

An Update on Neuropathic Hydrocephalus in Cattle

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As a result of the cooperation and collaboration between the American Angus Association, its member breeders, the University of Nebraska-Lincoln and the University of Illinois, the causative mutation responsible for the extreme form of hydrocephalus that has been observed in Angus cattle has been identified. Based on the disease pathology, the function of the mutated gene and a desire to more specifically define this defect using appropriate nomenclature, we have chosen Neuropathic Hydrocephalus (NH) as the descriptor for this condition. In accordance with the standard naming system, an individual that has been tested and found not to be a carrier for the defect is referred to as Neuropathic Hydrocephalus-Free (**NHF**). Alternatively, those animals that are found to be heterozygous (i.e., carriers) should be referred to as NH-Carrier (**NHC**). Calves born affected with the condition are homozygous for the mutation (i.e., inherit the mutation from both parents) and are NH-Affected (**NHA**).

To identify pedigrees that are at risk for carrying this genetic defect, two analyses have been conducted. Firstly, using DNA from affected calves and their relatives, we have identified the founder of the mutation causing NH. All NH affected calves trace back to the common ancestor G A R Precision 1680 (11520398) who is confirmed to be heterozygous for the mutation. However, both parents of G A R Precision 1680 have tested as NHF, thus allowing us to conclude that the mutation originated in this animal. Secondly, several thousand animals have now been genotyped for this mutation, including a current list of AI sires submitted by members of the National Association of Animal Breeders. Of all animals tested that are carriers of the mutation, "1680" can be confirmed as an ancestor.

The genotyping of 934 AI sires representing a broad cross section of registered Angus genetics reveals that 91 bulls were found to be carriers of NH, roughly 10% of the population. Given the number of calves reported during the research project, this frequency would appear to be higher than expected. For example, when performing the AM research roughly two to three times more affected calves were reported following the initial request for calves as compared to NH. However, following the identification of the AM mutation only ~8.5% of the population of AI sires were genotyped as carriers of the AM mutation. This phenomenon can be explained by a relatively high percentage of embryonic or fetal loss during gestation. In other words, the frequency of both the AM and NH mutations are relatively the same, but the number of AM-affected calves born is roughly two to three times higher than the number of NH-Affected calves. This means that there is a potential for 50% to 70% fetal loss in NH. This is consistent with what is known about mutations in this gene for other species. For instance, in the mouse, complete disruption of this gene results in 100% fetal mortality before the halfway point of gestation. The mutation identified in cattle, although also severely damaging to the function of the protein, is more subtle and most likely does not completely disrupt its function. Therefore, it can be expected that some affected calves might be born at or beyond term pregnancy.

In summary, genotyping of this mutation should, with 100% accuracy, identify those animals at risk for producing affected calves when mated to other carrier animals. Furthermore, the list of currently genotyped sires can be used to assess the risk of specific individuals in the Angus population. Commercial testing services are expected to become available within the next two to three weeks.

Registration Number	Name	NH Status
2719761	Skylandmere 2058	NHF
5770651	R R Rito 707	NHF
6810901	Rito 707 of Ideal 533 70	NHF
7530738	Band 602 of Ideal 928 72	NHF
7795918	Jetliner 707 of Conanga	NHF
7954685	Basin Q Bar 163	NHF
8568264	Premier Progressor	NHF
9250717	Q A S Traveler 23-4	NHF
9682589	Rito 9J9 of B156 7T26	NHF
9891499	Tehama Bando 155	NHF
9894245	Pine Drive Big Sky	NHF
10226429	Scotch Cap	NHF
10239760	Paramont Ambush 2172	NHF
10312571	Basin Emulation 5653	NHF
10566557	R&J Spade 1204	NHF
10705768	R R Traveler 5204	NHF
10717881	G D A R Rito 596 L T	NHF
10776479	N Bar Emulation EXT	NHF
10796576	Leachman Prompter	NHF
10809778	S A F Power Fix	NHF
10835815	Shady Brook Superstar	NHF
10842597	Gorthy of Graham 18866	NHF
10845727	G D A R Equalizer 6148	NHF
10848959	Hoff Esso S C 433	NHF
10858958	D H D Traveler 6807	NHF
10889102	S S Traveler 6T6	NHF
10925573	W H 8704 Rito 8503 R R	NHF
10936090	O Confluence 2417	NHF
10937839	Leachman Tonto	NHF
10988296	G D A R Traveler 71	NHF
10988397	G D A R Executive 727	NHF
10989617	G D A R Oscar 711	NHF
10990965	Hoff Dallas FT Worth S C 456	NHF
11072078	Rito 8E8 of 5H11 Traveler	NHF
11086635	Med Rock Traveler JR	NHF
11105489	V D A R New Trend 315	NHF
11107151	Nugget 801X of J R S	NHF
11121512	Summitcrest Traveler X044	NHF

11124399	Summitcrest Sasquatch 150X	NHF
11138672	Hoff Northlander S C 6029	NHF
11138705	Hoff Spade Flush S C 678	NHF
11138729	Hoff Hi Hand S C 654	NHF
11138801	Hoff Bold Scotch S C 491	NHF
11139613	Hylene Rito 9J9 278	NHF
11160685	G T Maximum	NHF
11160688	G T Expo	NHF
11194446	Patton Enticer	NHF
11196470	Schoenes Fix It 826	NHF
11216670	Ginger Hill Duster 89	NHF
11223752	Rito 9M9 of 2036 Scotch Cap	NHF
11223766	Rito 9FB3 of 5H11 Fullback	NHF
11270134	Landmark Bando 912	NHF
11278961	G D A R Traveler 9161	NHF
11279048	G D A R Centennial 911	NHF
11288972	Hoff Balancer S C 7109	NHF
11293310	R R Scotchcap 9440	NHF
11297283	Hoff Hi Flyer S C 7134	NHF
11300151	TC Dividend 963	NHF
11314692	R&J Cruz 109	NHF
11314694	R&J Maxima	NHF
11335168	O C C Maternal Trend 725Y	NHF
11356568	G A R Sleep Easy 1009	NHF
11367940	Sitz Traveler 8180	NHF
11391800	Westwind Rito 8503 D J H 019	NHF
11408407	Finks Future Trend	NHF
11418151	B/R New Design 036	NHF
11424367	Basin E Z	NHF
11438436	Pro Trend 9042 L W	NHF
11447288	G D A R Wham 021	NHF
11447335	G D A R Traveler 044	NHF
11447845	L R A New Trend 360	NHF
11449960	TC Influence	NHF
11451070	Woodhill Valor	NHF
11478173	R&J Maternal Power 270	NHF
11520398	G A R Precision 1680	NHC
11520477	G A R Ambush 1690	NHF
11527064	Rito 1B1 of 5H11 Bando	NHF
11527095	Rito 1J6 of 7N4 Rito 8C16	NHF

