

Odborný seminár

Skalský Dvůr 8. - 9. decembra 2009

Interbull a genomická selekcia v šľachtení HD



Katedra genetiky a plemenárskej biológie, SPU v Nitre

Juraj Candrák, Štefan Ryba*, Peter Strapák

* Plemenárske služby SR š. p.

INTERBULL

<http://www.interbull.org/>



[Home](#) [Organization](#) [Public Area](#) [Restricted Area](#) [Interbull Centre](#) [News](#)

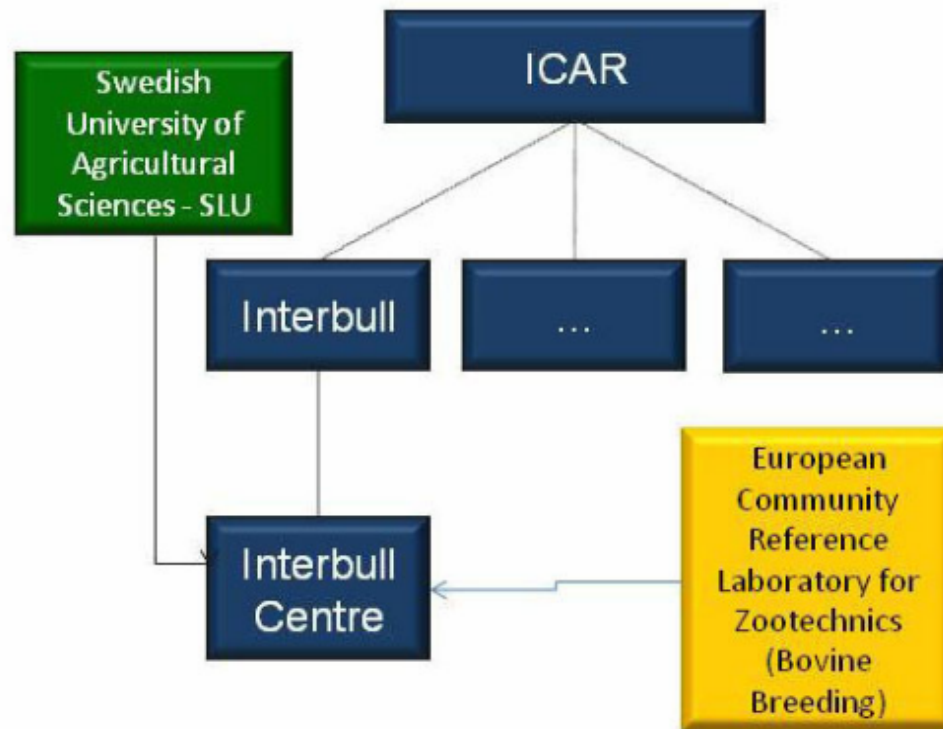


Interbull

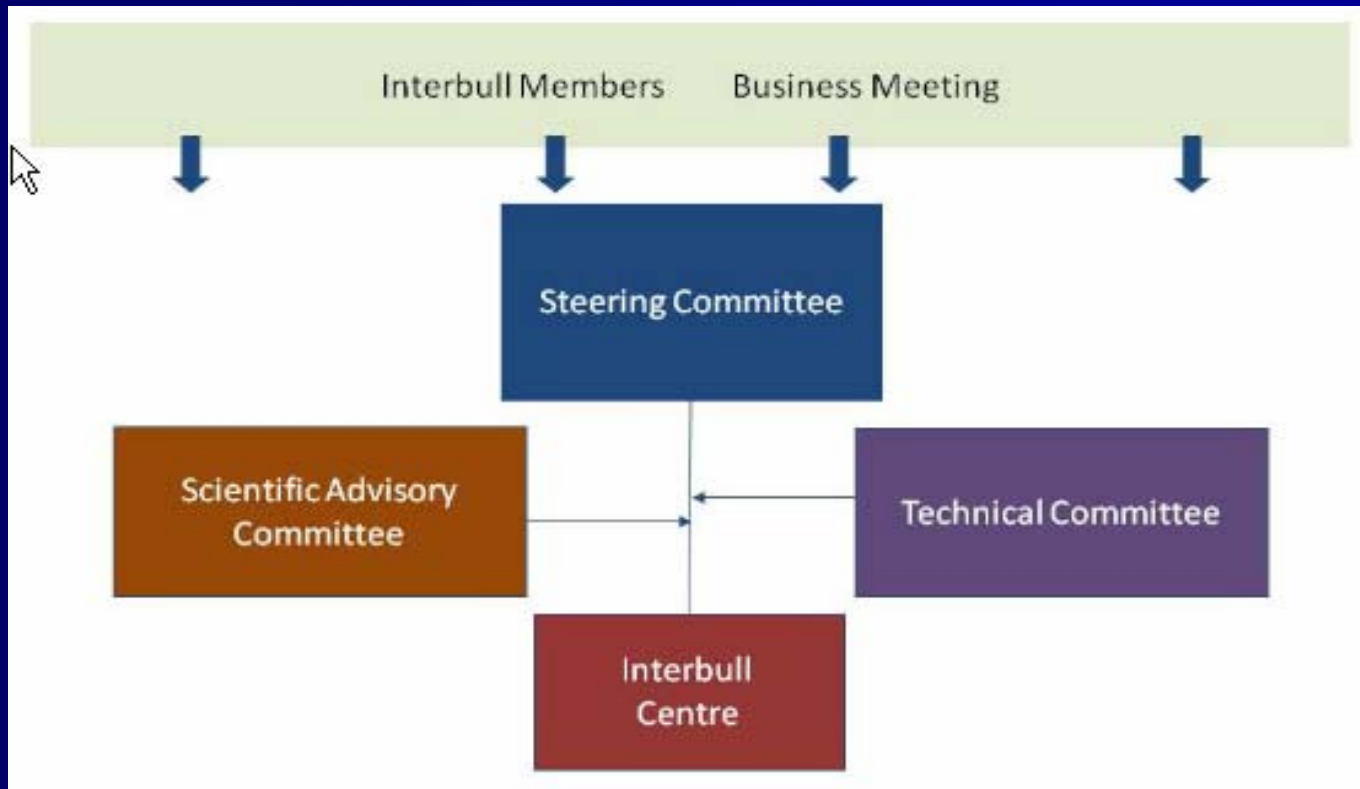
Welcome to the International Bull Evaluation Service Official Website. INTERBULL is a sub-committee of the International Committee for Animal Recording (ICAR).

INTERBULL

Organizational Structure



INTERBULL



INTERBULL – steering committee

Name	Contact
Reinhard Reents (Chairman) E-mail: rreents@vit.de Fax: +49-4231-955-185	Vereinigte Informationssysteme Tierhaltung w.V. Heideweg 1 27283 Verden / Aller Germany
Brian Van Doormaal E-mail: vandoorm@cdn.ca Fax: +1-519-7676768	Canadian Dairy Network 150 Research Lane, Suite 307 Guelph, N1G4T2, Ontario Canada
