

PAP Research EPD

01/31/2019

Registration No.	Name	Birth Yr	PAP EPD / Acc	Prog Mod Elevation	Prog High Elevation
9250717	Q A S Traveler 23-4	1978	-.54 .53		5
10239760	Paramont Ambush 2172	1982	-1.16 .42		2
10776479	N Bar Emulation EXT	1986	-1.70 .64		27
10858958	D H D Traveler 6807	1986	+2.35 .47		
10909451	Basin Rainmaker D S 450W	1987	+.44 .46		19
11104267	Bon View Bando 598	1988	-1.78 .46		2
11160685	G T Maximum	1988	+.58 .49		16
11367940	Sitz Traveler 8180	1990	-.45 .52		2
11418151	B/R New Design 036	1990	-2.67 .47		1
11478610	Leachman Pressman	1990	-3.62 .41		16
11520398	G A R Precision 1680	1990	+1.00 .42		
11597456	T A R Paycheck 8271	1991	-1.42 .67		64
11712158	Basin Sensational	1992	+1.24 .56		37
11750711	Leachman Right Time	1992	-.82 .53	14	4
11935889	S A F Fame	1993	+.21 .42		
11951654	Basin Max 602C	1993	+1.76 .41		1
12038475	Stevenson Royce 741C	1993	-.72 .47		18
12048084	B C C Bushwacker 41-93	1993	-.57 .44		10
12090820	Sitz Traveler 7594	1994	-.78 .44		12
12309327	GDAR SVF Traveler 234D	1994	-.62 .46		16
12310707	Sitz Alliance 6595	1995	-.70 .66		35
12346200	Twin Valley Precision E161	1995	-.10 .53		5
12350821	S A F 598 Bando 5175	1995	-.83 .41		1
12354643	N Bar Explosion V1495	1995	-2.25 .54		9
12396462	Shamrock Mentor 1425	1995	-2.58 .71		90
12448729	A A R Really Windy 1205	1995	-1.90 .50		27
12452829	B A R Ext Traveler 205	1995	+.81 .43		4
12493607	C A Future Direction 5321	1995	-1.22 .56		11
12514348	O C C Emblazon 854E	1995	+2.43 .46	34	
12557724	N Bar Prime Time D806	1996	-1.17 .44		13
12618076	S A F Focus of E R	1996	-.20 .56		16
12620490	Shamrocks Rito 1426	1996	-1.69 .69		85
12783078	TC Advantage	1997	-.08 .43		9
12783540	Bon View New Design 1407	1997	-2.46 .69		56
12810693	Vermilion Dateline 7078	1997	+2.68 .50		5
13006526	Rito 8K4 of 5028 Rito 3X25	1997	-2.09 .45		12
13009379	C R A Bextor 872 5205 608	1998	+3.60 .48		21
13026916	Connealy Freightliner	1997	+.29 .56		21

Breed average EPDs for PAP EPD are -0.3. Therefore animals with values less than -0.3 are a "breed improver" for that trait. Lower numbers are more desirable for the trait.

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13044574	Bon View New Design 208	1998	-2.62 .56		25
13050780	Boyd New Day 8005	1998	-2.28 .68	2	67
13058662	Hyline Right Time 338	1998	-1.51 .68		73
13062750	Bon View New Design 878	1998	-1.65 .58		17
13092912	O C C Great Plains 943G	1997	-2.39 .72		93
13196434	Shamrocks Sensational 4178	1998	+1.24 .48		26
13264062	Sitz Rainmaker 6169	1999	-1.94 .48	5	4
13324510	H A R B High Plains 975 JH	1999	-.75 .40		13
13346328	KMK Alliance 6595 I87	1999	-.88 .45		7
13360311	BT Right Time 24J	1999	-1.02 .42		9
13364218	Er Focus J049	1999	-2.72 .64		67
13394625	G 13 Structure	1999	-1.12 .43		16
13395344	G A R Predestined	1999	-2.07 .47		
13447282	Connealy Lead On	1999	+.57 .48		
13458027	Shamrocks Advantage 4609	1999	-1.18 .70		92
13512009	S A V 8180 Traveler 004	2000	-.81 .65		56
13592905	S A V Final Answer 0035	2000	-.56 .55	5	
13708885	Shamrocks Mentor 7700	2000	-1.15 .56		34
13776378	S S Objective T510 OT26	2000	+1.18 .48		
13871033	Shamrocks Alliance 8310	2000	-1.04 .51		26
13880818	Mytty In Focus	2001	+.15 .60	5	20
13898124	BR Midland	2000	-.40 .47		19
13936986	Woodhill Foresight	2001	-.75 .59	4	19
13977765	TC Freedom 104	2001	+3.51 .55		34
14036365	O C C Legend 616L	2001	+.25 .56		32
14093248	Sitz Tradition RLS 8702	2002	-.09 .55		28
14187839	B C Marathon 7022	2002	+5.90 .50		30
14216491	Connealy Onward	2002	+.54 .40		9
14368850	Sitz Rainmaker 9723	2003	-2.94 .54	7	30
14456390	O C C Magnitude 805M	2002	-.24 .61		55
14474596	Sitz New Design 458N	2003	-1.66 .57	23	25
14555310	Shamrocks Right Time 1983	2003	-1.41 .42		11
14569103	Shamrock New Design 1793	2003	-1.13 .57		36
14601562	Shamrock New Design 1813	2003	-1.41 .58		33
14658781	Sitz Alliance 7544	2004	-1.20 .44	4	7
14691231	GDAR Game Day 449	2004	+.71 .63	73	46
14739140	S A V 004 Traveler 4168	2004	-1.46 .43		17
14823655	S A V 004 Predominant 4438	2004	+.89 .50	1	21