11527181	Rito 1H13 of 5C7 Rito 9J9	NHF
11553377	N Bar Cornhusker Y2741	NHF
11556105	S V F Hi Road	NHF
11567326	V D A R Lucys Boy	NHF
11577350	Whitestone Equity	NHF
11581539	Hyline S V F Rito 1116	NHF
11592069	V D A R Traveler 722	NHF
11594860	Hoff Triumph S C 927	NHF
11595790	Hyline Travel Agent	NHF
11618176	Minerts Fortune 2000	NHF
11618631	Tehama 5204 Trav 565	NHF
11620565	R R Regal 1459	NHF
11620571	R R 9440 Scotch Cap 1483	NHF
11621009	M D G Chairman 1041	NHF
11626546	Ideal 1418 of 8103 4286	NHF
11640955	W F A Four Point Four	NHF
11644573	S E Bando 111	NHF
11656252	Rito 2E2 of 9FB2 Traveler	NHF
11672313	Becker Farms Pompey 118	NHF
11691408	Rito 2RT2 of 0B5 RR Traveler	NHF
11702184	S A Double Power 1002	NHF
11741609	Walridge Linard 1343	NHF
11741667	Leachman Conveyor	NHF
11747039	S A F Neutron	NHF
11779097	Mill Coulee Performer 224	NHF
11783725	Summitcrest Hi Flyer 3B18	NHF
11788302	Papa Equator 2928	NHF
11832272	Stone Gate Quantum 61	NHF
11847053	Summitcrest Scotch Cap 0B45	NHF
11872308	G A R Bingo 4192	NHF
11880388	Rito 3W3 of 0J2 Rito 9FB3	NHF
11887141	Nichols Easy Way 428	NHF
11889421	C S U Aggie Emulation 2144	NHF
11901155	Bon View Emulation Ext 473	NHF
11909809	Rito 3X17 of Rita 9FB2 Ext	NHF
11924057	Spring Cove True Value	NHF
11927423	Whitestone Traveler 2149	NHF
11927444	Whitestone Fly Traveler 3006	NHF
11927922	Ankonian Titleist	NHF
11935889	S A F Fame	NHF

11935897	S A F Easy Fortune	NHF
11947213	Leachman Explorer	NHF
11951654	Basin Max 602C	NHF
11958736	Hylite SVF Spectrum 15C	NHF
11965748	Umf Action of Wye 7090	NHF
11967378	Rito 3M2 of 5H11 GT Maximum	NHF
11973186	V F Venture Forward	NHF
11973368	Woodhill Supreme	NHF
11983127	Brooks Dividend 336	NHF
11983278	Brooks Premium 302	NHF
11994557	TC Bonus	NHF
12019395	G T S V F Treasury	NHF
12041904	S S Rito Rito R011 3R3	NHF
12048084	B C C Bushwacker 41-93	NHF
12075716	Leachman Saugahatchee 3000C	NHF
12077888	Rito 4X2 of Rita 1R52 Ext	NHF
12079809	G A R Evas Prescription 4553	NHF
12079812	G A R Evas Consistence 3803	NHF
12084043	R C C Sir Roy 308	NHF
12096699	B F Raindancer 012 306	NHF
12108043	Leachman Bushwhacker	NHF
12108074	Leachman Booster	NHF
12111867	Ankonian Union	NHF
12126334	Bon View Balance 834	NHF
12127839	One Way E308	NHF
12139259	Thomas Latigo	NHF
12155777	S A F Choice Plus	NHF
12162865	BT Direction 65D	NHF
12166857	Gardens EXT 4137 S2	NHF
12170322	Woodhill Crossfire	NHF
12170393	Woodhill Natural	NHF
12174018	Mill Coulee 6807-423	NHF
12176446	Alberda Traveler 416	NHF
12177814	Mr Wix of Mc Cumber 204	NHF
12189371	G T Sentry	NHF
12194989	Plowman 1627 of Millbrae SAR	NHF
12200110	Larks Canyon 74D4	NHF
12222286	Homestead Blockbuster 409	NHF
12223258	J L B Exacto 416	NHF
12223857	L F New Trend 4100	NHF

12237440	Rito 505 of Rita 1R3 Ambush	NHF
12241684	Butchs Maximum 3130	NHF
12257225	R R Ferdinand 758D	NHF
12270349	G T Triple Band	NHF
12284312	Emulation Easy 85X	NHF
12296482	C S U Aggie Ambush 4109	NHF
12303969	G A R Example 3204	NHF
12304120	G A R 6807 Traveler 4144	NHF
12304524	G A R Consensus 3704	NHF
12306217	Rito 5TR8 of Rita 3X12 RRT	NHF
12309327	GDAR SVF Traveler 234D	NHF
12326204	S A F Banker	NHF
12333453	Basin Ambush 3905	NHF
12337342	TC Linebacker 530	NHF
12344131	Boyd Mainstream 5006	NHF
12345052	Diamond Rainmaker 154E	NHF
12346200	Twin Valley Precision E161	NHC
12392161	VDAR KA Legacy	NHF
12395305	Congaree Sleep Easy E27	NHF
12396224	B T Ultravox 297E	NHF
12396365	Rockn D Ambush 1531	NHF
12411157	Whitestone Widespread MB	NHF
12422806	Gibb Illini	NHF
12429451	Papa Universe 515	NHF
12430389	Hoff Ultra S C 108	NHF
12448729	A A R Really Windy 1205	NHF
12449151	Magic Meadow Country Boy B50	NHF
12452829	B A R Ext Traveler 205	NHF
12455165	K C Prime Time 6029 95	NHF
12462818	R R Daquantae 789E	NHF
12493607	C A Future Direction 5321	NHC
12505904	Leachman Conveyor 3025E	NHF
12518180	R C C Marathon 510	NHF
12527924	Whitestone Precision H141	NHC
12528428	Sitz Intensifier 8206	NHF
12530601	Rito 6I6 of 4B20 6807	NHF
12548426	G A R Enhancer 5365	NHF
12548568	G A R Expectation 4915	NHF
12557724	N Bar Prime Time D806	NHF
12559758	TC Supreme Vision 691	NHF

