

**Livestock health:****A comparison between 'sudden death' poisoning in sheep grazing phalaris pastures at Dubbo, Naracoorte and Esperance.**

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The phalaris toxicity complex comprises three unrelated forms of poisoning. The first is phalaris staggers, the second is a cardiac form of 'sudden death', and the third is a polioencephalomalacic (or PE) form of 'sudden death' (Bourke *et al* 1988 and 1990, Bourke and Carrigan 1992). Phalaris staggers can affect sheep or cattle and cause nervous symptoms which persist for days, weeks or sometimes months. Cardiac 'sudden death' can affect sheep and horses. It causes small numbers of animals to suddenly collapse and die when a flock is mustered or disturbed in some other way. PE 'sudden death' can affect sheep and results in large numbers dying overnight, within 12 to 48 hours of being moved onto a paddock of phalaris.

PE 'sudden death' has been responsible for many outbreaks of phalaris 'sudden death' in NSW, and was first recognised in an outbreak at Dubbo in 1986. Outbreaks of phalaris 'sudden death' have occurred in South Australia, notably at Naracoorte, and in Western Australia, notably at Esperance. These outbreaks are also thought to involve the PE form of 'sudden death', but this is yet to receive laboratory confirmation. The following three case reports highlight the factors that are frequently associated with outbreaks of this form of phalaris toxicity.

**Case 1. 'Carinya' Ballimore via Dubbo, Central NSW**

Phalaris poisoning occurred on a series of small paddocks (6 to 10 ha each) on an alluvial sandy loam soil along a river flat. Soil pH was 5.0 to 5.5. The area had been sown to Sirocco phalaris and was being managed on a tight rotational grazing system using Merino sheep. The average annual rainfall in this district is 600 mm, and there is no seasonality of rainfall distribution. The year in which the outbreak of 'sudden death' occurred was a drought year. In late May 1,500 Merino wethers were moved onto a drought affected phalaris dominant paddock at the end of the day. Next morning 4 sheep were recumbent, by that afternoon a number of sheep were lying on their side convulsing. Their limbs were stiff, they were paddling, frothing at the mouth, stretching their necks backwards and had flickering eye movements. In addition about 30 sheep were dead, and by the following day this had

increased to 100. The phalaris pasture was very short but had started to re-shoot in response to a very limited recent fall of rain (8mm). The phalaris was stocked at 250 sheep/ha.

Four weeks later (late June) the drought conditions continued and a mob of 2,500 merino hoggets were put onto another phalaris pasture, again at about 250 sheep/ha. The phalaris was up to 10 cm high but sparse. Much of the phalaris consisted of dry butts, many of which were pulled up by the sheep and eaten. On the first day they were left on for 3 hours, and on the second day 1 hour, without any problems. On the third day they were put on the phalaris paddock in the morning and were all well when checked 6 hours later. However the following morning 200 were found dead and another 30 were sick. Most of these affected survivors died over the following 24 hours. Their symptoms included depression, mild head tremors, fine body tremors, aimless wandering, apparent blindness, head pressing, a high stepping gait, ataxia, star gazing (opisthotonus), and lateral recumbency with either convulsions or coma.

The following factors probably contributed to this mortality at Dubbo. The sheep were very hungry when put on the phalaris pasture. The pasture was predominantly phalaris. The phalaris was drought affected but re-shooting after a very limited amount of rain. The sheep were being rotationally grazed using very high stocking rates. The sheep consumed a lot of plant material in a short period of time. It is noteworthy that prior test grazing of several hours duration gave no indication of the potential toxicity of this phalaris pasture.

**Case 2. 'Waverley' Naracoorte, South Eastern, South Australia**

The portion of this property involved in outbreaks of phalaris poisoning consisted of a well maintained Holdfast phalaris stand harvested annually for the production of certified seed. The livestock enterprise on the property was based on Merino sheep. The soil type was a black sandy loam, over red clay and ironstone. The site was a slightly elevated, well drained ridge. Soil pH was originally 5.5, but use of alkaline irrigation water had lifted it to 6.5. The pasture was kept very pure

and free of all other plants. The dry phalaris trash along the phalaris rows was removed by burning, hence when sheep were given access to this block they were only able to graze pure fresh green phalaris shoots. The stocking rate was high, and grazing was carried out for short periods only, to control the rate of development of the phalaris plants during the early to mid growing season period.

