BVD – A case of immunosuppression and infertility.

Introduction

BVD is one of the most important health concerns on Northern Irish farms and is highly prevalent in certain districts of the island. As of March 2016 a national eradication programme has been put in place involving tissue tagging, however even now in many localities farmer education has been poor and therefore knowledge of this particular disease is limited. Portglenone, County Antrim falls into this category and so vaccination uptake and eradication strategies on farm have been minimal over the years. For this reason it was high on our list of diseases to address for one of our Suckler and beef clients, whose work we took on after opening a new branch surgery in the area. Following months of frustrating fire-brigade veterinary work we discussed that perhaps a look at whole herd health and some diagnostic testing would be useful. Problems on the farm were numerous and included weak calves who were slow to stand and start suckling; scour and pneumonia in young animals, dietary upset in cows, poor cow condition and general queries over fertility. This was a farm where although the farmer was knowledgeable and nutrition was good there seemed to be an underlying immunosuppression issue causing on farm productivity and profitability to be poor. BVD is known to cause primary disease in the form of early embryonic losses and mucosal disease in persistently infected animals, however it is the secondary diseases which result in the most significant economic losses. These secondary diseases are primarily due to the immunosuppression caused by the virus as it is passed transiently through the herd.

Investigation

Pneumonia and scour in young stock and body condition in adult animals were our initial main concerns. We therefore started our work-up with antibody bloods to check for the common pneumonia viruses, as well as mycoplasma. Calves between 6 and 12 months of age were blood sampled and results showed positive antibodies for BRSV and PI3, however they were negative for IBR, BVD and Mycoplasma. A comprehensive pneumonia vaccination strategy was put in place at this point for youngstock and the BVD question was put to the back of our minds.

Table 1: Pneumonia antibody results from calves 6-12 months of age, taken January 2015.

Serology (antibody)					
Animal	Sample type	BRSV Elisa	BVDVp80	IBRV	PI3V
		$ SOP DSIB 257	$ SOP DSIB 176	$ SOP DSIB 257	$ SOP DSIB 257
1633	Clot	Pos 62.3%*	Neg -5.12%*	Neg 2.9%	Pos 117%*
1644	Clot	Pos 77.8%*	Neg -7.77%*	Neg -.01%	Pos 133%*
1605	Clot	Pos 61.5%*	Neg -3.71%*	Neg 3.5%	Pos 79.7%*
1643	Clot	Pos 74.8%*	Neg -.42%*	Neg 7.0%	Pos 93.8%*
1617	Clot	Pos 75.1%*	Neg 3.5%*	Neg 2.8%	Pos 151%*

Faecal samples were also taken from young calves and revealed problems with cryptosporidial infection (Table 2 below). Being aware that most neonatal diseases are improved by adequate colostrum consumption and absorption, blood samples were taken from young calves aged two to three days old to check total protein levels. Although the calves sampled had received colostrum at birth and the farmer ensured all calves either “got a suck” or were stomach tubed with colostrum, total protein results were disappointing, which likely contributed to the high disease rate in young calves. Being a suckler farmer this was a difficult issue to address since there was not the endless supply of colostrum on a suckler farm that you will find on a dairy farm, and most artificial colostrum substitutes do not actively contain antibodies. Consequently hygiene of calving pens was made a priority and Halocur for 7 days from birth was implemented on farm to improve calf health.

Table 2: Faecal sample from 10 days old calf, taken April 2015.

Diagnostic Bacteriology				
Animal	Sample type	Bacterial species		Level
A	Faeces	No significant bacteria		Negative
Parasitology				
Animal	Sample type	Crypto (micro)		
A	Faeces	++*		
Virus Detection				
Animal	Sample type	Corona	Rota	
		SOP DSIB 270	SOP DSIB 270	
A	Faeces	Neg	Neg	

Having addressed issues with calf health we turned our attention to the condition of the suckler cows. On farm faecal investigations initially revealed that all stock that had grazed the previous season were heavily infected with Paramphistomes, more commonly referred to as Rumen Fluke. We attributed the poor body condition of the suckler cows predominantly to this parasite infection, and therefore treated accordingly with an Oxyclozanide based product. However repeat treatments were required throughout the winter period to address on-going issues with scour and condition loss in individual animals.