12564177	Bon View Spectrum 1176	NHF
12569815	B/R New Design 036-631	NHF
12578945	B C C Lariat 6Z1 of B749	NHF
12597077	PLS Rawhide F405	NHF
12610955	Boyd Translator 6025	NHF
12618076	S A F Focus of E R	NHF
12619399	T C A Engineer	NHF
12619909	S S Ambush Advantage 14F	NHF
12670840	Circle A 216 LTD 6517	NHF
12672258	Dalebanks Extender 6012	NHF
12677801	Woodhill Riptide 823-606	NHF
12689078	Gardens Expedition	NHF
12693793	Connealy Frontline	NHF
12696111	Younkin Triumph 4966	NHF
12698439	G A R Explosive 6313	NHF
12716815	G A R Evas Exceptional	NHF
12717041	G A R Precision 9296	NHC
12738228	Davis Prime	NHF
12740561	Millcreek Diversity	NHF
12753461	Connealy Vision 63	NHF
12755998	Sitz Value 7097	NHF
12760345	S A Neutron 377	NHF
12781813	C S U Optimum Traveler 7123	NHF
12783078	TC Advantage	NHF
12783540	Bon View New Design 1407	NHF
12784697	B/R Destination 727	NHF
12799597	Champion Hill B52 Traveler	NHF
12810693	Vermilion Dateline 7078	NHF
12811512	N Bar Emulation Ext A1747	NHF
12813090	N Bar Bando 598 X4127	NHF
12829295	L L F Gilreath Trendsetter	NHF
12835604	P A R B Design Plus 97	NHF
12837915	Barretts Solution	NHF
12862009	A&b Yukon 7150	NHF
12881292	Brooks Ext 792	NHF
12893612	Connealy Leadtime	NHF
12911472	Perry Power Design 715	NHF
12915498	Summitcrest Prime Cut 1G42	NHF
12920200	G A R Exacto 5687	NHF
12949624	P A F Bowman	NHF

12955187	Equity of P A R	NHF
12996570	Sitz Reliant 8898	NHF
13009379	C R A Bextor 872 5205 608	NHF
13009539	G G Chinook 736	NHF
13026915	Connealy Bottomline	NHF
13026916	Connealy Freightliner	NHF
13039059	J R Something Special	NHF
13044574	Bon View New Design 208	NHF
13045213	K F F Rito Traveler 434H	NHF
13047487	Gardens Highmark	NHF
13050780	Boyd New Day 8005	NHF
13054003	Northern Improvement 4480 GF	NHF
13058662	Hylene Right Time 338	NHF
13062750	Bon View New Design 878	NHF
13066872	Ideal 7451 of 8103 4465	NHF
13080972	Three Trees Everready C55D	NHF
13084963	J W K Sleepy Boy 8134	NHF
13092912	O C C Great Plains 943G	NHF
13103836	S S Decatur 55H	NHF
13113153	Creekstone Austin LTD 812	NHF
13122485	Summitcrest High Prime 0H29	NHF
13163485	SVF Siebrings Forever Russ	NHF
13169229	Connealy Forefront	NHF
13183335	War Handy Man 8026	NHF
13183408	War Hall of Fame 8023	NHF
13200618	G A R Pinnacle	NHC
13205097	White Oak Precise 6002	NHC
13207590	Nichols Extra H6	NHF
13213164	S S Traveler T510 8T4	NHF
13221587	Feltons Meat Packer 62	NHF
13229176	Rito 9Z50 of 6K20 814Z	NHF
13246306	Fountains Fortress 52	NHF
13254445	G A R Designation	NHC
13254554	G A R Grid Maker	NHF
13254727	G A R Paramount	NHF
13274945	W C C Handyman H457	NHF
13282661	E X A R Scotch Cap 816	NHF
13284421	R P Bushwacker 3 944	NHF
13286230	B/R New Design 323-9150	NHF
13286246	B/R Destination 727-928	NHF

13291559	Thomas New Design 9271	NHF
13296807	EXAR Anchorage 9479	NHF
13308692	S A F Choice Plus 8275	NHF
13320150	Ironwood New Level	NHF
13321276	G T Premium Design 919	NHF
13331795	S A V Limited Edition 9283	NHF
13333906	S A F Focus 9095	NHF
13334022	S A F Strategy 9015	NHF
13346328	KMK Alliance 6595 187	NHF
13352944	Baldrige Julio 157J	NHF
13356290	Ardrossan Jackson J6	NHF
13360311	BT Right Time 24J	NHF
13361389	Leachman Top Gold	NHF
13361440	Leachman Boom Time	NHF
13384754	Summitcrest Outlook	NHF
13384794	Summitcrest Pfred 3B18 0J98	NHF
13392170	Woodhill Confidence	NHF
13395329	G A R Retail Product	NHF
13395344	G A R Predestined	NHF
13404446	Brooks Premium 910	NHF
13412671	Baldrige Nebraska 901	NHF
13423598	Toebben Alliance C902	NHF
13433023	WAR Alliance 9126 6006	NHF
13436290	Tosu Mick 9301	NHF
13438124	Lemmon Seven Plus	NHF
13441628	Hinds Hills TLAR Long Cut 47	NHF
13447247	Connealy Logic 929	NHF
13447282	Connealy Lead On	NHF
13448453	L T 598 Bando 9074	NHF
13455316	Fintry of Graham 47539	NHF
13457421	S A F Mogcks Security	NHF
13458027	Shamrocks Advantage 4609	NHF
13469989	Vermilion Payweight J847	NHF
13481798	Plattemere Database	NHF
13495021	Roths Millcreek Unique	NHC
13498476	F A R Krugerrand 410H	NHF
13504290	S A F Focus J30	NHF
13512009	S A V 8180 Traveler 004	NHF
13521189	Oak Hollow 7709 of 1318 1118	NHF
13531361	Sitz Greatplains 9520	NHF

