sheep scab occurred 17 years ago. For many of the field staff of the Ministry who have no personal experience of the disease, a first hand account of this case may be of some interest, while for the older members of the staff it may arouse nostalgic memories, so these notes are submitted without apology.

This case is chronicled in "Animal Health, A Centenary" on page 170 as follows:

> "The last outbreak in Britain was a single case in Herefordshire, early in 1952, the origin of which was attributed to a chance contact in Hereford market the previous autumn at a time when there were several outbreaks in that country."

In fact, as recorded in the Report of Animal Health Services for 1951, there were in that year, two cases of sheep scab in Herefordshire, four in Shropshire, four in Worcestershire, four in Brecon and one in Radnorshire, all of which were connected with infection on the Black Mountains. The Black Mountains comprise an area ranging in altitude from 1,000 to 2,300 ft, lying between Hay-on-Wye and Crickhowell, and including areas in the counties of Brecon, Monmouth and Herefordshire. They provide many square miles of uninterrupted grazing for sheep of numerous owners. Sheep scab had been diagnosed intermittently among Black Mountain sheep from 1944 onwards, and the Black Mountain area was the centre of energetic gathering, inspecting, and dipping measures over this period. Older members of the Ministry's veterinary field staff will remember the sheep scab centres held at Crickhowell, Brecon and Abergavenny. The extent of infection on the Black Mountains had not been comparable with that on the Berwyn and Hiraethiog Mountains of North Wales, however, nor with the severe infestations that had beset the northern counties, with grazings on the "Backbone of England" from the Peak District of Derbyshire, through the Pennines of Lancashire and the West Riding of Yorkshire, and up into Westmorland and Cumberland. The following table gives a clear indication of the distribution of the disease from 1944 to 1952.

Table
Outbreaks of Sheep Scab, 1944 to Eradication
(from C.V.Os., Annual Reports)

	1944	1945	1946	1947	1948	1949	1950	1951	1952
Black Mountain & Hereford Group									
Brecon	1	-	-	14	5	-	2	4	-
Monmouth	-	-	-	1	1	-	-	-	-
Hereford	2	-	-	-	-	-	1	2	1
North Wales including Berwyn & Hiraethiog Mountains									
Anglesey	9	-	-	-	-	-	-	-	-
Caernarvon	15	5	1	-	-	-	-	-	-
Denbigh	51	20	4	6	1	5	-	-	-
Flint	3	2	2	-	5	1	-	-	-
Merioneth	30	11	10	14	9	-	-	-	-
Montgomery	2	9	3	8	1	-	-	-	-
Northern England including Peak & Pennines									
Cumberland	8	-	7	1	8	12	17	-	-
Derby	75	54	27	27	9	-	-	1	-
Lancaster	5	3	-	9	18	10	2	-	-
Westmorland	9	8	32	12	5	-	-	-	-
Yorks E.R.	1	-	1	-	-	-	-	-	-
Yorks W.R.	32	7	5	7	6	18	1	-	-
Other counties where scab was recorded									
Buckingham	-	-	-	-	-	-	1	-	-
Chester	-	-	-	3	-	-	-	-	-
Nottingham	-	-	2	1	-	-	-	-	-
Lincoln (Lindsey)	1	1	-	-	-	-	-	-	-
Radnor	-	-	-	-	-	-	-	1	-
Shropshire	1	1	-	-	-	-	2	4	-
Sussex (East)	-	-	-	-	1	-	-	-	-
Worcester	-	-	-	-	-	-	-	4	-

In 1951 there were two cases of sheep scab in Herefordshire, four in Shropshire, four in Worcestershire, four in Brecon and one in Radnorshire, all of which were connected with infection on the Black Mountains.

The final, historic case arose on 23rd February 1952 on a small farm in the fertile Woolhope area of Herefordshire.

The final, historic case arose on 23rd February 1952 on a small farm in the fertile Woolhope area of Herefordshire. This is not a bleak upland area but a friendly region of wooded hills, orchards, meadows, and even hop-yards. Not typical "sheep-scab country" at all. The case was notified by an LVI to whom it had been reported by the owner as "suspected scab". The owner, when a boy of 11, had seen scab, and in 1952 he was in his mid-seventies, but he still carried the picture clearly in his mind's eye. He was quite sure that this was what he now had in his flock. The entire flock comprised 16 yearling ewe lambs of which one showed symptoms of pruritus and "nabbed" occasionally with the lips. There was a bare place on the rump of old standing, which was probably coincidental. It was not inflamed, was quite dry, and caused no irritation. The scab itself was situated on the shoulder. It was about the size of a sixpence, grey and moist, denuded of wool (when exposed by parting the fleece), and the pearly glistening acari could be seen quite easily under the hand lens, especially when removed from the edge of the lesion by drawing a pin across it. I found no other sheep affected.

The flock was dipped with a single-dipping type dip on 28th February and the restrictions were lifted on 13th June 1952 after a satisfactory inspection. There was no contact with local sheep, and no spread took place.

Origin of Infection

Comprehensive investigations were made to establish the origin without conclusive results. Six of the flock had been bought from a neighbour in September 1951, and had remained healthy, as also were the neighbour's stock on inspection. A ram had been bought from another local farmer to serve the ewes and then sent for slaughter in January 1952 – tracing of this also gave negative results. The sheep infected with scab was one of ten bought in Hereford market on 5th September 1951. It must remain a matter for conjecture how it came by its infection. We know that another outbreak had arisen in sheep purchased at the market from dealers' pens on 1st September, i.e., four days previously. Pen numbers of the sheep had not been recorded, so we cannot tell whether the same pen was involved, or assess whether it was likely that an acarus had survived in a crevice of the pens to infect our ewe lamb at Woolhope. The vendor of the ten had an interesting story to tell, however. He farmed near the Black Mountain area but had no actual mountain grazing. His total stock of 93 sheep, inspected in February 1952, was found healthy. On enquiry, it was found that transport had been by a commercial haulier, with no float contacts. On arrival at the market the haulier had unloaded the 10 lambs into a pen – one of the range used by dealers. The vendor followed in his car and found that his pen of lambs now numbered nine only! He sought for the missing lamb around the market, and eventually found it by chance amongst a pen of sheep of very poor appearance, from which he retrieved it and put it back with the others. There was no means by which to identify or trace these indifferent sheep. I shall, however, always suspect that the one diseased sheep was the one, which got mislaid, and that it was from these questionable sheep that she picked up her acari.

In describing this as the last case of sheep scab, we should, of course, qualify this as the last case in our native sheep. As noted by W.T.Jackson in September 1963 (No. 54 of the STATE VETERINARY JOURNAL) cases were diagnosed and dealt with in sheep imported from Eire and Northern Ireland as recently as August 1962.

FASCIOLIASIS IN HUMANS IN CARDIGANSHIRE

by R. DUDLYKE
(Field)

This paper was originally published in Vol 25 No 73, January 1970.

Summary

A case of confirmed liver fluke in humans in which our assistance was requested in establishing the possible source of infection is recorded. Field investigations and laboratory findings highlight the risk to man consuming watercress from natural beds.

The possibility of humans becoming infected with liver fluke does not often occur to most of us when requested to carry out farm surveys in connection with the control of the disease amongst farm animals. Fortunately it is not often recorded in man but this year we have seen Press accounts of outbreaks in various parts of the country.

The following is a brief report of an interesting case in Cardiganshire in which the Medical Department called for our assistance in their investigations.

In 1968 a farmer and his wife complained of feeling unwell but their illness did not prevent them carrying their farm activities. As far as could be ascertained their symptoms consisted of nausea, some discomfort in the region of the stomach, fluctuating temperatures with a rise never more than one or two degrees, and night sweating.

Their doctor, who knew that the husband had some years previously been found to be brucella-positive, forwarded blood samples to Aberystwyth General Hospital for brucella tests and a blood count. The brucella tests proved negative but the cell count showed a marked eosinophilia. This prompted the suspicion of a parasitic condition and a request was made for faecal samples. On examination these revealed the presence of *Fasciola hepatica ova.*

By this time three other persons in another area of the country were found to have a similar blood picture and Fasciola hepatica ova were demonstrated in two out of the three. Two of these persons had been to tea at the farm where they were given watercress with their meal. They were also given some to take back with them and some of this was eaten by the third person. This was in November 1968.

