



Post-Chernobyl Monitoring and Controls

Report of Welsh De-Restriction and Experimental Surveys 2008

Food Standards Agency Wales

June 2009

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Welsh De-Restriction and Experimental Monitoring Surveys 2008

Summary

1. Following the Chernobyl accident in 1986, restrictions under the Food and Environment Protection Act 1985 were placed on the movement, sale and supply of sheep in areas of the United Kingdom where contamination levels in sheep meat could potentially cause a risk to public health.
2. In North Wales, of the 5,100 holdings and 2,000,000 sheep originally placed under restriction following the accident, 330 holdings and 180,000 sheep remain under restriction.
3. Surveys of sheep placed under restrictions following the Chernobyl accident are conducted in order to assess the possibility of de-restricting farms. The decision to lift restrictions affecting a particular farm is based on the results of at least two consecutive years monitoring.
4. The Foot and Mouth restrictions in place during the summer of 2007 resulted in no surveys taking place in North Wales.
5. In 2008, flocks from 7 farms in an area to the West of Betws-y-Coed were monitored, totalling 647 sheep. This report recommends that a second De-Restriction survey is conducted on the 7 farms during the summer of 2009 to assess whether any farms can be de-restricted.
6. Experimental Surveys (scoping surveys) were conducted on selected sheep farms under restrictions following the Chernobyl accident to determine if whole flock De-Restriction Surveys (which could lead to the lifting of restrictions) were appropriate to undertake. This report presents the findings of the Experimental Surveys conducted in 2008.
7. Surveys were conducted at 12 farms in the restricted area. Forty sheep at each farm were live monitored (43 on one farm). Of the 803 total sheep monitored, 43 were above the working action level (5.35%) There were no sheep above the working action level at 8 of the 12 farms
8. As the farms were spread throughout the restricted area it is recommended that surveys in 2009 are held at farms in the same area or at farms sharing grazing/pasture in order to identify candidates for removal of restrictions.

Background

9. The accident at the Chernobyl nuclear power plant in April 1986 resulted in radioactive contamination being deposited over many parts of Europe, including the United Kingdom. Some of this radioactivity fell on the uplands of North Wales. The principal radioactive isotope to be deposited was caesium-137. Caesium would normally be bound into the soil and made unavailable for uptake by plants. However, the highly organic nature of the soil in the upland areas means that the caesium remains un-fixed and so available for uptake by animals grazing grass and plants.
10. Monitoring at the time revealed that meat from sheep was the only food to be significantly affected by the contamination. An upper permissible level of 1,000 Becquerels per kilogramme (Bq/kg) was set based on interim advice from a group of experts set up under article 31 of the Euratom treaty and restrictions were placed on the movement, sale and supply of sheep in affected areas of the United Kingdom, under powers in the Food and Environment Protection Act 1985 (FEPA). Sheep determined to be contaminated above the 1,000 Bq/kg limit were, and continue to be, prevented from being moved and from entering the food chain.
11. Accurate determination of the levels of contamination in sheep requires the sheep to be killed and a sample of the meat analysed in a laboratory. To avoid killing sheep, monitors have been developed which enable levels of contamination to be assessed using live monitoring. A detector is used which estimates the levels of radiocaesium contamination within the sheep. In practice, to help ensure that levels of contamination estimated by live monitoring are safely within the 1,000 Bq/kg limit, a Working Action Level (WAL) is used. All sheep leaving a restricted area must be live monitored before permission is granted; this is known as the Mark and Release scheme. Sheep found with estimated concentrations above the WAL are prevented from entering the food chain by marking with indelible paint.
12. To de-restrict farms, surveys of whole flocks (termed De-Restriction Surveys) are conducted in the summer months (when it has been established that levels of radiocaesium in sheep meat are at their highest) to determine the maximum level within the flock. If estimated levels of radiocaesium in the whole of a flock are below the 665 Bq/kg WAL for two consecutive years, then the farm may be considered for de-restriction. In this way areas which may not have been grazed in one year are taken into account the following year. The whole flock surveys are usually preceded by Experimental Surveys; these are screening surveys of 40 sheep conducted on farms identified as potentially being suitable for de-restriction. As there are a relatively large number of restricted farms in Wales, compared to other parts of the United Kingdom, this allows a targeted approach for our resources.
13. Initially, 5,100 sheep farms in Wales were placed under restriction. Levels of contamination have reduced during the 23 years since the accident, with a significant decrease in the number of farms remaining under restrictions. Due to the open environment in much of the area around the Snowdonia Mountains, where the Welsh restricted areas are centred, there are very few stock proof boundaries. This has limited the possibility of de-restricting some farms. Within the restricted area, there remain 330 farms (or part farms), containing approximately 180,000 sheep.

14. The last farm de-restrictions in Wales were in 1998, when a total of 21 farms were de-restricted, and in 2003, where restrictions were removed from 4 farms.