13544928	S A F Connection	NHF
13567991	Leachman Diamondback	NHF
13573500	Dansie Primero 0006	NHF
13574137	S A F Directive	NHF
13582536	Byergo Full Cut	NHF
13588640	B/R New Frontier 095	NHF
13592905	S A V Final Answer 0035	NHF
13599697	Kapp Corner Post	NHF
13600998	PAF Alta's Prestige	NHC
13608527	Pascalar Ayres New View P310	NHF
13619920	ER Denton K240	NHF
13620649	Mohnen Modern Design	NHF
13626625	ER Falcon K177	NHF
13632776	Lemmon Newsline C804	NHF
13633726	G A R Everest 9409	NHC
13645514	RCC Preference	NHF
13654637	LCC Number Crunch 3050K	NHF
13654695	LCC New Frontier 3215K	NHF
13659860	S A F Millcreek Charisma	NHC
13664352	Larkota 814Z 011	NHF
13665765	D B New Horizon 020	NHF
13667844	Summitcrest Diamond 0K24	NHF
13670548	Millers Bullseye J373	NHF
13676338	Connealy Forecast	NHF
13676998	Double G Marksman	NHF
13687063	K C F Bennett Total	NHF
13697595	Bushs Grand Design	NHF
13708459	G T Echo	NHC
13718618	S A F Factor	NHF
13724351	G A R Yield Grade	NHF
13728513	G A R New Design 5050	NHF
13739339	Fintry of Graham 52170	NHF
13739532	H A Image Maker 0415	NHF
13742799	Stukels Bandwidth	NHF
13752642	Nichols Extra K205	NHF
13776378	S S Objective T510 0T26	NHF
13791489	Genetics by Design 049	NHF
13793825	Rito 111 of 2536 Rito 6I6	NHF
13793826	Rito 112 of 2536 Rito 6I6	NHF
13796655	Rito 1196 of 3015 Rito 6I6	NHF

13798592	RES Volunteer 051	NHF
13806056	Exar Sudden Impact 1537	NHF
13806971	W C C Precision E161 J239	NHF
13808820	Exar Expand 1241	NHF
13814652	ACF New Design 0321	NHC
13815252	Connealy Mayor 898	NHF
13818764	Gardens Wave	NHF
13822057	R&R Architect 0223	NHF
13824342	SydGen Original 1013	NHF
13828202	Boyd On Target 1083	NHF
13830028	Basin Rainmaker 747L	NHF
13831100	Connealy Viewpoint 901	NHF
13834593	SydGen 1531 Ambush 1149	NHF
13838168	N A Powerline of 206T	NHF
13839683	Circle A Accurate 1038	NHF
13845259	S A V Successor 1175	NHF
13846942	W C C Special Design L309	NHF
13850227	SydGen Refocus	NHF
13850307	4 Point 8 of Ironwood	NHF
13850346	Basin Expedition 290L	NHF
13866016	Basin Ambush 8161	NHF
13874784	Leachman Fundamental	NHF
13875837	S A V Front Runner 0713	NHF
13875838	S A V 5175 Bando 0699	NHF
13878619	YON Southern Rock L26	NHF
13880447	Baldrige Lightning L72	NHF
13880818	Mytty In Focus	NHF
13888258	Whitestone Survivor N088	NHF
13895274	King Kahn B100	NHC
13896250	H S A F Bando 1961	NHF
13898124	BR Midland	NHF
13907951	Gibb Iroquois 9111	NHF
13913492	E&B 1680 Precision 1023	NHC
13913514	Summitcrest Commando	NHF
13916633	Royal Precision DRCC 1007L	NHF
13930597	L C R Precision 101	NHF
13930599	L C R Precision 112	NHC
13934918	LCC Dillon G689L	NHC
13936986	Woodhill Foresight	NHF
13953039	Ranger G 1720	NHC

13955271	Hoff Gold Label S C 900 541	NHF
13959251	LD Exactly 1912	NHC
13961547	Exar Foundation 1806	NHF
13961577	Holiday Express 1852	NHF
13966936	Connealy Danny Boy	NHF
13992383	H A Power Alliance 1025	NHF
13998476	Summitcrest Roseda Designed	NHF
14009358	RAB-GAR Satisfaction 4191L	NHF
14009384	RAB-GAR Leverage 4222L	NHF
14011376	G A R Precision 5771	NHC
14011547	G A R Prime Design	NHF
14011611	G A R Encore	NHF
14021056	Morgans Direction 111 9901	NHC
14035047	Exar Lutton 1831	NHF
14037690	Krone Royal 1140	NHF
14037894	Hyline Right Way 781	NHF
14048508	R3 Scanner L527 SCC	NHF
14056739	Rito 2X15 of Rita 8Z22 EXP	NHF
14084300	Rito 2A63 of 2536 205	NHF
14084757	Bear Mtn Freight Train 350L	NHF
14088249	Rito 2V1 of 2536 1407	NHF
14088423	SydGen Contact	NHF
14094252	Sitz New Design 349M	NHF
14098261	Circle A Endeavor 2058	NHF
14099897	SydGen Focus 2088	NHF
14100695	EXAR Make the Grade 234	NHC
14101541	VDAR Predicta Bull	NHC
14102387	Basin Payweight 959M	NHF
14104633	SydGen E161 Precision 1485	NHF
14104725	SydGen Ally	NHF
14106302	SydGen Prestige 1316	NHC
14106303	SydGen 1407 Corona 2016	NHF
14116881	C F Right Design 1802	NHF
14121653	LD Redirect 11	NHF
14128747	Vermilion Nebraska M404	NHF
14139259	EXG Prime Plus M737 R3	NHF
14139514	Three Trees Exacto 1517	NHF
14144643	Boyd Captain 2067	NHF
14159119	B C Matrix 4132	NHF
14164824	Stevenson Yellowstone M808	NHF