Following the confirmation of these cases in January 1969 I received a request from the County Medical Officer seeking our help in finding the source of infection. I visited the farm which is a smallholding of some 60 acres and carries a herd of 20 Jerseys. The land is very wet and in fact ideal for liver fluke. Owing to its size, and the wetness, the farm does not carry sheep. Sheep are present on adjoining land and no doubt do from time to time cross the boundary. The cattle on the farm are probably affected but only one clinical case has been recorded.

My enquiries revealed that in May 1968, in order to conserve a supply of water for the cattle in very dry weather, the farmer had excavated a small reservoir in the corner of the field. This particular spot was chosen as it was never without some water provided by two open ditches that joined at this particular point and in which watercress grew. As the family are passionately fond of watercress this was introduced into the reservoir where it made rapid growth and they were able to consume it from October 1968 onwards.

Not only had the owner selected a very good place for water storage but at the same time selected what must have been a heavily populated snail habitat, because scores of Limnaea truncatula were present both in the mud at the bottom, which was about one foot under the water at the shallowest end, and on the watercress.

It was obvious that if the snails were infected with the parasite, then the cress was likely to be heavily contaminated and was almost certainly the source of the human infection. In an attempt to carry the investigation to a more conclusive point a quantity of cress was collected and fed to a guinea pig and a rabbit at the Veterinary Investigation Centre, Aberystwyth. Due to wilting, consumption tailed off after two weeks, but it was estimated that they had consumed from one to one and a half pounds. Both were killed one month after feeding with cress had commenced and on post-mortem examination the liver of the guinea pig yielded 40 immature flukes and that of the rabbit over 80. It was evident from this that the watercress was very heavily contaminated with metacercariae.

Acknowledgment

I wish to acknowledge the willing assistance given by H. E. Roberts, V.I.O., in conducting this experiment.

THE CAMBERLEY CASE OF RABIES

By EW Hendrie and EJ Westcott
(Field)

Summary
A case of furious rabies in a 2½ year old dog recently released from quarantine is described. The methods adopted to try to contain the disease are also described, particularly the action taken to prevent the disease becoming endemic in wildlife. The paper deals with the effect of the outbreak on the public and the co-operation of the Medical Officer of Health, the police and the army.

This paper was originally published in Vol 25 No 75, September 1970. This article has been edited. If you would like to read the full paper please contact the Production Team (see inside front cover).

History

The dog Fritz was a 2½ year-old grey terrier-type dog. Originally it had come from Germany. Its owners, the Hemsleys, on veterinary advice, had not had their dog vaccinated, understanding that such vaccination might possibly mask the disease.

In Germany the Hemsleys had occasionally exercised Fritz in nearby woods, but to their knowledge there had never been any fighting or biting incident. There was only one occasion, in January 1969, when the dog had been out of sight, and then only for about 15 minutes. They did recall that the dog keenly hunted rats.

In April the Hemsleys brought Fritz home. He was collected by a licensed carrier. During quarantine they did not visit the dog, which was vaccinated on 11th April against distemper, hard-pad, hepatitis and leptospirosis, and released on 4th October 1969.

Initial Symptoms

It was not until 6 days later that anything was noticed; Fritz hid under a bed and howled. He also seemed stiff in his hind quarters. This was put down to unaccustomed exercise. On 11th October Fritz refused food and water. The dog ate a little food but still refused to drink. On 13th October Fritz seemed very excitable, biting aggressively and barking in a different voice. Mrs. Hemsley brought her children to school, and took the dog with her in the car. It persisted in barking and howling and she thought the dog was "odd". Early on the 14th October Major Hemsley let the dog out; he noted that Fritz appeared constipated. He went out to recover the dog, and was told by a neighbour that Fritz had just killed his cat and that the milkman had had the sole of his boot bitten through. Fritz had disappeared. Mrs. Hemsley suspected rabies, and realised that she must do something urgently before the dog bit anybody else. She went out to look for Fritz, asking her husband to seek the advice of Major Morgan Jones, who advised the immediate capture and restraint of the dog. At 8.35 a.m, Mrs. Hemsley spotted the dog jumping into a taxi full of schoolchildren. She managed to get the dog out of the taxi, although by now it appeared to be completely mad and was furiously trying to get back into the taxi amongst the children. She bravely hung on to the dog, calling for help. A passer-by produced a piece of string which was tied round the dog's muzzle, and Mrs. Hemsley, firmly clutching the dog, walked back to the house. She had been bitten on the leg and arm. She took the dog to Major Morgan Jones, who locked it up and telephoned the Divisional Veterinary Officer to report suspected disease.

Divisional Office Action, Further Symptoms and Post-Mortem Findings

The Divisional Office was contacted at 9.15 a.m. on 14th October. A Veterinary Officer examined the dog and suspected rabies, and Fritz was moved to quarantine. The Chief Public Health Inspector was already in attendance commencing enquiries into human contacts.

Daily inspection of the dog reported classical symptoms: high-pitched howling finishing with a stifled yell, fixed staring expression and great strength. The dog bit and tore at the steel mesh on the front of its kennel. The pupils were dilated and incoordination of the fore and hind legs became evident. There seemed to be transitory weakness or paralysis. Increased sexual stimulation was in evidence. The dog did not eat or drink, but had diarrhoea. Late on 17th October the dog suffered convulsions, finally collapsing and becoming recumbent. By 8.30 a.m. on 18th October it was dead. The carcase was delivered to Weybridge, and examination revealed: carcase congested, pancreas haemorrhagic, acute gastritis, intestinal obstruction in duodenum (hair bolus and blood clot), hair and broom bristle in stomach, congested spleen, buccal ecchymoses and bites on fore legs.

About 5.30 p.m. on 18th October the Divisional Veterinary Officer was informed by telephone that a positive rabies diagnosis had been made.

Action Subsequent To Confirmation

All interested parties were immediately notified, and a list of animal contacts was compiled—a total of 9 dogs. The owners were served with A2 notices detaining their pets at home.

Fritz lived on an army officers' housing estate, and was known to have played with other dogs locally. He could have had access to nearby commons and was exercised regularly on part of Barossa Common.

After deciding which area Fritz might have wandered in, it was decided to place all dogs living within a third of a mile of Fritz's home under modified A2 restrictions, confining them to the house and garden, prohibiting contact with other animals and only allowing exercise if leashed, muzzled and under effective control. Sixty four notices were served by 21st October. As a result of a Ministerial letter detailing symptoms and responsibilities, a further 85 modified A2 restrictions were served. Eventually, 191 notices were operative in the area.

A police caravan and, later, the local police station, was used to deal with public queries and the station was literally besieged by hundreds of people clamouring for information and reassurance. Needless to say, veterinary staff were present throughout to assist the police.

“About 5.30 p.m. on 18th October the Divisional Veterinary Officer was informed by telephone that a positive rabies diagnosis had been made.”

Destruction of Wildlife

Following consultation, it was decided to destroy all foxes, badgers, squirrels, rabbits, hares and vermin on the commons, including carrion birds. The total area chosen covered approximately 2000 acres. Further meetings confirmed complete and absolute support for the proposed shoot, although many representatives expressed their regret at its necessity. The first day of the shoot would be on the 30th October. Police posted warning notices around the commons and drafted extra staff to patrol the periphery.

A Veterinary Officer accompanied the shooting parties and did not observe any animals showing symptoms of the disease. In his opinion, all were killed efficiently and humanely. The total kill on the 2 days' shooting was as follows: foxes 11, squirrels 101, magpies 8, jays 9, rabbits 1, crows 1. Foxes' lairs and badgers' setts had been gassed, so a massive kill at the shoots was not expected. All carcasses were incinerated.

Hunting in the Camberley Area

There was a risk that wildlife had become infected and minimal disturbance of wildlife in the area around Camberley was required. To this end, all hunting within 10 miles of Camberley was voluntarily suspended by adjacent hunts.

Persons at Risk and Liasion with the Medical Officer of Health and Veterinary Surgeons

Close contact was maintained with the Medical Officer of Health. Over 50 people were vaccinated, mainly children. On the whole, reactions were few. Reinforcing injections were given some 5 weeks later. All biting and scratching incidents were reported and investigated. A total of 134 persons were bitten by dogs and 6 by other animals.