Farms under restriction

15. Alongside the de-restriction surveys and experimental monitoring, work was undertaken to validate the number of farms quoted as being under restriction. The number of operating sheep farms within the restricted area varies with time, affected by market forces and changing priorities. Farms are bought and sold, merge and split. Much of the land within the area is rented, therefore changing tenants will affect the numbers as will farms de-stocking and no longer farming sheep.
16. Where previously 359 farms were quoted as being under restriction, the number as of July 2009 is 330, however, as noted above, this will vary with time.

De-Restriction Surveys

17. Sheep on the 7 farms surveyed in Wales were live monitored during August. Where possible, the monitoring was performed within 24 hours of the animals leaving the fell (hills), because in-bye (lowland) pasture has little contamination and radiocaesium levels in the sheep decrease rapidly with time. This ensures that the most conservative results are recorded.
18. For each sheep, three 10 second live monitor readings were taken. For each monitor used, six background counts were taken (performed by taking a reading against the operator's stomach, whilst crouching to represent the height at which the sheep are monitored), and the mean determined. After deduction of the mean background, the mean live monitor Count Above Background (CAB) was calculated for each sheep. Estimated activity concentrations were determined by multiplication of the CAB with a conversion factor previously derived from laboratory and field calibration tests.

Survey Results

Farm 1	2008	
Number of sheep monitored	136	
Number of sheep above the Working Action Level	0	0%
Number of sheep below the Working Action Level	136	100%
Estimated maximum activity concentration (Bq/kg)	673	
Estimated mean activity concentration (Bq/kg)	376	
Standard deviation (σ , Bq/kg)	125	

Farm 2	2008	
Number of sheep monitored	113	
Number of sheep above the Working Action Level	0	0%
Number of sheep below the Working Action Level	113	100%
Estimated maximum activity concentration (Bq/kg)	429	
Estimated mean activity concentration (Bq/kg)	170	
Standard deviation (σ , Bq/kg)	124	

Farm 3	2008	
Number of sheep monitored	92	
Number of sheep above the Working Action Level	0	0%
Number of sheep below the Working Action Level	92	100%
Estimated maximum activity concentration (Bq/kg)	219	
Estimated mean activity concentration (Bq/kg)	0	
Standard deviation (σ , Bq/kg)	145	

Farm 4	2008	
Number of sheep monitored	61	
Number of sheep above the Working Action Level	0	0%
Number of sheep below the Working Action Level	61	100%
Estimated maximum activity concentration (Bq/kg)	227	
Estimated mean activity concentration (Bq/kg)	0	
Standard deviation (σ , Bq/kg)	158	

Farm 5	2008	
Number of sheep monitored	74	
Number of sheep above the Working Action Level	0	0%
Number of sheep below the Working Action Level	74	100%
Estimated maximum activity concentration (Bq/kg)	454	
Estimated mean activity concentration (Bq/kg)	38	
Standard deviation (σ , Bq/kg)	182	

Farm 6	2008	
Number of sheep monitored	159	
Number of sheep above the Working Action Level	0	0%
Number of sheep below the Working Action Level	159	100%
Estimated maximum activity concentration (Bq/kg)	614	
Estimated mean activity concentration (Bq/kg)	308	
Standard deviation (σ , Bq/kg)	134	

Farm 7	2008	
Number of sheep monitored	12	
Number of sheep above the Working Action Level	0	0%
Number of sheep below the Working Action Level	12	100
Estimated maximum activity concentration (Bq/kg)	597	
Estimated mean activity concentration (Bq/kg)	317	
Standard deviation (σ , Bq/kg)	150	

19. Two sheep at farm 1 exceeded the Working Action Level (WAL) in 2008. Both sheep were taken as samples for laboratory analysis, which demonstrated that the sheep were below the WAL. The results from laboratory analysis are more accurate than those from the field monitors. All of the remaining sheep were below the WAL.
20. **Recommendation:** Flocks from the seven farms near Betws-y-Coed are monitored again during the summer of 2009 to assess their suitability for de-restriction.

Experimental monitoring

21. It was originally planned to monitor 20 farms three times each between July and August, however, the prolonged wet weather resulted in surveys being conducted at 12 farms only. Of the 12 farms surveyed, only one was able to be monitored on three occasions and six on two occasions. 40 sheep were selected at random from flocks on upland grazing and live monitored.
22. Three 10 second live monitor readings were taken for each lamb. The mean Count Above Background (CAB) was then derived for each lamb and an Estimated Activity Concentration derived by multiplication with a conversion factor.