14167786	RES Exceed 114	NHF
14171230	D C C Rito Prime 115	NHF
14173159	Twin Eagles No Fault M904	NHC
14181726	Riverbend Blueprint L24	NHF
14187839	B C Marathon 7022	NHF
14188956	B/R Ambush 28	NHF
14200755	Rito 2 878 of 2536 BVND 878	NHF
14201376	Mill Brae Freightliner 2096	NHF
14201925	MAR Precision Paving The Way	NHF
14202761	Champion Hill Edition 2029	NHC
14204395	Triple J Design of Foxcross	NHF
14209689	Bluegrass Major Design 202	NHF
14215210	S A V Last Call 2063	NHF
14216456	Connealy Alliance 995	NHF
14216491	Connealy Onward	NHF
14216571	Connealy Safe Lead	NHF
14218202	LCC Sultan G041	NHF
14218253	LCC New Standard	NHF
14222526	G A R 65R Authority	NHF
14222595	G A R Cimarron	NHF
14222612	G A R Integrity	NHC
14222615	G A R Solution	NHF
14222787	G A R New Market 7892	NHF
14230122	EXAR New Look 2971	NHF
14230973	KG Dakota	NHC
14237017	TC Gridiron 258	NHF
14237157	BT Equator 395M	NHF
14245842	K A R Alliance 258	NHF
14251765	Tehama Total M811	NHF
14257843	DDA Emblazon 27C	NHF
14267926	21AR Coal Bank C014	NHF
14270028	Blevins Raindance 2503	NHF
14284743	SydGen E161 Precision 2467	NHC
14291315	SydGen Eclipse 2478	NHF
14292649	Dr J Analyst M250	NHC
14298428	SydGen Bouncer 2458	NHC
14299352	S S Rito Rito R011 2R12	NHF
14300920	G A R Premium Product	NHC
14301014	G A R US Premium Beef	NHF
14308295	Baldrige Mullen M528	NHF

14311951	Sinclair Net Present Value	NHF
14321158	H A R B Windy 702 JH	NHF
14327307	Spur Success 2801	NHF
14343264	EXAR Nominal 3550	NHF
14355577	Lafins Cutting Edge 2075	NHF
14357467	Sinclair Open Range 2Q23	NHF
14361794	G G Chisholm	NHF
14367367	Boyd Poundmaker 21	NHF
14368395	Stevenson American Idol 9273	NHC
14368434	Stevenson Benchmark N190	NHC
14368437	Stevenson Silverado N195	NHF
14368850	Sitz Rainmaker 9723	NHF
14377095	Big Elban of Sydgen 3023	NHF
14381890	EXG Osage N112 R3	NHF
14382607	EXG Midnight N657 R3	NHF
14383761	Diamond Max 180N	NHF
14384566	EXG Outcross N655 R3	NHF
14385150	Basin Expedition 867N	NHF
14385286	B/R Future Direction 3100	NHF
14385395	B/R 65R Genesis	NHC
14386761	S A R New Frontier 095 1156	NHF
14390643	EXAR Numerical 3919	NHF
14391235	B C Maverick 2702 ET	NHF
14394786	B C Mid Emblazon 854E 702	NHF
14395270	SydGen OnStar 3217	NHC
14397563	B C Emblazon 854E 8023	NHF
14399473	GAR Goode Backcross 313	NHF
14400964	Basin Future Direction 7163	NHC
14400977	Basin Future Direction 8833	NHF
14401002	Basin Future Direction N905	NHC
14404295	EXG Rangeland 3946	NHC
14404296	EXG Heartland 3947	NHF
14412753	Circle G Kash 2189	NHF
14416680	K C F Bennett Architect M299	NHF
14417348	K C F Bennett Coalition SCC	NHF
14418962	Kenny's Creek Sandy S15	NHF
14419184	G T Shear Force	NHF
14419602	Basin Payweight 9333	NHF
14422113	Bear Mtn Right Direction	NHC
14422326	RAB-EGL Blue Moon 4407M	NHF

14424380	Basin New Design 7753	NHF
14434266	Ayres Sudden Revival of OCC	NHF
14439463	Diamond Payweight 738N	NHF
14446504	Southern Panhandle 3432	NHC
14448891	ALC Nobleman N01N	NHF
14454058	M A R Midland Empire 3092	NHF
14455342	S A V Peacemaker 3179	NHF
14456390	O C C Magnitude 805M	NHF
14474596	Sitz New Design 458N	NHF
14492305	ER Justice N013	NHF
14495534	S A V Trailblazer 3015	NHF
14502851	L T Bandwagon 3105	NHF
14503795	Rito 3835 of 2536 BVND 878	NHF
14504755	G A R User Friendly	NHF
14505152	K M Keystone 1913	NHC
14506274	G A R Preeminent	NHC
14508531	Bushs Strut 756	NHF
14509685	BT Crossover 758N	NHC
14510132	Lau Decade	NHF
14512407	Riverbend Mile High 3718	NHF
14513180	Three Trees Next Step	NHF
14514372	Mohnen Brushpopper 353	NHF
14515789	LRA Foresight 26C	NHF
14521474	K C F Bennett Index	NHF
14523007	Ideal 3542 of 7451 7417	NHF
14528172	Connealy Overtime	NHF
14528246	Connealy Leader	NHF
14528330	Connealy Reflection	NHF
14529106	EXAR Non-Stop 3967	NHF
14531922	HA Future Direction 3540	NHF
14542822	Summitcrest Sears Star Power	NHF
14542824	Summitcrest High Prime 0N15	NHF
14551206	Brooks Night Off 309	NHF
14552847	Baldrige Navigator N5	NHF
14560689	ALC Big Eye D09N	NHF
14570934	LCC New Chapter G831N	NHF
14573335	SydGen Substance 3450	NHF
14575589	B A F Limited Edition 372	NHF
14575900	D C C Rito Platinum 3J4	NHF
14576247	Woodhill Commander 143L-132N	NHF