Undoubtedly local veterinary practitioners greatly helped to allay public panic and keep the disease risk in true perspective. Twenty eight report cases in Surrey were investigated, reflecting the anxiety of the public and the seriousness with which the profession regards this disease.

Conclusions

This outbreak highlights the necessity for contingency plans to be prepared so that rabies suspects can be caught and detained. An information centre near the scene of the outbreak is vitally important as is close liaison with the police and medical authorities.

“There was a risk that wildlife had become infected and minimal disturbance of wildlife in the area around Camberley was required.”

BOVINE TUBERCULOSIS IN WILD BADGERS IN SOUTH GLOUCESTERSHIRE

By R. H. Muirhead
(Field)

This paper was originally published in the Vol 27 No 81, September 1972. This article has been edited. If you would like to read the full paper as originally published, please contact the Production Team (see inside front cover).

Summary

Post-mortem examination revealed lesions of tuberculosis in 10 wild badgers obtained from the Wotton-under-Edge/Dursley area of the County. Mycobacterium bovis was typed from all of them. A survey of the herd histories of all the herds in a selected area was undertaken, from the time when tuberculin testing began. The role of the badgers in the epidemiology of the disease is discussed.

Introduction

The incidence of tuberculosis in cattle in the county of Gloucestershire has remained at a higher level than the national average or that of the surrounding counties.

No reasonable explanation until now has been suggested for the continuation of infection in this part of the country. The number of open cases in cattle has never been large. Half the reactors have been in the 2 year old age group. This is a group which is usually isolated from the adult cattle and one would have thought would have been the least likely group to contract tuberculosis from the older cattle.

The idea that a wildlife reservoir of tuberculosis might exist is not a new one. It had been frequently remarked by farmers in the Wotton/Dursley area that the wild badger population was unusually large. One of the features of Gloucestershire is the line of escarpment marking the western limit of the Cotswold Hills. It consists of sandstone gravel with a thick belt of natural woodland and provides ideal country for badgers as there is abundant natural cover with easy digging and splendid natural drainage.

Origin of this Investigation

In April 1971 the owner of a large farm lying in the Cotswolds a few miles to the east of the head of the Wortley valley, brought into the Divisional Office a badger which he had found dead on his farm. Examination revealed generalised tuberculosis. A slide revealed numerous acid fast organisms taken from a mesenteric lymph gland which were subsequently typed by the Central Veterinary Laboratory as *Mycobacterium bovis.*

Wotton-under-Edge/Dursley area

The area surveyed is a rough square bounded on the west by the line of Gloucester to Bristol railway and to the east by the A46 Stroud to Bath road. It also includes one parish to the east of this road where the first of the badgers with tuberculosis was found. The north boundary is the west to east line drawn 2 miles north of Dursley. The south boundary is a similar line drawn one and a half miles south of Wotton-under-Edge.

The area is roughly 8 miles square and maintains a cattle population of 12,000. There are 185 herds of which 20 are on small holdings. Reactors with lesions of tuberculosis have been found in 93 of these herds during the 11 years from 1961 to 1971. In all, 576 reactors with lesions were slaughtered in the area during those 11 years. Only 16 of those reactors were recorded as 'open cases'. 47 per cent of reactors were cattle under 3 years of age. The herds are mostly self contained dairy herds. There are a few pure beef herds. Most of the farms also maintain some dairy cross beef cattle which are either sold as stores or fat cattle. There is little introduction of outside cattle into the area.

A recent survey has revealed over 1,000 sets with a probable badger population of at least 5,000 in the Wotton/Dursley area.

Waterley Bottom Valley

The incidence of tuberculosis in this narrow, confined valley is recorded on the same graphs by separate lines. The totals are also included in the figures for the Wotton/Dursley area. They show that infection in the valley is higher than in the area as a whole. 210 reactors have been found since 1953. The valley supports a cattle population of 1,000 which is divided among 19 herds. 4 of these herds have less than 15 cattle each. Only 2 small herds have remained free from tuberculosis during the years 1961 to 1971.

The valley also supports a badger population estimated at not less than 300. 32 badger sets have been identified. During 1971 one badger with lung lesions of tuberculosis was found. This badger had been killed in a road accident. Its set was not positively identified. However, later in the year, badger faeces samples were collected from pastures near sets located on farms which had recently had reactors. Guinea pigs inoculated with faecal material reacted to mammalian tuberculin.

Tuberculin testing in the valley did not become general until 1957. The farm on which the infected faeces were found started testing before 1950 and has had a long history of reactors, mostly in young stock. Reactors have been found at irregular intervals. The last lot of young reactors had grazed pastures where the infected badger faeces were found.

Post-Mortem Examinations

20 badger carcasses were examined during 1971. 16 of these were obtained in the Wotton/Dursley area. Lesions of tuberculosis were found in 4 of the 16. The Central Veterinary Laboratory typed M.bovis from the 4 positive ones. A kite-shaped pattern emerges on the map if the positions where the infected badgers were found is plotted. It lies across the centre of the area and is 6 miles long by 3½ miles wide. 3 miles, as the crow flies, is the nearest distance between positive cases.

Aged female badger

This carcase was found dead on 23 April 1971. Lesions were found in the lungs, mediastinal, bronchial and hepatic lymph glands. In addition, pinpoint calcified lesions were found in a mesenteric gland. Acid fast organisms were found in great profusion on a slide prepared from this gland.

A total of 7 cattle reactors with lesions had been found on the farm of origin in 1966, 1969 and 1971. They were all 18-month old bullocks purchased as dropped calves. The farm is a large one, partly arable and has not maintained a cow herd since 1964. Prior to the finding of this badger, it had been noted that reactors always came from groups of cattle which had been grazing in fields adjacent to the badger sets. Later in 1971 a reactor with glandular lesions was found on a neighbouring farm with a clear previous history. This reactor was a home bred heifer.

“20 badger carcasses were examined during 1971. 16 of these were obtained in the Wotton/Dursley area. Lesions of tuberculosis were found in 4 of the 16.”

Aged male badger

This badger had been killed in a road accident and was found on 27 July 1971 in Waterley Bottom. Lesions were found in one submaxillary gland in 2 bilateral subcutaneous lymph glands sited over the points of the shoulder. Similar lesions were observed distributed in the lungs. As the lung glands did not appear to be infected, tuberculosis was not diagnosed. However, samples were set to Weybridge and M.bovis was typed. At the time of the post-mortem examination it was considered that the distribution indicated a wound infection, probably from fighting.

Investigation of the badger sets located near to the position where the carcase was found, indicated that it could have originated from sets on any of 3 adjacent farms. Some mention has already been made about this case in the description of Waterley Bottom.

One farm has a clear testing history since 1961. In 1961, 12 reactors with glandular lesions were slaughtered. At the time the origin was considered to be from a Spanish maid infected with tuberculosis. Nevertheless, for reasons which are now obscure, the badger sets on this property are believed to have been destroyed by dynamite. They have since been re-established.

The second farm had a clear testing history until 1966 when 2 heifers with glandular lesions were slaughtered. In 1967 this farm was sold and a fresh herd was introduced. A cow with glandular lesions was found in a slaughterhouse in 1970. Four more cow reactors with glandular lesions were found at a check tuberculin test. The farmer reports that he has seen badgers in his cowhouse. A badger set is located on the edge of the field normally grazed by his cows.

The third farm has a long history of reactors. These have been found in 1953, 56, 61, 65, 66, 70 and 71. In all 19 have been slaughtered. With the exception of the year 1953 no more than 2 reactors have been found at any one tuberculin test. The reactors have mostly been young animals. An open case was disclosed in 1961 and another in 1966.

Badger faeces samples collected in November 1971 from a set on the farm resulted in guinea pigs reacting to mammalian tuberculin when inoculated with faecal material.

Young male badger

This badger was shot on 26 August 1971 and was estimated to 1½ years old. It was undersized and was the only carcase examined in which some impaction of the rectum was observed. Lesions were found in the bronchial lymph glands.