Gert Pedersen Aamand E-mail: GAP@landscentret.dk Fax: +45 8740 5010	Nordisk Avelsvurdering Udkærsvvej 15, Skejby, DK-8200 Århus N Denmark
Bevin Harris E-mail: bevinharris@me.com Fax: +64 7 858 2741	Animal Evaluation Unit Private Bag 3016 Hamilton New Zealand
Marjorie Faust E-mail: MFaust@absglobal.com Fax: 608/846-6444 or 6446	ABS Global, Inc. P.O. Box 459, 1525 River Rd. DeForest, WI 53532 USA
Sophie Mattalia E-mail: sophie.mattalia@jouy.inra.fr Fax: +33-1-34652210	Institut de l'Elevage INRA-SGQA Domaine de Vilvert 78352 JOUY en JOSAS cedex FRANCE
Enrico Santus E-mail: enrico.santus@anarb.it Fax: +39-45-7156655	Assoc. nazionale allev. bovini razza Bruna Loc. Ferlina, 204 37012 Bussolengo (Verona) Italy
Hans Wilmink E-mail: Wilmink.H@cr-delta.nl Fax: +31-26-3898777	NRS PO Box 454 6800 AL Arnhem The Netherlands
Juraj Candrak E-mail: Juraj.Candrak@uniag.si Fax: +421-37-7411-451	Department of Genetics & Animal Breeding Biology Faculty of Agrobiolgy and Food Resources Tr.A.Hlinku 2 949 76 Nitra Slovak Republic