14587431	Sinclair Telecast 01S3	NHF
14591941	Lemmon Newsmaker N156	NHF
14595121	Sugar Loaf Direct Hit N021	NHF
14599782	LCC Outlook G800N	NHF
14608561	4G Regulator	NHC
14630766	Whitestone Tiger T159	NHC
14631681	Rito 4612 of Rita 8G23 1I2	NHF
14631852	Rito 4D7 of 2536 338	NHF
14631908	Rito 4L41 of Rita 2B41 208	NHF
14640726	Bear Mtn Right Stuff 3259	NHF
14641538	Rito 4L6 of 2536 208	NHF
14657131	F R F Midland 4026	NHF
14659834	Stevenson CE Deluxe 1914	NHC
14660859	Quaker Hill Objective 3J15	NHF
14663248	SydGen Platinum 4027	NHF
14663267	SydGen Itasca 4083	NHC
14664625	SydGen Kahlua 4204	NHF
14667449	EXAR Predictable 4158	NHF
14667450	EXAR Problem Solver 4181	NHC
14675445	B/R New Day 454	NHF
14675477	B/R Future Direction 4268	NHF
14676756	Monarch Pahoee 3016	NHF
14679569	SydGen Connection 4249	NHF
14679694	3F Emblazon 3652	NHF
14682821	EXAR Pit Boss 409	NHF
14686091	Basin Future Direction 7054	NHF
14686102	Basin Yellowstone 116P	NHF
14686137	Basin Franchise P142	NHC
14686155	Basin Up The Limit	NHC
14686985	SydGen Rito Plus 4051	NHF
14687512	EXAR Phenomena 4037	NHF
14691231	GDAR Game Day 449	NHF
14692281	FV New Dimension P142	NHC
14693095	DAJS The Matrix 008	NHC
14712641	SydGen Journey 4355	NHF
14724225	Basin Prime Cut 4967	NHF
14724271	Basin Rainmaker P175	NHF
14725035	S A V 004 Density 4336	NHF
14728662	EXG New Design P620 R3	NHF
14730263	Baldrige Pinpoint P4	NHF

14737017	Genex Replica 1081	NHC
14739204	S A V Net Worth 4200	NHF
14740749	Gardens Prime Star	NHF
14742267	LT Curve Bender 4810 of EA	NHF
14743506	G A R Prominent	NHC
14745477	Bonnors Up The Limit 7P	NHF
14745817	KMK Alliance I87 N24	NHF
14754153	Woodlawn Charge On 14	NHF
14768724	Rito 4I6 of 2536 6807	NHF
14768727	Rito 4I9 of 2536 6807	NHF
14768728	Rito 4L60 of 2536 BVND 208	NHF
14768733	Rito 4S5 of 2536 SA	NHF
14768734	Rito 4S6 of 2536 SA	NHF
14769662	Boyd Landmark 405	NHF
14774030	Sinclair Extra 4X13	NHF
14777016	MCC Daybreak	NHF
14779044	Ideal 4355 of OT26 2440	NHF
14790816	G A R High Mesa	NHF
14790998	Summitcrest Designer 177P	NHF
14791623	B C Lookout 7024	NHF
14793708	Woodhill Mainline	NHF
14796227	Brooks Easy Way Out 4260	NHF
14796284	Baldrige SCC Pacemaker P800	NHF
14798552	S A V 5175 Bando 4597	NHF
14798616	S A V 004 Traveler 4836	NHF
14800786	G A R Simplicity	NHC
14802410	Doerr Defiance	NHF
14814936	TC Boom Time 434	NHF
14817265	Sitz Hindsight 973P	NHF
14817353	Basin Expedition 00P1	NHF
14823655	S A V 004 Predominant 4438	NHF
14823656	S A V 004 Hold'em 4452	NHF
14823774	S A V Bachelor 4404	NHF
14828348	HA Future Direction 4505	NHF
14828349	HA Future Direction 4506	NHC
14829055	Whitestone Landmark 623T	NHC
14840492	TC Power Stroke 4118	NHF
14842384	S A V Initiative 4406	NHF
14843192	Connealy Foundation 426	NHF
14843254	Connealy Freight Train	NHF

14843300	Connealy Resource FD 464	NHF
14843347	Connealy Meat Maker 4834	NHF
14844711	TC Total 410	NHF
14844714	TC Rito 416	NHF
14844728	TC Beef Maker 480	NHF
14845068	Connealy Whitman	NHF
14845081	Connealy Grant 208 4246	NHF
14848339	Mohnen Day Ahead 144	NHF
14848587	MCC Cupid 414	NHF
14850409	Summitcrest Complete 1P55	NHF
14851313	SCR Promise 4042	NHF
14852720	Tehama Vigilance P139	NHF
14874385	MOGCK Whispering Wind 584	NHF
14874534	SydGen Ally 4646	NHF
14874578	Mytty ForeFront 77P	NHF
14876747	SydGen High Prime 4474	NHF
14880311	SydGen Triumph	NHC
14885809	K C F Bennett Performer	NHF
14898814	Dunlouise Cortachy Boy D137	NHF
14899284	Blevins Retail Design 4812	NHF
14899673	Rockin Horse Tailor Made 456	NHF
14931356	Basin Center Cut	NHF
14933037	Ardrossan Connection X15	NHF
14934706	Rito 593 of 2821 RP	NHF
14953535	Reich Lead On 424	NHF
14961745	EXAR Rejuvenator 5401	NHF
14963730	Sitz Upward 307R	NHF
14969822	Sinclair Excellency 5X25	NHF
14973288	Basin Payweight 176R	NHF
14973975	Basin Opportunity	NHC
14974014	Basin Future Direction 815R	NHF
14976177	Black Woodlawn 2.0	NHF
14977480	SydGen Bullet	NHF
14984112	EXAR Rito 5118 of Rito 112	NHF
14987907	Riverbend Beyond	NHF
14987941	Riverbend Impressive	NHF
14993300	Diamond On Track 748R	NHF
15003218	Stevenson Cattleman R142	NHF
15003238	Stevenson Moneymaker R185	NHF
15012747	EXAR 263C	NHF