The herd on the farm on which this badger was shot was wiped out in 1971 as a result of 3 tuberculin tests. No open cases were discovered, Glandular lesions were found in 32 cattle; 24 were cows and 7 were calves under the age of 9 months. A check test was arranged 6 months after the annual herd test because reactors had been found on an adjacent farm. All the cows in the herd were slaughtered as a result of this test and a further test 2 months later. Seven calves which were housed in buildings on an isolated part of the farm were left for a further 2 months. They were turned out to graze in May on pasture which had been vacant of cattle for 3 months. In 2 months 6 of the 7 had developed glandular lesions. This pasture adjoined a badger set and this is where this infected young badger was shot.

Shortly afterwards, a heifer with glandular lesions was discovered on an adjacent small

farm. She was one of a bunch of 19 heifers turned out for summer grazing on rented land. A tuberculin test had been carried out on the whole herd 3 months previously.

On another contiguous farm a heifer reactor with glandular lesions was found in 1966. In 1970, 2 slaughterhouse cases with lesions were reported. In the same year 8 young cattle and one cow reacted at a tuberculin test. In the spring of 1971, 2 cow reactors were found which had glandular lesions. These farms lie in the Dursley valley.

Young female badger
This badger was shot on 5 October 1971 the day after 2 cows which had reacted, were slaughtered. Glandular lesions were found in one of them. The farm lies on the high ground to the south of Wotton –under-Edge valley. No reactors had been recorded on the farm since tuberculin testing started in 1957.
Post-mortem examinations of the badger revealed lesions suggestive of tuberculosis in one bronchial lymph gland. Iliac and inguinal glands were also infected. In addition, both renal lymph glands were involved. The Central Veterinary Laboratory were asked to investigate one kidney and its lymph gland separately from the rest of the visceral glands which were kept isolated from each other. M. bovis was typed from both samples.
Later in the year 2 yearling cattle on a small contiguous farm reacted to tuberculin and were found to have glandular lesions . There is a large badger set on this farm located on pasture fields within a quarter of a mile of the outskirts of Wotton-Under-Edge. The position where this positive badger was shot suggests that she came from this set.

Modes of transmission of tuberculosis

Until experiments have been conducted with laboratory badgers, this is very much a matter for conjecture. The susceptibility of the badger to the different strains of tuberculosis is quite unknown. The post-mortem findings suggest that pasture contamination could occur from an infective badger from the faeces from a latrine located in the field, from tubercle bacilli being passed out in the urine, or from infected material being coughed out from a lung lesion.
Of the 4 positive badgers found in 1971 to be infected with tuberculosis, 3 were considered to be infective in one or more of these ways. It is also possible, in view of the reports of badgers being seen in farmyards and in cattle buildings, that infection can occur there rather than on pasture land. From the frequency with which young stock only are found to be infected in Gloucestershire, pasture contamination would appear to be the more likely method of infection.
Cross infection from cattle to the badger is even more an open question. In view of the very small number of open cases in cattle in recent years, this now probably hardly happens at all. The author considers that bovine tuberculosis is now endemic in badgers in the Wotton/Dursley area of Gloucestershire and strongly suspects that it also endemic in 4 other areas of the county. He further suggests that tuberculosis in badgers may exist in other parts of the country and suggests that where origins of infection are obscure, particularly in young grazing stock only, a badger origin is worth investigation. The possibility of a wildlife origin in other species than the badger must not be ignored.

Postscript

Since this article was first written, confirmation has been obtained that the tubercle bacilli can be found in badger faeces. It is believed that tubercle bacilli in infected material coughed up from the lungs and swallowed would pass out in faeces in a viable condition. Transmission from badger to badger in confined underground sleeping chambers also seems highly probable. The author believes that tuberculosis in the badger is slow and progressive and that individuals may possess considerable resistance to the disease. Experts at the Central Veterinary Laboratory at Weybridge state that the mycobacterium isolated is of typical bovine strain.

ANIMAL BEHAVIOUR

by D J Coffey
(Laboratory)

Summary

The importance of animal behaviour as a factor in the dynamic relationship an animal enjoys with its environment is emphasised. The need for academic training and research in various aspects of behaviour has increased with the intensification of agriculture. Consideration is given to the effects of variations in social structure and behaviour on an individual's production and on the reproductive efficiency of the whole group. An attempt is made to dismantle the artificial barriers at present created between the results of psychological and physiological abnormalities as precursors to disease.

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The process of evolution has hopefully provided each species with the necessary anatomical form to ensure its survival within the environment in which it finds itself. Born with a genetic potential which produces a largely inflexible physical structure each individual has the ability to adapt to the constant changes in its environment by the continuous activation of physiological or behavioural mechanisms. These act as the fine tuners of ecological adaptability.

Until the changes of the last few decades agriculture was pursued by conservative farmers using traditional methods of stock husbandry. Changes which occurred evolved slowly over many years allowing a subconscious assimilation and understanding of the effects produced. Animals lived in an environment well within their adaptive ability. The range of their behavioural patterns was well known to the farmer. Similarly, the veterinary surgeon acquired a comprehensive knowledge of animal behaviour.

The flexibility and infinite variability of behaviour ensures, like sociology, that the mathematical restrictions of statistical analysis cannot easily be applied. Groups of animals are not and cannot be considered objects of uniformity. Each social group, however small, will assume qualities of uniqueness depending on the different experiences and characteristics of the individual components and the social interrelationships which develop.

Social Behaviour and Production

Wild animals select, albeit subconsciously, the social groupings in which they live. Domestic stock are forced to exist in groups consistent with the demands of agricultural economics. In many intensive systems animals live close to the brink of adaptability with the result that small adverse changes in the social environment can adversely affect production. The social structure in any system is a result of several independent factors: population density; absolute size of group; and the particular interrelationships which develop within the society.

Sufficient experimental evidence exists to confirm early observations that there is an optimum density of population for maximum production.

The comparison between animals kept in isolation and those in small groups usually demonstrates the disadvantages to production of isolation.

If one of several animals within a group performs a behaviour pattern there is a tendency for others to copy. This is social facilitation of behaviour. Animals will eat more when in a group than when alone as a result of this phenomenon.

One of the common physiological responses to environmental pressure or maladaptation is an increased level of circulating corticosteroids. Isolation has been shown to produce

just such an effect. Experimental injection of corticosteroids into animals reduces the body weight or retards weight gain. Increased circulating corticosteroids may then contribute to the loss of production so commonly observed in isolated animals.

Experimental work with a wide range of orders and species, both wild and domestic, has shown that as the population density increased beyond the optimum, weight gain is reduced. Several contributing factors have been identified. In very high stocking density the animals may be physically impeded from free access to the feeding trough. Where animals are closely packed causing a rise in the environmental temperature the animals may become overheated, resulting in reduced food intake.

Dominance orders produce stability within a group and reduce the number of active aggressive encounters since the respective positions are recognised and largely accepted by the individuals. Fighting among established groups is reduced therefore by symbolic acts of aggression and submission. In the pig the act of submission includes a backward movement. Where high density prevents enactment of the symbolic submissive behaviour pattern the aggressor will continue to attack having failed to receive the signal of submission. Actual combat will therefore be precipitated. Free range enables submissive individuals to stay clear of those dominant in the social hierarchy. Restrictive environments negate this alternative.

Where limited feeding points are available subordinate animals may be prevented from adequate access to food.

It appears from work with the pig that there may be a finite number beyond which the animals lose the ability to remember their relative social positions. Each encounter with another pig in the group therefore requires actual combat to re-establish continually the hierarchical decision. Increased aggression may therefore be anticipated if the optimum size of the group is exceeded.

“It is important that an animal learns to recognise its own kind in order that it can develop socially within the group and learn to co-operate and communicate with it.”

Social Behaviour and Production of Young

The production of young is a very complex series of events which includes pairing, mating, conception, implantation, maintenance of pregnancy, birth or hatching, and the rearing and the feeding of young. Many of these events are affected by socio-psychological and behavioural factors.

Young animals have a period early in life during which they learn to recognise their own species. It has been called imprinting or period of socialisation. It is important that an animal learns to recognise its own kind in order that it can develop socially within the group and learn to co-operate and communicate with it.

There is a considerable amount of scientific evidence that isolation of the male before socialisation has occurred seriously impairs its future sexual behaviour.

In the male when population densities are high, sexual maturity is retarded and sex organs, in particular the testes begin to involute. The seminal vesicles also regress.