Farm 1

	Round 1
Number of sheep monitored	40
Number of sheep above the Working Action Level	1
Number of sheep below the Working Action Level	39
Percentage failures (%)	2.50%
Estimated maximum activity concentration (Bq/kg)	665
Estimated mean activity concentration (Bq/kg)	357
Standard deviation (σ , Bq/kg)	145

Farm 2

	Round 1
Number of sheep monitored	40
Number of sheep above the Working Action Level	0
Number of sheep below the Working Action Level	40
Percentage failures (%)	0%
Estimated maximum activity concentration (Bq/kg)	311
Estimated mean activity concentration (Bq/kg)	138
Standard deviation (σ , Bq/kg)	59

Farm 3

	Round 1
Number of sheep monitored	40
Number of sheep above the Working Action Level	0
Number of sheep below the Working Action Level	40
Percentage failures (%)	0%
Estimated maximum activity concentration (Bq/kg)	311
Estimated mean activity concentration (Bq/kg)	145
Standard deviation (σ , Bq/kg)	73

Farm 4

	Round 1	Round 2	Round 3
Number of sheep monitored	40	40	40
Number of sheep above the Working Action Level	1	11	0
Number of sheep below the Working Action Level	39	29	40
Percentage failures (%)	2.50%	27.50%	0%
Estimated maximum activity concentration (Bq/kg)	665	925	387
Estimated mean activity concentration (Bq/kg)	383	548	160
Standard deviation (σ , Bq/kg)	131	95	82

Farm 5

	Round 1
Number of sheep monitored	40
Number of sheep above the Working Action Level	0
Number of sheep below the Working Action Level	40
Percentage failures (%)	0%
Estimated maximum activity concentration (Bq/kg)	631
Estimated mean activity concentration (Bq/kg)	383
Standard deviation (σ , Bq/kg)	123

Farm 6

	Round 1	Round 2
Number of sheep monitored	43	40
Number of sheep above the Working Action Level	4	0
Number of sheep below the Working Action Level	39	40
Percentage failures (%)	9.30%	0%
Estimated maximum activity concentration (Bq/kg)	866	370
Estimated mean activity concentration (Bq/kg)	463	128
Standard deviation (σ , Bq/kg)	146	95

Farm 7

	Round 1	Round 2
Number of sheep monitored	40	40
Number of sheep above the Working Action Level	0	0
Number of sheep below the Working Action Level	40	40
Percentage failures (%)	0%	0%
Estimated maximum activity concentration (Bq/kg)	423	177
Estimated mean activity concentration (Bq/kg)	298	60
Standard deviation (σ , Bq/kg)	71	46

Farm 8

	Round 1	Round 2
Number of sheep monitored	40	40
Number of sheep above the Working Action Level	0	0
Number of sheep below the Working Action Level	40	40
Percentage failures (%)	0%	0%
Estimated maximum activity concentration (Bq/kg)	336	429
Estimated mean activity concentration (Bq/kg)	167	333
Standard deviation (σ , Bq/kg)	77	51

Farm 9

	Round 1	Round 2
Number of sheep monitored	40	40
Number of sheep above the Working Action Level	13	13
Number of sheep below the Working Action Level	27	27
Percentage failures (%)	32.50%	32.50%
Estimated maximum activity concentration (Bq/kg)	849	942
Estimated mean activity concentration (Bq/kg)	587	641
Standard deviation (σ , Bq/kg)	134	121

Farm 10

	Round 1	Round 2
Number of sheep monitored	40	40
Number of sheep above the Working Action Level	0	0
Number of sheep below the Working Action Level	40	40
Percentage failures (%)	0%	0%
Estimated maximum activity concentration (Bq/kg)	151	177
Estimated mean activity concentration (Bq/kg)	0	58
Standard deviation (σ , Bq/kg)	99	56

Farm 11

	Round 1
Number of sheep monitored	40
Number of sheep above the Working Action Level	0
Number of sheep below the Working Action Level	40
Percentage failures (%)	0%
Estimated maximum activity concentration (Bq/kg)	227
Estimated mean activity concentration (Bq/kg)	149
Standard deviation (σ , Bq/kg)	55

Farm 12

	Round 1	Round 2
Number of sheep monitored	40	40
Number of sheep above the Working Action Level	0	0
Number of sheep below the Working Action Level	40	40
Percentage failures (%)	0%	0%
Estimated maximum activity concentration (Bq/kg)	336	151
Estimated mean activity concentration (Bq/kg)	172	4
Standard deviation (σ , Bq/kg)	59	52

23. Of the 12 farms surveyed, failures were recorded at 4. Of the total number of sheep monitored (803) there were 43 sheep above the working action limit (5.35%) The estimated maximum activity concentration found was 942 Bq/kg (farm 9)
24. The results suggest that other farms within the restricted area may be suitable candidates for de-restriction. Budget permitting, further experimental monitoring should be undertaken in 2009 to build upon the 2008 results and identify area which may be targeted for de-restriction.
25. **Recommendation:** The 12 farms surveyed were located throughout the restricted area, therefore, the 2009 surveys should target farms within discrete areas and any contiguous farms, in order to identify suitable candidates for de-restriction.