15014301	SydGen Contact 5261	NHF
15015207	Stevenson Paycheck 9415	NHF
15016931	Quaker Hill Rito 2V1 4V1	NHF
15022955	Three Trees Crossroads R0638	NHC
15028961	Basin Expedition R156	NHF
15030668	Diamond Direct Deposit 3R57	NHC
15031034	Basin Expedition R850	NHF
15033947	G A R Right Direction	NHC
15034593	BC 7022 Raven 7965	NHF
15041285	Diamond Benchmark 3R65	NHF
15044512	Bear Mtn Owyhee 5012	NHF
15048590	RAB-EGL Future Design	NHC
15076709	Autumn Oaks Super Star 302	NHF
15098880	GAR-EGL Protege	NHF
15098911	Circle S At Ease 4221	NHF
15107823	S A V Future Investment 5662	NHF
15107825	S A V Mandan 5664	NHF
15108200	S A V New Year 5320	NHF
15108317	S A V 5175 Bando 5190	NHF
15109865	S A V Bismarck 5682	NHF
15118068	N U Option 5012	NHF
15119746	Baldrige Retailer R164	NHF
15124610	Brooks Premium Product 547	NHF
15125595	Summitcrest Direction 2R71	NHC
15127569	Bluegrass Right Time 500	NHF
15129617	G A R Selective	NHF
15129674	G A R Objective 7125	NHF
15134123	G A R Cloudburst	NHF
15140670	B P F Special Focus 504	NHF
15142201	Rito 5FA9 of 1247 FD	NHF
15142281	Rito Revenue 5M2 of 2536 Pre	NHF
15147477	LT Timberwolf 5014	NHF
15148585	Connealy Power One	NHF
15148659	Connealy Thunder	NHF
15148739	Connealy Compass 510E	NHC
15148954	Mytty In Line	NHC
15150605	Connealy Contrast	NHF
15150630	Connealy Danny 5398	NHF
15150757	Connealy Black Baron of SCAR	NHC
15161251	HA Program 5652	NHF

15163839	SCR Superior 210M-50203	NHF
15170660	CAR Efficient 534	NHF
15183035	HD Dunn Altitude 5011	NHF
15183732	Tehama Band XL R739	NHF
15191744	V A R Midland 5271	NHF
15199294	RR Midland 5017	NHC
15200651	SydGen Corona 5512	NHF
15204322	SydGen Black Substance 5602	NHF
15204463	SydGen 5175 Bando 5728	NHF
15214134	SydGen Garfield 5732	NHF
15231166	Blevins Mission 5709	NHF
15247770	Stevenson Bullseye 3R11	NHF
15248684	RR Cork Predestined 5042	NHF
15249612	T K Big Bend R35	NHF
15260057	RDDA Overload 2437R	NHF
15262910	EXAR Spartan 6225	NHF
15262914	EXAR Showton 6230	NHF
15266350	Rito 6EM3 of 4L1 Emblazon	NHF
15266353	Rito 6EM6 of 4L3 Emblazon	NHF
15270965	DVA Scout 553	NHF
15276737	EXAR Prime Premium 6444	NHC
15283265	G A R Prediction	NHF
15283299	G A R Predestined N5905	NHF
15310366	Rito 6656 of 021 Rito 112	NHF
15313140	HARB Pendleton 765 J H	NHF
15316436	FHCC Affirmative	NHF
15325987	Diamond Justice 901S	NHF
15326281	Circle A IN Focus 5627	NHF
15327227	Sitz JLS Forward 568S	NHF
15330093	T O S U Hawk 5306	NHF
15330681	SydGen 9095 Focus 6025	NHF
15330682	SydGen Focus 6026	NHF
15330743	SydGen C C & 7	NHF
15331756	Three Trees Rocky Top	NHF
15331769	Three Trees Big Top S1116	NHF
15331771	ThreeTrees Blackfoot Mile Hi	NHF
15331879	Basin Bellagio 410S	NHF
15332038	Basin Payweight 025S	NHF
15332050	Basin Payweight 006S	NHF
15336681	Circle A Direction 6150	NHC

15337433	SydGen Mandate 6079	NHF
15343181	B/R Ambush 28-6149	NHC
15343833	B/R Logic 626	NHF
15347911	Boyd Next Day 6010	NHF
15349689	Casino Objective B135	NHF
15354674	SydGen Trust 6228	NHF
15355003	Trowbridge Crusader 614	NHF
15356040	Thomas Grade Up 6849	NHF
15365425	K C F Bennett Outlook R448	NHF
15369092	S A V John Wayne 6220	NHF
15369205	S A V Heritage 6295	NHF
15371285	Basin Dollar B 9916	NHC
15380785	Sinclair Extravagant 6X7	NHF
15384833	Stevenson Online 11S0	NHF
15386718	Ardrossan Direction W109	NHC
15393885	Whitestone Satisfaction	NHC
15396062	M A R Jefferson 6009	NHF
15399709	Boyd Heritage 6078	NHF
15418431	Lafins South Wind 5258	NHF
15430961	BC Rocket 44	NHF
15434180	E&B Blueprint 691	NHF
15437492	KCH Trajectory	NHC
15443045	Three Trees Ante Up T0170	NHC
15445237	Rito 6S3 of 2536 SA	NHF
15446550	M A 1961 Bando 346-90	NHF
15450425	P T Wusthof 906	NHF
15452662	HA Image Maker 6550	NHF
15456246	Exar PAF Sizzle 620	NHF
15456344	Summitcrest Rush Hour 0S23	NHF
15458947	S/C Constellation 06S6	NHF
15458959	Summitcrest DARTH 1S37	NHF
15458960	Summitcrest Stardom 1S54	NHF
15462668	TC Advantage Plus 680	NHF
15463997	G A R Symmetry	NHF
15464017	G A R Remedy	NHF
15464043	G A R Ultimate	NHF
15470489	EXG Masterson 6011 PPC	NHF
15478023	Woodhill Foresight 285M-S103	NHF
15478191	Woodhill Foresight 270N-S62	NHF
15482196	G A R Game On	NHF