The female remains sexually immature for longer, shows lower ovulation rate, becomes pregnant less often, has a greater number of resorbed embryos, a lower birth weight and produces smaller-sized offspring. A higher proportion of the young die due to suppressed lactation in dense populations. The young born alive may be in poor condition and tend

to be weaned early. In high densities it has been shown that reproduction is restricted particularly among subordinate animals. Reproduction may be affected by reduced sexual behaviour and impaired physiological functioning in the male, and reduced implantation of the embryos, increased intrauterine death, debilitated live young, poor lactation and inadequate maternal behaviour in the female. Clearly socio-psychological and behavioural components can affect the reproduction of stock.

Behavour and Disease

Plato is quoted 'for this is the great error of our day, that physicians separate the soul from the body'. The concept implied is as important to veterinary problems encountered in modern intensive animal production as it should have been to the medical profession of ancient Greece.

In spite of historical traditions following Koch's work, clinicians have always been aware that there is more to the manifestation of disease than the presence of a pathogenic micro-organism. A definition of disease is difficult to formulate since it relates to deviations from normality which in itself is indefinable.

The complexity of modern western society has precipitated and increased the so-called "stress" diseases of man-cardiac conditions, gastric and duodenal ulcers. Similar conditions will occur in a wide variety of species subjected to inadequate social conditions.

The relationship between an individual and other members of the group can affect its susceptibility to disease. Observations on a group of free-range calves fed supplementary hay and concentrates showed that the 2 most subordinate members of the group were unable to approach the feeding points until all the concentrates and most of the hay were consumed. The poor bodily condition of these 2 animals reflected the results of social ostracism. Similar studies with goats have confirmed the observations. The heavier worm burden endured by these submissive individuals was related to their social subordination.

Behaviour and Welfare

Following the Brambell Committee's suggestion that the veterinary profession should concern itself more with animal behaviour in an attempt to improve its pronouncements on welfare matters, there has been an incorrect tendency to consider behaviour and welfare as synonymous.

Scientific consideration of behaviour adds a further parameter on which to base an opinion: it does not replace established dimensions of veterinary science. Further, many aspects of welfare leave the roles of pure science to spill into the fields of morals, ethics and philosophy.

Stereotyped behaviour is the frequent fixed and rigid repetition of a behaviour. This may be a qualitative abnormality like wind sucking, weaving or crib biting in horses or the fixed, often repeated, pattern of normal pacing commonly seen in captive zoological collections. The performance of stereotyped behaviour while indicating environmental inadequacy may protect the individual from complete psychological collapse. Behavioural scientists have for some time appreciated the disadvantages of psychologically sterile surroundings. Many studies have confirmed the improved ability which results from the

A definition of disease is difficult to formulate since it relates to deviations from normality which in itself is indefinable.

provision of enriched environments - in the case of rodents, toys, ramps, tunnels, wheels and wall patterns. Since psychology and physiology are indivisible in total body function it is inevitable that enriched environments will enhance general adaptability.

In spite of the difficulties it is important to agriculture that attempts are made to understand the dynamic relationship between the social individual, the environment and production and that the effects are considered when any new system of husbandry is planned. In this way it may be possible to avert economic loss either to the individual or for the industry as a whole.

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SWINE VESICULAR DISEASE: AN APPRAISAL OF THE ERADICATION POLICY

by R. S. JOHNSTON
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Summary

An appraisal is made of the eradication policy for the swine vesicular disease from its appearance in England in December 1972 up to the time of the introduction of the Movement and Sale of Pigs Order in March 1975. It looks at the principles involved in the eradication, the legislation necessary to apply these principles and the modifications that occurred as the epidemiology of the disease was elucidated from the experience of the pattern of the disease in the United Kingdom, which is described, and from virological studies.

REFLECTIONS

THIS article was prepared during 1974/75 as the basis of a thesis in the Diploma in Animal Health Course at London University. It was completed in April 1975 at a time when the success if the Ministry's eradication policy for swine vesicular disease (SVD) was in doubt. There was no evidence to suggest that the epizootic was approaching an end and because of this some sections of the agricultural community were pressing for a reversal of the commitment to eradiation.

However, the full value of the new Diseases of Animals (Waste Food) Order 1973 and the Movement and Sale of Pigs Order in March 1975 had not been felt or appreciated.

The subsequent history of the epizootic illustrates in the absence of any other evidence how this legislation has been.

In April, May and June 1975 there were respectively 8, 7 and 5 outbreaks of SVD. In September 1975 there was one outbreak and a recrudescence occurred on this farm in March 1976.

The numbers of recorded cases dealt with by the Ministry since December 1972 now totals 383, and approximately 200,000 pigs have been slaughtered.

The whole episode reflects the Ministry's ability to deal with a new disease. The sound approach to the problem was based on epidemiological evidence with secondary considerations such as the commercial interests of the agricultural community pushed very much into the background. These could have only delayed and confused the satisfactory outcome.

Optimistically we can hope that we have seen the last of SVD and as a considerable bonus now have a more satisfactory control on the use of swill and the marketing of pigs.

The numbers of recorded cases dealt with by the Ministry since December 1972 now totals 383, and approximately 200,000 pigs have been slaughtered.

INTRODUCTION

Swine vesicular disease appeared in the West Midlands of England in December 1972 (Dawe, Forman and Smale, 1973). This was the forth time that the disease had been identified internationally. The disease had previously been recognised in Italy in 1966 (Nardelli et al., 1968) in Hong Kong in 1971 (Mowat, Darbyshire and Huntley, 1972) and in Italy in 1972 (Burrows, Mann and Goodridge, 1974a).

Further cases of the disease were reported in Austria (Kubin, 1973), in Italy (Rossi, 1973), in France (Dhennin and Dhennin, 1973); Larenaudie, Dhennin, Gourreau and Dhennin, 1973), Poland and Switzerland (Pohlenz, Williams and Keller, 1974).

These original observations of the disease, without exception, emphasise the similarity of the clinical picture in SVD to that of foot-and-mouth disease (FMD) in pigs.

The sudden appearance of a relatively new disease simultaneously in several European countries, which was clinically indistinguishable from FMD, was of such significance that it resulted in the convening of an emergency session of the European Commission for the Control of Foot-and-Mouth Disease in Rome on 9 January 1973 (Anon., 1973a).

Under the Chairmanship of Mr A. G. Beynon (at that time Chief Veterinary Officer of the Ministry of Agriculture, Fisheries and Food), the Commission recommended immediate control methods exactly as if dealing with a proven case of FMD, the measures to include when possible, slaughter of infected and contact pigs and destruction of carcasses. Other principle recommendations were that the disease should be made notifiable; the movement of other livestock should be restricted until their epidemiological significance is determined; appropriate action should be taken to prevent spread through the feeding of inadequately treated food; that serological surveys should be made to determine whether or not inapparent infection exists and that information on the disease and the virus as it becomes available should be exchanged.

The Ministry of Agriculture, Fisheries and Food (MAFF) adopted these recommendations and emphasised that since the lesions of SVD are indistinguishable clinically from those of FMD in pigs it is essential that suspected cases are reported immediately and that initially they are dealt with as if they were FMD unless there is a known contact with another outbreak of SVD.

The principles of preventative medicine and disease eradication which have evolved over the years, have been applied and, as necessary, legislation has been enacted to assist the authorities.

Bovine Brucellosis — A History of Eradication

J A KELLY

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Summary

The whole of Great Britain has now, for all practical purposes, been freed from brucellosis. This is a milestone in our long tradition of eradicating the major plagues of livestock. This article tells the story of the events from the first 'Order' of 1922 to1980. The table, graph and appendices give a detailed picture of the progress and success of the campaign, and show, among other things, the immediate benefit to public health, and also that Scotland led the field.

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Introduction

Calves aborted due to brucellosis are normally dead, or die within a short time, and this together with the reduced milk yield, possible retained placenta and depression of fertility is an important cause of economic loss. Human infection (undulant fever) can follow the consumption of raw infected milk or cream or by direct contact with infected cattle (see Fig. 1).