With the poor body condition of the cow herd and the level of parasitic infestation we decided to ensure trace element supplementation was adequate. Also although control measures had been put in place to try to combat the pneumonia and scour issues in calves, both diseases still seemed prevalent, and so blood samples were taken from cows 4-8weeks prior to calving. Samples were tested for Copper, Selenium and Iodine levels and results showed severe deficiencies in both Selenium and Iodine levels (Table 3 below). At this same time we decided to re-check our BVD status to ensure that it was not having a role in our immunosuppression on farm. We repeated our antibody testing of calves greater than 6 months old and found that all but one were negative for BVD antibody (Table 4 below). The positive calf was the youngest of the batch and therefore it was queried as to whether this result could be attributed to maternal antibodies or whether it was a sign

of active infection. The decision was therefore taken that bloods would be repeated if health issues continued.

Table 3: Blood sample results for trace elements taken from pre-calvers November 2015

Biochemistry (Blood samples)				
Animal	Sample	Plasma Copper	GPX	Pool PII
		uM	U/g Hb	ug/L
P1 1447-1	Blood CH	7.9*	51*	
P1 1593-2	Blood CH	10.5*	325*	
P1 25-1	Blood CH	6.7*	341*	
P1 1473-1	Blood CH	7.2*	116*	
P1 199-7	Blood CH	16.3*	118*	
P1 1452-1	Blood CH	8.8*	70*	
Pool 1	Serum			38
Lower Limit		8	160	
Upper Limit		16		

Table 4: Blood sample results from calves 6-8 months old, taken November 2015

Serology (antibody)		
Animal	Sample type	BVDVp80
		$ SOP DSIB 176
1679-4	Clot	Neg 3.5%
1684-2	Clot	Neg 7.6%
1672-4	Clot	Neg 2.1%
1643-3	Clot	Neg 8.4%
1683-1	Clot	Neg 6.0%
1694-5	Clot	HPos 93.9%

Knowing that trace element deficiencies can attribute to immunosuppression it was therefore deemed appropriate to use rumenal boluses to ensure adequate supplementation, and all cows were painted with 20ml of aqueous iodine on a weekly basis prior to calving. The farmer was also advised to improve his mineral spec and ensure all stock received a high quality mineral as part of their diet. It was hoped this would also improve calf health by ensuring new born calves were not suffering from either iodine or selenium deficiencies. Blood samples were taken post bolusing to ensure that trace element levels were within normal ranges again (Table 5 below) and as a result of treatment calves born from cows post bolusing seemed both livelier and more willing to get up and suck after calving.

Table 5: Blood sample results from cows post bolusing, taken March 2016

Biochemistry (Blood samples)				
Animal	Sample	Plasma Copper	GPX	Plasma Iodine
		uM	U/g Hb	ug/L

1605-7	Blood CH	17.7*	280*	>150
1390-2	Blood CH	13.5*	356*	>150
1321-3	Blood CH	13.6*	168*	118
39-1	Blood CH	16.1*	386*	>150
1555-6	Blood CH	12.1*	235*	>150

Health on farm improved significantly until in January 2016 I received a phone call from the farmer. He had just scanned a batch of heifers and was deeply distressed to find only 4 out of 14 were in calf. With this news we decided to re-sample the calves that had previously been tested for BVD antibodies, as well as calves from 2 other batches to see whether BVD could be resulting in the infertility in the heifers. Results showed that previously antibody negative animals were now antibody positive and from this we concluded that BVD was actively being transmitted on farm. Since all stock were both home bred and housed at the time it was highly likely that a PI animal was present on farm (Table 6 below).

Table 6: Blood sample results from calves 6-12 months old housed in 3 separate batches, taken January 2016

Serology (antibody)		
Animal	Sample type	BVDVp80
		$ SOP DSIB 176
1699 B1	Clot	HPos 100.0%
1710 B1	Clot	HPos 100.0%
1713 B1	Clot	HPos 100.0%
1714-4 B1	Clot	Neg 12.5%
1720 B1	Clot	LPos 70.1%
1694 B2	Clot	HPos 100.0%
1700 B2	Clot	HPos 100.0%
1701 B2	Clot	Neg -.08%
1706 B2	Clot	Neg 9.2%
1715 B2	Clot	HPos 100.0%
1624 B3	Clot	Neg 5.6%
1626 B3	Clot	Neg 7.4%
1629 B3	Clot	Neg 9.8%
1635 B3	Clot	Neg 3.5%
1648 B3	Clot	Neg -2.18%

Fortunately the farm was due an annual TB and Brucellosis test 2 weeks later and it was decided that all animals would be blood sampled and tested for BVD antigen. Samples were submitted to AFBI diagnostic lab and we requested they be tested using their pooled PCR. Out of 200 blood samples, we had one animal who was BVD antigen positive, all other animals were antigen negative (Appendix 1 and 2). On discussion of the blood sample results with the farmer, he said the positive calf had been a poor doer from birth and decided to euthanase this animal. All breeding stock was vaccinated and an ongoing BVD vaccination policy was put in place.