The average annual rainfall in this district is 600 mm and the seasonality of rainfall distribution winter-spring (June to Nov). December to May is usually hot and dry. Supplementary irrigation was used on the phalaris seed block to ensure adequate consistent growth, and adequate seed set and seed development, consequently it was normally only used in the mid to late growing season. The sheep were managed on a loose rotational grazing system. Problems with 'sudden death' occurred in sheep on this property during the March to June period, when phalaris growth was erratic because of the unreliability of rainfall at that time of the year. Affected sheep were either found dead, or observed to develop symptoms and then to die, during the first 12 to 48 hours after being moved onto the phalaris seed block. The symptoms displayed were as follows: sheep became depressed, stopped grazing, stood about, gradually developed tremors and twitches, then went down into lateral recumbency. Some developed limb rigidity, paddled, frothed at the mouth and died, while others became comatose before dying.

The factors that contributed to these mortalities at Naracoorte appear to have been as follows: the stand of phalaris was pure, the stage of growth grazed was new short green shoots, the time of the year when losses occurred was usually hot and dry but with occasional patchy falls of first seasonal rains. The sheep went onto the phalaris hungry, they were rotationally grazed and the stocking rate was high; they consumed a lot of plant material in a short period of time.

### **Case 3 'Oake Marsh Farm', Esperance, Southern, Western Australia**

The portion of this property involved in phalaris poisoning consisted of 200 ha divided up into 35 ha paddocks and sown down to phalaris. These pastures were rotationally grazed by Merino sheep and a portable electric fence used to facilitate a strip grazing system within each paddock. The phalaris cultivar sown was Sirolan. The stocking rate used was nominally 84/DSE/ha, in reality the moveable strip fence created an effective stocking rate of 750 sheep per hectare. The average annual rainfall in this district is 600 mm and the seasonality of rainfall distribution is winter-spring (June to November). December to May is usually hot and dry. The phalaris pasture was about 15 to 20 cm high when grazed, and was fresh green and short

regrowth plant material. The soil type was sand over clay, typically 25 to 50 cm deep. The sandy topsoil was water repellent and had a pH of 4.5 to 5.5. The water table was high, water logging was a problem, and salinity was developing.

Outbreaks of 'sudden death' had occurred every year in sheep on these pastures since they were first sown in the winter of 1989, up until they were removed by herbicide application in the winter of 1996. These outbreaks always occurred between December and May. That is they occurred when the pastures were phalaris dominant, and when that phalaris was suffering from heat and moisture stress. The outbreaks commonly occurred about 4 weeks after an isolated fall of rain. Sheep losses ranged from 2 to 51%, with an average figure of 15%. Symptoms of poisoning would first develop within 8 to 12 hours of the sheep being given access to a fresh strip of phalaris pasture, and deaths would follow within 24 to 48 hours. The symptoms observed in affected sheep were as follows: disorientation, wandering away from the mob, depression (standing with head held low), walking into electric fences, tremors and twitches, collapse into lateral recumbency with limb paddling and foaming at the mouth, increasingly laboured respiration, convulsions and death.

The following factors appear to have contributed to these deaths at Esperance. The stand of phalaris continued to grow when all other pasture species in the mix had ceased to grow and had been eaten out. The pasture was therefore pure phalaris. The stage of growth being grazed was new short green shoots, the time of the year was hot and dry but there had been occasional light falls of rain that were enough to maintain some phalaris growth. The sheep were being managed under a very tight strip grazing rotational system, this ensured that they were hungry prior to grazing each new strip. In addition, the very high stocking rate ensured that each sheep ate ravenously when offered a new strip, so as to obtain the green shoots before the others.

### **Conclusions**

The phalaris toxin responsible for the PE form of 'sudden death' is unknown. However it is clear from the above three case studies that it occurs in several phalaris cultivars and that its level in the plant rises in response to adverse seasonal conditions, notably soil moisture stress. Many sheep are able to successfully detoxify this phalaris toxin, provided they are given the chance to increase their intake of it slowly. It is the sudden, rapid ingestion of large amounts of phalaris plant material, at a time when the levels of toxin are rising, or are already high, that kills sheep.

### **References**

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