Legislation and control

Controls were initially based on the Epizootic Abortion Order of 1922, which applied to bovines that had aborted, and prohibited their movement and sale in the two months following their abortion. In June 1942, a scheme was introduced, providing free laboratory diagnosis and 'anti-abortion' vaccine (No 1 vaccine). The Calfhood Vaccination Scheme followed in December 1944, and the Free Calf Vaccination Scheme was introduced in May 1962. Before 1 July 1967 vaccination of heifer calves was confined to calves between five and eight months of age, but, this was reduced to between three and six months to lessen the effect of the vaccine on blood antibody levels at 18 months of age when tested. On 1 October 1960 approximately 40 per cent of herds gave reactions to the milk ring test.

Brucellosis (Accredited Herds) Scheme 1967

The object of the scheme was to build up a voluntary register of brucella-free herds to form a reservoir of disease-free replacements. Herds became 'controlled' and after three free milk ring tests at three months intervals for dairy herds, and one blood test for beef herds, became 'supervised' and proceeded to the official blood test. If they passed this test, they were entered on the "Accredited Register". When the Brucellosis (Accredited Herds) Scheme was closed to new applicants on 18 March 1970 there were 16,633 herds registered.

On 1 October 1960 approximately 40 percent of herds gave reactions to the milk ring test.

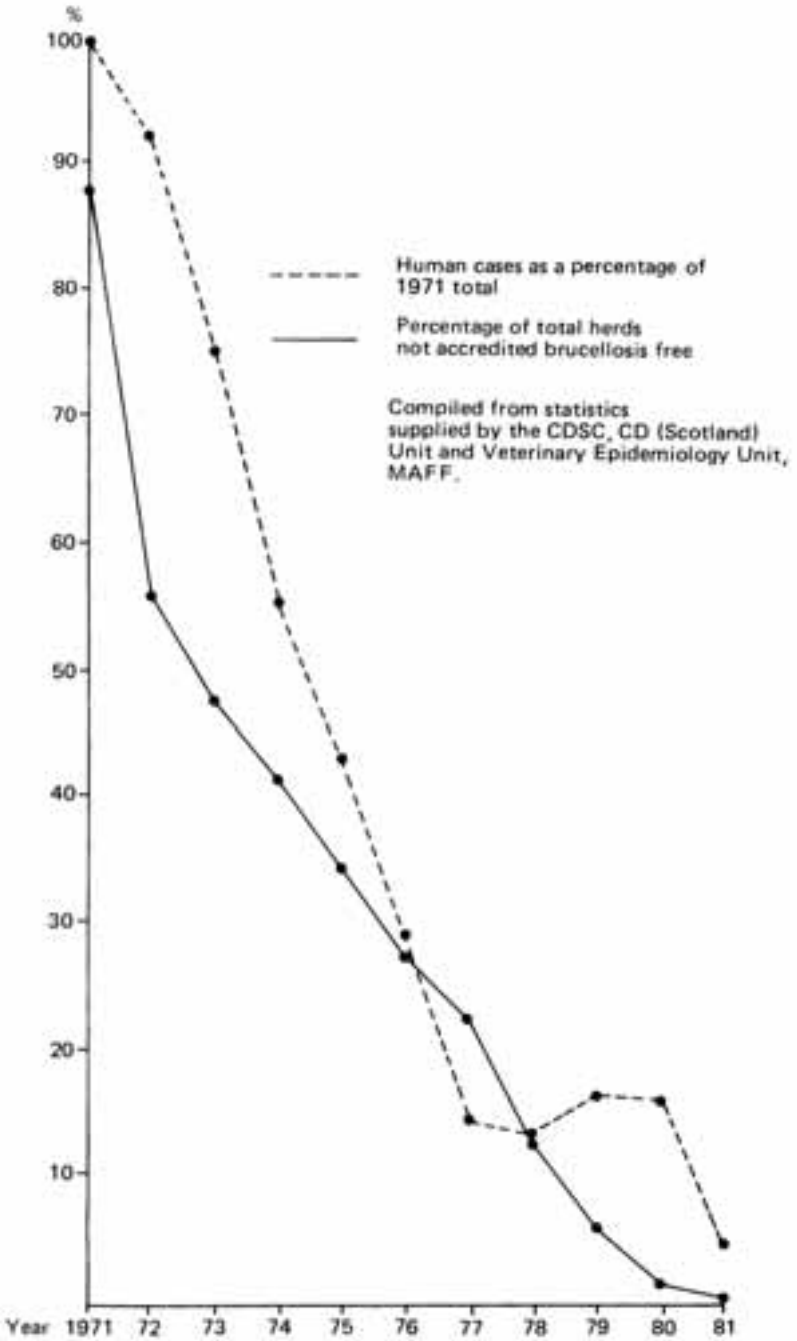

Figure 1. Progress of eradication in cattle and decline in human cases in England, Wales and Scotland.

Brucellosis Incentives Scheme 1970

The Scheme was launched to accelerate the build up and maintenance of brucella-free herds.

Owners of herds gaining "accreditation"were given the option to transfer to the" Incentives Scheme" which differed in three main respects.

- Payment of compensation for reactors before and following accreditation;
- Owners required to arrange the slaughter of reactors and advised to arrange private insurance cover for the difference between the market value of the animals and their carcase value; and
- All tests of eligible animals for accreditation were blood tests.

Incentives were introduced at rates of ld (0.52p) a gallon for milk and 37s 6d (£l.87 and a 0.5p) for each animal qualifying for the hill cow and beef cow subsidy - guaranteed for a five years from the date of entry on the register.

LAY BLOOD SAMPLERS

The Veterinary Surgery (Exemption) Order 1970 was made to permit trained lay staff, in the employment of practising veterinary surgeons, and technical assistants employed in Animal Health Offices, to receive proficiency certificates after a period of practical training. Arrangements were also made for Milk Marketing Boards to undertake the periodic testing of milk from accredited herds

MARKETS AND INCREASED INCENTIVES

In December 1970 the approval of markets for the sale of 'once tested' cattle was announced for animals from herds qualifying for accreditation and animals from accredited herds temporarily denied movement permits. This helped meet the demand for replacement animals. In 1971 incentive payments were increased and as a result, applications increased to an average of around 2,500 herds each month. The total number of herds participating in the two voluntary Schemes at the end of 1971 was 52,315, i.e. just over 26 per cent of all herds in Great Britain, representing well over one-third of all testable cattle.

COMPENSATION AND COMPUTERISATION

To encourage continuing participation in the Incentives Scheme, it was announced on 19 May 1972 that owners of accredited herds would be eligible, 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. At the same time, the maximum compensation payable under the Brucellosis (Accredited Herds) Scheme was increased from £160 to £240.

“By 31 October 1977 virtually all herds owned by producer retailers had been registered as accredited.”

Post-incentive arrangements provided for the payment of compensation for all reactors at 75 per cent of market value subject to a maximum payment of £300. Arrangements were made with local authorities and MAFF laboratories to sample and test the herds not covered by the Milk Boards. The scheme was closed to new applicants on 1 November 1979, when the maximum compensation was £425.

Compulsory brucellosis eradication

The Government announced, on 17 March 1971 the first stage of its programme for the compulsory eradication of brucellosis from cattle in Great Britain under the Brucellosis (Eradication Areas) (England and Wales) Order 1971 and the Brucellosis (Eradication Areas) (Scotland) Order 1971. The first areas were chosen for their geographical situation, response to the voluntary schemes, potential for provision of replacements for other areas, and relatively low incidence of infection.

Attested areas

The first attested areas in Great Britain were announced in 1975 (Shetland, Western Isles and Argyll and Bute). These areas had been under compulsory testing procedures for at least two years and had a true breakdown rate of less than 0.5 per cent.

In l974 a British Register of Officially Brucellosis-Free Herds was set up to assist British herd owners to continue to trade with EEC countries. To qualify for entry on to the register a herd must already have achieved “accredited status”, contain no animal which has been vaccinated against brucellosis within the preceding three years and have been free of clinical signs of brucellosis for six 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 more stringent EEC standards. In 1980 steers were exempted from testing, and by the end of that year there were 119 herds on the register.

Producer retailers

In August 1975 the Minister announced that unpasteurised milk could only be sold after 31 July 1977 if it was produced from accredited herds. By 31 October 1977 virtually all herds owned by producer retailers had been registered as accredited.