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14844711	TC Total 410	2004	-1.43 .54		13
14849409	Shamrocks Direction 006 E15P	2004	-.55 .53		34
14850409	Summitcrest Complete 1P55	2004	-1.83 .45		9
14949480	Sitz Identity 2575	2005	-2.55 .53	16	29
14963730	Sitz Upward 307R	2005	-.11 .71	72	76
15081884	Sinclair Mountain Pass 4P138	2004	-2.53 .40		14
15109865	S A V Bismarck 5682	2005	-1.20 .48		
15140670	B P F Special Focus 504	2005	+2.03 .43		15
15148659	Connealy Thunder	2005	-1.27 .54	12	27
15213668	Shamrocks Direction 714 E68R	2005	-1.56 .50		20
15310052	Sitz Rainmaker 8276	2006	-2.54 .58		49
15610610	SVF Shamrock Copyright 4926	2006	-1.33 .43		10
15656853	Sitz Madison 10477	2007	+1.83 .52	5	28
15656868	Sitz Dash 10277	2007	+1.11 .53	30	24
15656999	Sitz Dimension 8607	2007	-1.52 .50	12	21
15688392	S A V Pioneer 7301	2007	-1.06 .46	3	
15719841	A A R Ten X 7008 S A	2007	+0.06 .50	17	12
15755575	O C C Rising Sun 739R	2005	+0.21 .51		34
15848422	Connealy Final Product	2007	-.66 .42	12	3
15895211	SVF Shamrock IN Focus 116T	2007	-1.02 .40		10
16003720	Spur Franchise 7070	2007	-2.67 .44		17
16124994	Hoover Dam	2008	+0.34 .51		15
16150299	TC Thunder 805	2008	+0.65 .44		16
16295688	G A R Prophet	2008	+2.51 .41	4	4
16381311	PA Power Tool 9108	2009	-1.15 .48	12	17
16430795	K C F Bennett Absolute	2009	-1.81 .54	70	25
16433346	S Summit 956	2009	-.02 .40	20	7
16447771	Connealy Consensus 7229	2009	+0.21 .50	4	13
16568189	Soo Line Motive 9016	2009	-1.91 .43		19
16748950	Connealy Combination 0188	2010	-2.57 .50		27
16761479	Connealy Confidence 0100	2010	-1.33 .41	3	7
16764044	KM Broken Bow 002	2010	+0.15 .42	44	6
16924332	WR Journey-1X74	2010	-.72 .56		44
16925771	Quaker Hill Rampage 0A36	2010	+1.34 .42	25	11
16933958	G A R Sunrise	2010	+0.51 .43		16
16969520	Pine View Upward Y068	2010	-1.89 .44		12
17028963	Connealy Black Granite	2011	+0.03 .45	15	2
17031465	Connealy Comrade 1385	2011	-1.12 .51		8

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17035849	L J G Total 6521	2011	-1.12 .40		9
17038724	Basin Payweight 1682	2011	+1.49 .44	1	
17198958	SMR/CCC First Option 1563	2011	-.24 .40		15
17264774	Musgrave Aviator	2012	-1.24 .56		42
17287387	S S Niagara Z29	2012	+1.02 .41		12
17307074	Deer Valley All In	2012	+.14 .49	4	
17417375	KCF Bennett Expert Z138	2012	-.16 .40		12
17923103	GA Hoover Dam 7384	2014	-1.08 .44		11
18283090	DLG Power Tool 2665	2015	-2.19 .46		13
18286467	HA Cowboy Up 5405	2015	+.08 .42		

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## Research Report: Selection Tools for Pulmonary Arterial Pressure

On February 1, the American Angus Association® and Angus Genetics, Inc. (AGI) released research EPDs for high altitude pulmonary arterial pressure (PAP). The PAP EPD predicts the genetic differences in PAP score with lower scoring animals being more acceptable. PAP is an indicator for animals with lower risk of developing high altitude disease (HAD) which in most cases results in congestive right heart failure.