15487342	Limestone Converter S239	NHF
15488048	Tehama Silverado S105	NHC
15488089	Mill Brae Bluestem 6081	NHF
15490794	Connealy Full Freight	NHF
15490811	Connealy All Around	NHF
15491633	Connealy Forward	NHF
15493207	Connealy Formation 60C	NHF
15498429	Rito 6EMA of 4L3 Emblazon	NHF
15498453	Rito 6FA7 of Rita 2V6 FD	NHF
15498627	Rito 6M51 of Rita 2V5 Pred	NHF
15507991	Spur Reward 6005	NHF
15509162	MRCC New Idea 629	NHC
15513053	Mr JT High Light 638	NHF
15515066	T D L Nine Irons Preemptor	NHF
15515072	T D L Nine Irons 3335S	NHC
15518651	S D R Chief Justice 662	NHF
15521467	V A R Prime Rate 6254	NHF
15522896	Tehama Online S472	NHF
15535998	Vermilion X Factor	NHF
15539210	F V 20K King 308M	NHF
15543702	Connealy Impression	NHF
15543742	Tehama Alternative S454	NHF
15553616	SydGen 5175 Bando 6560	NHF
15553710	SydGen Turbo 6684	NHF
15553713	SydGen Option 6689	NHF
15553772	SydGen Corona 6510	NHF
15585939	Mohnen Dynamite 1356	NHF
15594410	J Bar 7 On Time 6537	NHF
15599345	B C C Emblazon 6062-6022	NHF
15601553	Sinclair Eclipse	NHF
15601884	Quaker Hill On Board 6BT2	NHF
15603496	Exar Top Shelf 7524	NHF
15603560	Exar Treasury 7596	NHF
15606026	Five Star Sum Total 6010	NHF
15607046	G T Global Image	NHF
15623928	V A R Prospector 7093	NHC
15626702	RM Ruger 6502	NHF
15628710	Rito 775 of Rita 2B44 2v1	NHF
15630115	Silveiras Out West 7026	NHF
15630936	ALC Shooter B01S	NHF

15637146	Sitz Jackson 431T	NHF
15644157	Sinclair Multi-X	NHF
15657025	Sitz Onward 8337	NHF
15661253	Exar 263C 7256	NHF
15664421	SydGen Corona 7029	NHF
15664462	SydGen Power Source 7017	NHF
15667302	Circle A Endurance 6679	NHF
15672111	Sitz Foresight 7897	NHF
15688392	S A V Pioneer 7301	NHF
15690301	Basin Prepotent	NHF
15690358	Basin Spread 304T	NHF
15694062	Basin Future Direction 2T15	NHC
15696204	Basin High Definition 3T84	NHC
15696472	Stevenson Moneymaker 576T	NHF
15700047	Thomas Synergy 7261	NHC
15700828	SydGen Corona 7281	NHF
15700829	SydGen Corona 7285	NHC
15700836	SydGen Right Gard 7304	NHF
15705880	SQ Credence 67S	NHF
15707145	S A V Providence 6922	NHF
15714917	EXAR Titlelist T011	NHF
15717088	SydGen Corona 7326	NHF
15723180	G T Tender Force	NHF
15726438	Dunlouise Jipsey Earl E161	NHF
15726453	Dunlouise Commander Bond	NHF
15730504	Three Trees Performance King	NHF
15730548	Three Trees Top Performer	NHF
15730796	Baldrige Progressive S834	NHF
15738589	Werner Westward 357	NHF
15743897	Three Trees Lexington T0678	NHC
15748572	Yon Future Focus T219	NHF
15753349	ONeills Encore	NHC
15774209	CSU Ram Nation 7105	NHF
15779234	PVF ALL PAYDAY 729	NHF
15782591	ICC Judge 7001	NHF
15787788	S A V Efficiency 7056	NHF
15790033	S S Insight T20	NHF
15793806	Efficiency NFI	NHF
15796904	Rito 7O65 of Rita 5M46 Obj	NHF
15799258	Basin Mile High 60T4	NHF

15807819	Ardrossan Admiral A2	NHF
15816127	Garret's On Target 323C	NHF
15817542	WAR Architect T040	NHC
15818622	MCATL Triple Stack	NHF
15823918	UI Peer Reviewed T083	NHF
15827698	Three Trees Destiny WCAR CA	NHF
15827916	Mill Brae Shawnee 7156	NHC
15828386	Lemar Dakota Gold 18T	NHF
15832299	Lyons Santa Fe 6119	NHF
15832303	Lyons Prairie Fire	NHF
15832579	Connealy Answer 71	NHF
15832596	Connealy Wrangler	NHF
15832750	Connealy Right Answer 746	NHF
15836708	SCR Right Cross 70024	NHF
15840414	TC Aberdeen 759	NHF
15851941	Baldrige Turbo T108	NHF
15866553	Koupals B&B Balance 7022	NHF
15876020	21AR Big Spread 7012A	NHF
15883460	21AR Roundup 7005	NHF
15885405	Poss Total Impact 745	NHF
15889408	VAR Programmer 7551	NHF
15899735	MOGCK Sure Shot	NHF
15904091	SydGen Contact 7711	NHF
15904153	SydGen 4247 Directive 7603	NHF
15904185	SydGen Contact 7839	NHF
15904186	SydGen Corona 7840	NHF
15904192	SydGen Triumph 7851	NHF
15904193	SydGen Contact 7853	NHF
15904204	SydGen Success 7872	NHF
15913232	Sinclair 20/20	NHF
15915090	SydGen Corona 7651	NHF
15915113	SydGen Sure Bet	NHF
15918327	SydGen Determination BDE	NHF
15922661	Nichols Quiet Lad T9	NHF
15923039	SydGen Next Step 7667	NHF
15934618	Duff Standout 785	NHF
15940911	Basin ON Target 7T16	NHF
15957231	Summitcrest Grid Buster T096	NHF
15973416	Blue and Gray Lee V04	NHF
15974345	Blue & Gray Jackson 90V	NHF

15989605	RM I Trend 7528	NHF
16016607	SydGen Corona 8144	NHF
16029532	SydGen Journey 8200	NHF
16033736	SydGen Directive 7509	NHF
16034520	SydGen Triumph 7916	NHF
16034524	SydGen Triumph 7925	NHF
16040356	SydGen Strategy 7909	NHF
16040357	SydGen Strategy 7912	NHF
16040359	SydGen Strategy 7935	NHF
16046828	G A R Concrete	NHF
16047469	D R Sierra Cut 7404	NHF
16090291	SydGen Poster Boy 8159	NHF
16098718	SydGen Corona 8468	NHF
16098723	SydGen Corona 8477	NHF
16148009	Steed Peacemaker 68	NHF