The 45/20 Vaccination Scheme

On 12 January 1976 a free vaccination scheme using the killed vaccine 45/20 was introduced in Cheshire, Staffordshire, Northumberland and that part of Tyne and Wear north of the River Tyne: The scheme involved a programme of vaccination of adult female cattle in the more heavily-infected herds with the aim of reinforcing the immunity already achieved by Strain 19 calfhood vaccination. This would reduce the incidence of the disease in the Counties concerned to a level where eradication could be completed without an unusually high number of slaughterings.

Vaccination with strain 45/20 vaccine in these herds ceased on 30 September 1978 to minimise the risk of vaccinal reaction in herds subject to compulsory eradication measures. Over 1300 herds joined the scheme and about 231 000 animals were vaccinated.

EEC assistance for acceleration of eradication – EEC Directive 77/391

An announcement made on 23 March 1978 stated that the EEC Commission had agreed the UK would be eligible for assistance from community funds for animals slaughtered during a three-year period which commenced on 15 May 1978. All parts of Great Britain would be subject to compulsory eradication measures as from 1 November 1979.

Vaccination in eradication and attested areas

No vaccination was permitted in attested areas in Great Britain after 1 August 1977, and in eradication areas after 1 November 1979. This paved the way for herds to achieve one of the requirements of 'officially brucellosis-free' status within the terms of the EEC regulations.

In 1980, with the total of accredited herds nearing 100 per cent it was possible to relax the statutory controls on movements of accredited cattle.

Editorial comment: Eradication of the disease from Great Britain was officially recognised with the declaration of "attested" status on 1 November 1981.

KREBS – ONE YEAR ON

FROM RECOMMENDATIONS TOWARDS A SUSTAINABLE POLICY TO CONTROL TB IN CATTLE

Sue Finlay, Disease Control Centre, Tolworth

INTRODUCTION

The April 1998 edition of the SVJ outlined the recommendations in the report by Professor Krebs and the Independent Scientific Review Group, published in December 1997. This edition reports on the progress, which has been made, taking account of the recommendations and the practical advice of Professor Bourne and the Independent Scientific Group on how to take forward certain aspects of those recommendations.

GOVERNMENT'S APPROACH

Advice from Krebs and Bourne was that "the sum of evidence strongly suggests the view that, in Britain, badgers are a significant source of TB in cattle". Ministers were faced with a difficult decision on how to protect cattle from TB and yet continue to protect wild badgers. On 17 August, the Minister of State, Jeff Rooker, announced a five-point strategy to tackle the problem of TB in cattle.

LIAISON WITH DEPARTMENT OF HEALTH

The Government's policy puts human health first. The risk to humans is thought to be negligible, given the protection which we receive through pasteurisation of milk, inspection of carcasses at slaughter, cooking of meat and the regular testing of herds and slaughter of reactor animals. However, since the incidence of TB is increasing in cattle, Krebs recommended that the incidence in humans should also be monitored. With the backing of the Chief Veterinary Officer and the Chief Medical Officer, quarterly liaison meetings have been set up between the two departments and a range of issues is being pursued to check that all necessary controls are in place to ensure that the disease is not passed on from cattle to humans.

INCREASE IN INCIDENCE OF TB IN CATTLE

The historical areas of persistent high incidence of TB are the southwest of England, East Sussex and west Wales. In recent years, the incidence of TB has also increased in other areas of England and Wales, notably Herefordshire, the Staffordshire/Derbyshire border and Monmouthshire. For the first six months of 1998, new confirmed TB incidents across the whole of Great Britain increased by more than 40 per cent compared with the same period last year.

CHANGE OF EMPHASIS IN RESEARCH

The research recommended by the Krebs Report included some elements, which were present in the existing MAFF funded programme, but there were also some entirely new initiatives. In order to refocus the TB research work, a research requirement document was issued in April 1998. Some elements of the programme are to be commissioned directly with research groups already working in this field in order to maintain expertise to meet policy needs for the control of the TB programme as a whole. However, for the majority of the programme, MAFF has reflected the Krebs recommendation to use the best expertise in the research community in an open tender competition. Thirty-five research projects were submitted by a wide

Five-Point Strategy on TB in Cattle:

- To minimise the risks to humans and investigate the potential links with human health – new arrangements are being set up with the Department of Health to track human cases;
- For the long term, to carry out research leading to development of a cattle vaccine, as recommended by the Krebs Committee – this may be a 10-15 year programme;
- To understand better how infection is transmitted – this is also built into the Government's research plans;
- To prevent spread from cattle to cattle – routine cattle testing, slaughter of reactors and movement restrictions have this as their aim and the Government is looking to see if it can strengthen them to stop the spread of disease in the short term;
- To carry out the badger culling trial recommended by the Krebs and Bourne Committees in order to find out when culling is an effective approach and when it is not.

range of universities and research institutions for a research programme to start in April 1999. These included vaccine research and work to better understand how the disease is transmitted. The overall research budget has been increased from £1.7 million in 1998/9 to £3.1 million in 1999/2000. Of this, £1 million or more will be spent on vaccine research.

CHANGES TO TESTING REGIME

Following the revision of EU Directive 64/432, which (inter alia) lays down the rules for testing and monitoring the incidence of TB in cattle, MAFF is revising the tuberculin testing arrangements with a view to introducing changes during 1999. In addition, MAFF is looking to see whether any further measures could be taken within Great Britain, which would help stop the spread of the disease in the short term.

BADGER CULLING TRIAL

Krebs concluded that the sum of evidence strongly supports the view that badgers are a significant source of infection in cattle. The strongest evidence comes from cases in which complete or near complete removal of badgers from an area has been followed by a reduction in or complete cessation of herd breakdowns. Although badger culling has taken place for more than 20 years, there has been no scientific study of how, to what extent, and in what circumstances, badger culling is effective in reducing TB incidence.

Professor Krebs concluded that a trial was necessary to find out in which circumstances badger culling is effective in controlling the spread of *M.Bovis.* He suggested a basis for conducting the trial. Professor Bourne and the Independent Scientific Group have taken this forward and have recommended a practical design for the trial.The Group's report, 'Towards a sustainable policy to control TB in cattle – a scientific initiative', was published on 17 August. Following Krebs' recommendation, there would be no badger culling outside the trial areas.

TRIAL DESIGN

The Bourne Group endorsed Krebs recommendation that the trial should compare treatments in 30 areas approximately 100km^2 where TB incidence has historically been high. The areas are to be grouped into 10 sets of three areas (triplets), with each 100km^2 area within a triplet being subject to a different treatment.

The three treatments are:

- A proactive strategy, where as many badgers are removed as possible from the whole area and the area is kept as clear as possible of badgers;
- A reactive strategy, where badgers are removed from farms with TB outbreaks;
- A survey-only strategy, where no badgers are culled but the land is surveyed for details of badger activity.

Where is the trial taking place?

The trial will be conducted in the areas were the risk of TB is greatest. Areas will be selected on a rolling basis to reflect the latest information. The first six areas to be identified are in one triplet on the Cornwall/Devon border and in a second on the Gloucestershire/Herefordshire and Worcestershire border. The remaining 24 areas will be phased in over the next two years. A national Trial Manager has been appointed to run the trial for MAFF. In August 1998, MAFF Wildlife Unit staff began visiting occupiers of land in these areas, to obtain agreement to survey and apply one of the trial treatments. Once surveying was finished in the Cornwall/Devon triplet, treatments were allowed on a random basis. Culling began on 2 December and was continuing at the time of writing.

How will the trial be conducted?

To ensure consistency across all the trial areas, standard operating procedures will be followed, and external and internal audits of aspects of the trial, including the operating procedures, will take place to ensure the validity of the recommendations, which ensue.

The Group concluded that it was unable to recommend the use of snares on the basis of the evidence currently available. Badgers will be removed by cage trapping. It recognised that the use of cage trapping alone may reduce the number of badgers caught and possibly extend the length of the trial.

However, the Bourne Group is satisfied that cage trapping will not reduce the scientific validity of the trial.

The Group also recommend a closed season for culling, from 1 February to 30 April, to minimise the number of lactating females captured at a time when the consequences would be that dependent cubs would be left underground to starve.

Will the trial have an effect on overall badger numbers?

Not enough is known about badger populations to say how many badgers will be culled in the trial. The Krebs report suggested that 12,500 badgers could be removed over the five years of the trial, although some expert commentators feel that this could be an underestimate. The trial will take place on less than 1 per cent of the area of Great Britain and is unlikely to have a significant impact on the national badger population.