Researchers and veterinarians at Colorado State University (CSU) have been studying the disease and its onset for years and have developed PAP tests in order to select animals to avoid pulmonary hypertension. This disease, most commonly found in cattle living at elevations of 5,000 ft or greater, is a result of animals living in hypoxic environments which challenges heart and lung function. Symptoms of the disease include lethargy, diarrhea, weakness, brisket edema and death. While hard to quantify the economic deficit the industry is facing from the disease, it is known to be detrimental to high altitude herds as onset can occur at any age, can be further exacerbated by other events such as bovine respiratory disease (BRD), and in almost all cases is fatal to the animal if they are not recognized and moved to lower altitudes.

The PAP procedure is helping operations to avoid the unfavorable onset of HAD by finding high risk individuals earlier in life, not only to be removed from the herd and sent to lower altitudes but also to select breeding animals for the next generation. In order to take high altitude PAP measurements on individual groups, animals need to be living at elevations at 5,500 feet or higher for at least a 4-6 week period before scores are taken. This warm-up period allows for the cattle to adjust to the environmental settings allowing for accurate measurements to take place.

Research in the area shows PAP score is a heritable measurement meaning genetic selection can take place. This opens the opportunity for geneticists to create prediction tools like EPDs to aid in selection. A collaboration with the Association, CSU, and AGI laid the fundamental groundwork for a PAP genetic evaluation. In a recent study looking at three combined datasets amongst the group, it found moderate heritability estimates and investigated the relationships of scores taken at differing elevations. The study by Pauling et al. (2018) concluded a high positive correlation ( $r=0.83$ ) between PAP measurements taken at high altitudes (5,250 ft or greater) and moderate altitudes (4,000-5,250 ft) exists meaning PAP scores

taken at moderate altitudes can be an informative indicator trait of measurements taken at higher altitudes. The correlation is actually higher than witnessed between carcass records and ultrasound measurements that are used to inform Carcass EPDs.

For the Association's PAP genetic evaluation, measurements taken at 5,500 ft or greater are considered high altitude measurements whereas measurements taken from 4,000 to 5,500 ft are considered moderate altitude. Heritability estimates were similar to those found in previous research with high altitude ( $h^2=0.36$ ) having a larger heritability when compared to moderate altitude PAP scores ( $h^2=0.16$ ). In addition, the correlation estimate between the two elevation groups remained relatively unchanged at 0.80. In total, 4,700 high altitude PAP scores and 1,500 moderate elevation PAP scores were used in this initial research run. Through collaborations with high altitude breeders and CSU, more data will be added to the database in the coming months. Both age and elevation were accounted for in the model as covariates and yearling contemporary groups were included in the model as fixed effects. Contemporary group includes herd, sex, test date, and elevation.

When evaluating these initial research EPDs it is important to remember, a lower PAP EPD would indicate a sire should produce progeny with lower pulmonary arterial pressures decreasing the risk of contracting HAD, which is desirable. It is also important to remember that a PAP EPD is not a replacement for taking scores on cattle living at elevation. An animal may have good genetics to pass onto the next generation, but due to a life event, BRD for instance, their respiratory system may be damaged causing them to lack the viability to survive at high altitudes. Think of PAP in terms of scrotal size. Animals may have the genetic potential to pass along larger scrotal size genetics, but scrotal (SC) EPDs are not a replacement for breeding soundness exams (BSE). Producers will not send a bull out without conducting a BSE no matter how good his SC EPD is. The EPD can be valuable to select parents for the next generation with less risk. However, if a sire is to be taken to higher elevations to live they should be tested themselves before doing so.

This research EPD intends to prompt discussion among high altitude breeders to gather feedback from the industry before a weekly production PAP EPD would be released later this year. With this initial release, only A.I. sires with accuracy values of greater than 0.40 are published this research report. EPDs in this report were predicted with the use of the

Association's Single Step genomic evaluation; therefore, genotypes were readily used for the PAP evaluation to more precisely define relationships among pedigrees. Association members who have sent in data to the Association will receive research PAP EPDs on individual animals in their herds who have PAP scores submitted and on herd sires who have enough progeny scores recorded. If members have PAP data they would like to send into the Association to be used for future analysis, members are asked to log into their AAA Login account to submit these scores. The collection of more PAP data will allow for more research on the topic and, ultimately, more definitive answers about HAD susceptibility.