Conclusion

Two months post removal of the BVD PI animal we were back on farm for the follow up TB test. Herd health was discussed along with the vaccination programmes put in place. Since the removal of the BVD positive calf the farmer was amazed at how well his animals were thriving. New born calves were having only minor problems with scour and pneumonia which were easily cured, his heifers were in calf having been vaccinated and his beef bulls had “never grown like it”. Overnight the farm went from having “nearly every problem under the sun” to being a successful enterprise with a very happy farmer at the helm.

It is clear to see that BVD on this unit was underlying and transient infections between animals were resulting in significant losses from secondary diseases. Although identification of these secondary diseases was necessary and control measures implemented, only once the underling BVD issue was resolved did the health on farm really start to improve. This is likely because any control protocols put in place were still being hampered by the BVD infection. In this case I think we see the importance of BVD as an underlying disease which must be eradicated on farm to ensure that all other disease control protocols also have a successful outcome.

Appendix 1: Blood sample results for all animals less than 2 years old taken for pooled PCR for BVD antigen.

Animal tags and pool distribution		
1773 B1	1744 B1	1756 B1
1752 B1	1765 B1	1757 B1
1762 B1	1740 B1	1722 B1
1704 B1	1780 B1	1750 B1
1746 B1	1745 B1	1764 B1
1759 B1	1758 B1	1720 B1
1724 B1	1733 B1	1772 B1
1760 B1	1748 B1	1753 B1
1741 B1	1763 B2	1754 B2
1729 B2	1707 B2	1732 B2
1774 B2	1771 B2	1742 B2
1751 B2	1749 B2	1761 B2
1766 B2	1714 B2	1710 B2
1735 B2	1769 B2	1770 B2
1743 B2	1747 B2	1721 B2
1768 B2	1755 B2	1702 B2
1734 B2	1708 B2	1699 B3
1718 B3	1705 B3	1684 B3
1711 B3	1695 B3	1691 B3
1620 B3	1614 B3	1624 B3
1738 B3	1719 B3	1683 B3
1700 B3	1694 B3	1690 B3
1773 B3	1697 B3	1634 B3
1635 B3	1713 B3	1706 B3
1715 B3	1643 B3	1642 B3
1672 B4	1692 B4	1681 B4
1623 B4	1629 B4	1728 B4
1717 B4	1676 B4	1727 B4
1679 B4	1731 B4	1685 B4
1693 B4	1626 B4	1648 B4
1703 B4	1736 B4	1701 B4
1739 B4	1723 B4	1726 B4
1687 B4	1686 B4	1615 B4
1621 B4	1716 B5	1778 B5
1698 B5	1725 B5	1730 B5
1776 B5	1779 B5	1777 B5
No tag B5	Batch 1	Batch 2
Batch 3	Batch 4	Batch 5
Virus Detection		
Report continued overleaf for case: 2016-003453		(Page 1)
		Report continued for Case: 2016-003453

Animal	Sample type	BVDV	BVDV Pool RT-PCR
		$ SOP DSIB 234 $	
1763 B2	Clot	Neg .0	
1754 B2	Clot	Neg .009	
1729 B2	Clot	Neg -.004	
1707 B2	Clot	Neg -.002	
1732 B2	Clot	Neg .01	
1774 B2	Clot	Neg -.009	
1771 B2	Clot	Neg -.012	
1742 B2	Clot	Neg -.004	
1751 B2	Clot	Neg -.003	
1749 B2	Clot	Neg .004	
1761 B2	Clot	Neg .007	
1766 B2	Clot	Neg .0	
1714 B2	Clot	Neg .001	
1710 B2	Clot	Neg .001	
1735 B2	Clot	Neg -.003	
1769 B2	Clot	Neg .002	
1770 B2	Clot	Neg -.004	
1743 B2	Clot	Neg .01	
1747 B2	Clot	Neg .004	
1721 B2	Clot	Pos 3.93	
1768 B2	Clot	Neg .014	
1755 B2	Clot	Neg .012	
1702 B2	Clot	Neg .002	
1734 B2	Clot	Neg .002	
1708 B2	Clot	Neg -.005	
Batch 1	Serum		NEG .0*
Batch 2	Serum		POS 29.327*
Batch 3	Serum		NEG .0*
Batch 4	Serum		NEG .0*
Batch 5	Serum		NEG .0*

Appendix 2: Blood sample results for all animals greater than 2 years old taken for pooled PCR for BVD antigen.