Trial results

The Government is committed to making information about the trial widely available. The Bourne Group will need time to assess results. Subject to the need to ensure that the data does not prejudice the outcome of the trial, data will be released as soon as possible.

This paper was originally published in Vol 8 No 4, September 1998.

The 2001 Foot and Mouth Disease (FMD) Outbreak in Great Britain

Jim Scudamore, Chief Veterinary Officer and Director General
Animal Health and Welfare

AN OVERVIEW OF THE 2001 OUTBREAK

FMD was confirmed in pigs in an Essex abattoir on 20 February 2001; the first case in Great Britain since 1981. In total there were 2,026 confirmed cases across Great Britain and 4,017,000 animals were slaughtered during the year in order to eradicate the disease. Although the first case to be confirmed was in pigs at an abattoir in Essex, this was not the index or primary case in the epidemic. The virus responsible for the outbreak was confirmed as the highly virulent pan-Asiatic O type. Restrictions were placed on all FMD-susceptible livestock movements within Great Britain, although this ban was gradually lifted when areas were declared FMD-free. The last reported case was on 30 September 2001.

Epidemiological evidence suggests that the index case occurred in pigs on Burnside Farm, Heddon on the Wall, Northumberland which was licenced to feed waste food under the Animal By Products Order 1991. Disease is thought to have been introduced to this holding at the beginning of February or the end of January 2001. It was subsequently spread in two ways: first, by the movement of pigs to an Essex abattoir and from there by various means to other farms in Essex and Kent. Second, airborne spread to sheep at Prestwick Hall Farm, Ponteland, Northumberland. Subsequent sale of infected sheep from Prestwick Hall Farm, through markets at Hexham (Northumberland), and Longtown

Jim Scudamore, Chief veterinary Officer and Director General Animal Health and Welfare

(Cumbria), resulted in widespread dissemination of disease throughout the rest of England and Wales and to bordering counties in southern Scotland. The latter took place before the suspicion of FMD in pigs at the Essex in abattoir had been reported and the index case traced and identified.

The scale and temporal pattern of FMD cases in the first months of the 2001 epidemic was similar to that in 1967/68. Both reflected the practical problems of controlling epidemics characterised by initial multiple seeding followed by local spread. However, the evidence suggests that in the 2001 epidemic, the index case was the source of infection for all other cases, whereas the 1967/68 epidemic had a multi-centric origin in which a number of pig farms were infected concurrently from the same source. The peak of the 1967/68 epidemic was greater and occurred earlier after the first case.

In the 2001 epidemic there was a delay between the introduction of infection and the reporting of suspect disease to the authorities. This contributed to the widespread dissemination of disease and the scale of the epidemic. In the 1967/68 outbreak disease was detected within four days of the onset of clinical signs on the first affected farm. The only intervening outbreak in 1981 was detected on the index farm and was restricted to a single farm.

Epidemiological enquiries have shown that over 50 premises from the Solway Firth to Devon were already infected by the initial movement before disease was confirmed on 20 February.

The issue of the SVJ is devoted to recording aspects of the FMD outbreak not told elsewhere

Personnel and Organisation

In London, the Joint Co-ordination Centre was established both to co-ordinate the efforts of all government departments involved in dealing with the epidemic and the field operation. The Joint Co-ordination Centre was organised and staffed primarily by DEFRA and the Army. It included representatives of many government departments, the police and the National Farmers Union (NFU).

Linda Smith recalls how the Veterinary Resource Team in Page

Street handled the recruitment of large numbers of Temporary Veterinary Inspectors from many countries.

In the field, Divisional Veterinary Managers set up Disease Control Centres in all the affected areas, drawing initially on locally available resources, such as local veterinary practices, agricultural colleges and auction marts for suitable personnel. These centres were also staffed by people drawn from other parts of DEFRA and many government offices, both centrally and in the regions. As an example, the Newcastle office grew from 7 to 200 staff in two weeks and expanded to over 500 staff over a slightly longer timescale. The articles by Richard Drummond, Nafees Meah and Mike Lomas describe what setting up and running Disease Control Centres entails. Some Local Authorities set up their own co-ordination centres and the article by Ian Jordan of Dumfries and Galloway describes some of their experiences. Some of the actions taken by the Council in placing disinfectant mats on public roads and putting up warning signs outside Infected Areas went further than was advised by SEERAD. Nevertheless the contribution made by Dumfries & Galloway in dealing with the disease and its aftermath received well-deserved recognition.

Laboratory diagnosis and serological surveillance

Laboratory diagnosis was usually based on virus isolation from samples of epithelium taken from affected animals. Serological surveillance was required to provide epidemiological information and to assist in confirming zones were free of infection. The article by Dr Anderson and colleagues from the Pirbright Laboratory describes the diagnostic methods used in combating the outbreak while the articles by Ruth Lysons and Michael Dawson describe the enormous effort, which went into meeting the demand for serological testing, especially during the closing stages.

Vaccination

The government had vaccination under active consideration at all stages of the outbreak, and took into account the European and international legal framework within which the use of vaccination could be deployed. Great Britain had contingency plans in place to support a vaccination programme, including access to emergency supplies of vaccine. Classic ring vaccination was not a practical option when the outbreak was detected. It was very soon clear that many thousands of sheep movements had taken place before the first case of FMD was identified and it was believed, and since confirmed, that the virus had been spread across a wide area. While vaccination was not used during the 2001 epidemic its use has been recommend for the control of future outbreaks by subsequent inquiries. The article by David Mackay describes some of the practical issues in differentiating between vaccinated and infected animals.

This article was written before the publication of The Royal Society's report: Infectious diseases in Livestock. This highlighted the urgent need to achieve validation for the field use of tests that discriminate infected from vaccinated animals.

Carcase disposal

There have been considerable changes in legislation and the public awareness of environmental issues since the last great FMD outbreak in Great Britain in 1967/68. Gordon Hickman and Neil Hughes describe some of the work involved in the disposal of the carcasses of livestock slaughtered during the eradication of FMD.

Cleansing and disinfection

Premises where stock had been slaughtered were subject to cleansing and disinfection. Farm buildings, machinery, vehicles, storage bins, and silos that could have been contaminated with FMD virus were thoroughly cleansed and disinfected with approved disinfectants. Cleansing and disinfection of slaughterhouses and markets was also carried out if there had been any possible contact with FMD infected animals. Tony Potter outlines the principles and some of the practicalities of completing this important task.

Movement controls

Following confirmation of FMD on 20 February 2001 and as soon as it became apparent that the disease might be widespread across a sizeable

part of the country on 23 February, the whole of Great Britain was designated a Controlled Area. The effect was to ban movements of all farmed livestock throughout Great Britain.

Certain movements under official control were permitted for reasons of animal welfare or to allow animals to be slaughtered for human consumption as it would not have been possible to maintain a permanent and total movement standstill across the whole of the country. For this purpose, in mid March the country was divided into three types of area:

- **provisionally free areas** where no outbreaks of FMD occurred;
- **at risk areas** which were either adjacent to infected or were formerly infected areas themselves where restrictions had been lifted;
- **58 infected areas** where there had recently been or still were, FMD outbreaks and where Infected Area movement restrictions continued to be applied pending demonstration of freedom from infection by completion of serological surveillance in the protection zones.

Movements under official control were only permitted from areas of low to high FMD risk until later in the outbreak. In addition to the above, movements under the Livestock Welfare Disposal Scheme direct to slaughter were allowed, subject to official veterinary inspection. Geraldine Whitmore describes the operation of this scheme and the associated Light Lamb Scheme, which was necessary because of the temporary loss of export markets.

Last case and infected area

The last case of FMD in Great Britain was confirmed on 30 September. However, the last Infected Area was not lifted until midnight on 28 November 2001; this released 1,474 farms from Infected Area restrictions. The removal of restrictions followed a programme of blood testing of sheep and goats within the 3km protection zone around infected premises. Blood testing continued on sheep and goats within the 10km surveillance zones as part of the process towards the reclassification of countries from 'at-risk' to 'FMD-free'.

The Office International des Epizooties restored Great Britain's FMD-free status (without vaccination) for the purposes of international trade on 22 January 2002. This was only possible because of the efforts of a large number of people and it is my pleasure to thank everyone concerned.

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