



GENE CHECK NEWS

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SEASON'S GREETINGS

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Codon 136

By now most of you have probably heard that there has been a QR sheep diagnosed with scrapie in the US. What is most important about this particular case is the rest of that sheep's prion protein genotype. The sheep was AV at codon 136. QR AV sheep are not susceptible to strain C scrapie but are susceptible to strain A scrapie. We had all hoped that we did not have strain A scrapie in this country, but apparently we do. A few facts:

1. Any sheep with a "V" at codon 136 is susceptible to strain A scrapie. Only AA sheep are resistant to strain A scrapie.
2. All codon 171 RR sheep are AA at codon 136. RR sheep are resistant to both strains of scrapie.
3. QQ VV and QQ AV sheep are susceptible to both strain A and strain C scrapie.

What is a "strain" of scrapie?

Remember that scrapie is caused by an infectious protein (prion) that is a misfolded form of a normal protein (prion protein). Prions do not replicate as do viruses or bacteria, but rather "recruit" other normal proteins to convert to the misfolded form, presumably by acting as some sort of template. Strains of scrapie are differently folded forms of the same protein. Imagine a long string of beads on a wire. That wire can be folded into many different shapes without changing any of the beads. It is similar with proteins, which are long strings of amino acids. However, changing certain "beads" (amino acids) in the protein can prevent the protein from assuming some shapes. For example, an "A" at codon 136 will prevent the prion protein from adopting the shape that is characteristic of strain A scrapie. However, an "A" at codon 136 does not prevent the protein from adopting the shape that is characteristic of strain C scrapie, provided the protein has a "Q" at codon 136.

People sometimes talk about the prion protein "mutating" to become a prion. This is not correct. A mutation is a change in the DNA, which can result in a change in a protein's amino acid sequence. However, the prion protein does not change its amino acid sequence when it converts to a prion, only its shape.

Enough science. What does it mean to us as sheep producers that we apparently have strain A in the US? Unfortunately, it may mean that we will need to do some additional DNA testing. Because testing is not free, the goal needs to be to minimize the amount you need to do. At Gene Check, we still do not recommend testing routinely at codon 136. Remember, if you are breeding toward RR at codon 171, you are automatically breeding toward AA at codon 136. If all you are selling is RR animals, don't bother testing anything at codon 136. If you are selling QR animals, as most of us still are, you may want to test some.

A new blood sample is not needed to test codon 136. We can use the DNA from codon 171 or spider testing.

Which animals to test? The simplest plan is to test every QR you intend to sell. However, if you will be selling QR sheep for a few more years, that plan may not be the most cost effective. If you are using only RR rams, or intend to use only RR rams on your QR and QQ ewes, it may be most efficient to test the ewes, particularly the QR ewes, from which you are planning to sell QR offspring. If you are using an RR ram, he will only contribute "A" at codon 136 to his offspring. Therefore, if a lamb from an RR x QR cross is AV, the dam must have been QR AV. In other words, when you cross an RR AA ram with a

QR AV ewe, all QR lambs must be AV. Again, in a QR AV animal, the "A" is linked with and will always be passed on with the "R" and the "V" is linked with and will always be passed on with the "Q". Because of this linkage, you can draw a simple Punnett square for the RR AA x QR AV cross:

		Sire	
		RA	RA
Dam	QV	QR AV	QR AV
	RA	RR AA	RR AA

Note two things about this cross: (1) Half the offspring will be RR and half will be QR - no surprises there - (2) **ALL** the QR offspring will be AV. Therefore, if you are going to sell QR lambs out of an RR x QR cross, we recommend that you test **only** the QR parent at codon 136. If the QR parent is AA, you don't need to worry about the lambs at codon 136. If the QR parent is AV, you still only need to test the lambs at codon 171. All the RR lambs will be AA and all the QR lambs will be AV.

If you are using a QR ram, you really should check his codon 136 genotype. If he is AA and you only use him on RR ewes (or QQ or QR ewes that you know are AA at codon 136) it is not necessary to test any lambs at codon 136.

However, if you use a QR ram on QR or QQ ewes that are AV, you should test QR lambs before selling them.

With what we know today, the safest thing for a breeder to do is to avoid selling any QQ sheep and any QR AV sheep. If you have any questions or want to discuss your particular situation, call Gene Check at **800 822-6740**.

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