Animal tags and pool distribution		
B1 UK 9 121078 1390 2	B1 UK 9 124387 0124 2	B1 UK 9 124387 39 1
B1 UK 9 124387 0010 7	B1 UK 9 121078 1436 6	B1 UK 9 121078 1125 3
B1 UK 9 124387 0175 4	B1 UK 9 1786 1968 3	B1 UK 9 121078 1286 3
B1 UK 9 124387 0151 1	B1 UK 9 124387 0043 5	B1 UK 9 121078 1555 6
B1 UK 9 124387 0137 1	B1 UK 9 124387 0048 3	B1 UK 9 121078 1321 3
B1 UK 9 121078 1543 1	B1 UK 9 121078 1549 7	B1 UK 9 121078 1248 7
B1 UK 9 124387 0132 3	B1 UK 9 124387 0111 3	B1 UK 9 121078 1605 7
B1 UK 9 121078 1516 2	B1 UK 9 124387 0054 2	B1 UK 9 121078 1207 1
B1 UK 9 121078 1053 1	B2 UK 9 124387 0055 3	B2 UK 9 121078 1204 5
B2 UK 9 121078 1564 1	B2 UK 9 121078 1526 5	B2 UK 9 121078 1393 5
B2 UK 9 121078 1308 4	B2 UK 9 121078 1305 1	B2 UK 9 121078 1498 5
B2 UK 9 121078 1388 7	B2 UK 9 121078 1351 5	B2 UK 9 121078 1059 7
B2 UK 9 121078 1458 7	B2 UK 9 121078 1500 7	B2 UK 9 121078 1452 1
B2 UK 9 121078 1601 3	B2 UK 9 124387 0112 4	B2 UK 9 124387 0188 3
B2 UK 9 121078 1406 4	B2 UK 9 121078 1568 5	B2 UK 9 121078 1594 3
B2 UK 9 651858 0721 4	B2 UK 9 121078 1410 1	B2 UK 9 124387 0025 1
B2 UK 9 123747 0990 2	B2 UK 9 124387 0199 7	B3 UK 9 124387 0183 5
B3 UK 9 121078 1473 1	B3 UK 9 121078 1596 5	B3 UK 9 124387 0174 3
B3 UK 9 124387 0201 2	B3 UK 9 121078 1332 7	B3 UK 9 121078 1600 2
B3 UK 9 121078 1520 6	B3 UK 9 121078 1604 6	B3 UK 9 121078 1593 2
B3 UK 9 121078 1592 1	B3 UK 9 121078 1121 6	B3 UK 9 121078 1598 7
B3 UK 9 121078 1341 2	B3 UK 9 120846 2248 2	B3 UK 9 121078 1453 2
B3 UK 9 121078 1424 1	B3 UK 9 121078 1561 5	B3 UK 9 121078 1570 7
B3 UK 9 124387 0145 2	B3 UK 9 121078 1578 1	B3 UK 9 124387 0203 4
B3 UK 9 121078 1563 7	B3 UK 9 121078 1437 7	B3 UK 9 124387 0202 3
B4 UK 9 121078 1569 6	B4 UK 9 121078 1541 6	B4 UK 9 124387 0173 2
B4 UK 9 564413 0419 6	B4 UK 9 121078 1282 6	B4 UK 9 121078 1579 2
B4 UK 9 124387 0139 3	B4 UK 9 121078 1472 7	B4 UK 9 124387 0106 5
B4 UK 9 124387 0011 1	B4 UK 9 121078 1300 3	B4 UK 9 121078 1447 3
B4 UK 9 124387 0219 6	B4 UK 9 121078 1197 5	B4 UK 9 124387 0216 3
B4 UK 9 124387 0206 7	B4 UK 9 123747 1036 6	B4 UK 9 121078 1501 1
Batch 1	Batch 2	Batch 3
Batch 4		
Virus Detection		

Animal	Sample type	BVDV Pool RT-PCR
		$
Batch 1	Serum Pool	NEG
Batch 2	Serum Pool	Neg
Batch 3	Serum Pool	Neg
Batch 4	Serum Pool	Neg