INTERBULL - praktická stránka

International information

[Cross-reference list](#)

Interbull Cross-reference lists of bulls with multiple registrations

[Production](#)

Evaluation summaries for production traits

[Conformation](#)

Evaluation summaries for conformation traits

[Udder health](#)

Evaluation summaries for udder health traits

[Direct longevity](#)

Evaluation summaries for direct longevity traits

[Calving Traits](#)

Evaluation summaries for calving traits

[Female Fertility](#)

Evaluation summaries for female fertility traits

[Workability](#)

Evaluation summaries for milking speed and temperament

INTERBULL - praktická stránka

Table 1. National evaluation data considered in the Interbull evaluation for dairy production traits (August 2009). Number of records for milk yield by breed

Country	Red Dairy Cattle	Brown Swiss	Guernsey	Holstein	Jersey	Simmental
Australia	493		110	5497	1261	
Belgium#				735		
Canada	571	138	78	7889	373	
Czech Republic				2547		2430
DFS ###	5840			9522	1631	
Estonia	278			585		
France		241		12435		275
France, Montbeliarde						3272
France, RedHol				157		
Germany-Austria	321	4473		19047	73	15003
Hungary				2145		142
Ireland				1435		55
Israel				888		
Italy		1425		7295	106	1031
Japan				3608		
Latvia	560			387		
Netherlands##		103		11109	88	136
New Zealand	930	34	56	4902	3158	
Norway	2989					
Poland				5605		
Rep. South Africa	112		36	1022	520	
Slovak Republic				721		386
Slovenia		286		233		463
Spain				1803		
Switzerland		2262		823		2241
Switzerland, RedHol				1345		
United Kingdom	384		248	4802	591	
United States	429	749	658	26021	2792	
No. Records	12907	9711	1186	132558	10593	25434
No. Bulls	12068	8247	963	112162	8924	23723
Publishable Proofs	11966	8203	963	109744	8887	22720

Walloon part of Belgium

The Netherlands + Flemish part of Belgium

Denmark, Finland and Sweden

INTERBULL - praktická stránka exteriér

	AUS	BEL	CAN	CHE	CHR	CZE	DEU	DFS	ESP	EST	FRA	FRR	GBR	HUN	ITA	JPN	NLD	NZL	POL	USA	ZAF	No. record	No. bulls
stature	2727	688	7022	818	1194	2285	17157	8825	1775	218	12091	154	4341	1612	6473	3340	10558	3851	4711	22979	569	113388	99556
chest width	2727	634	7022	818	1194	2285	16849	8611	1775	218	7310	105	4331	1612	6469	3340	8334	3851	4706	22978	401	105570	92407
body depth	2464	684	7022	818	1194	2285	17156	8612	1775	218	7987	154	4332	1612	6469	3340	8340	3851	4707	22978	569	106567	93149
angularity	2723	607	7022	813	0	2285	16889	8611	1774	218	7310	154	4308	1612	6469	3340	8066	0	4706	22978	568	100453	88278
rump angle	2727	688	7022	818	1194	2285	17157	8614	1775	218	12091	154	4341	1612	6473	3340	10558	3851	4711	22979	569	113177	99346
rump width	2727	557	7022	818	1194	2285	17150	8613	1775	218	7987	154	4339	1612	6473	1411	10362	3851	4708	22979	569	106804	93410
rear leg set	2727	688	7022	818	1194	2285	17157	8824	1775	218	12091	154	4341	1612	6473	3340	10558	3851	4711	22979	569	113387	99557
rear leg rear view	1268	501	5267	814	1192	1502	13773	8590	1702	217	4642	105	3507	1595	5988	2657	6880	0	3225	22973	400	86798	76037
foot angle	2459	541	7022	818	1189	2250	4849	8575	1747	213	11139	139	4295	1595	6416	3340	7860	0	4664	22976	568	92655	80914
fore udder	2727	636	7022	818	1194	2285	13921	8785	1775	218	9395	154	4333	1612	6469	3340	8340	3851	4708	22978	568	108129	94577
rear udder height	2727	637	7022	818	1194	2285	17155	5646	1775	218	11143	154	4291	1612	6470	3340	8340	3851	4709	22978	569	106934	93371
udder support	2727	638	7022	818	1194	2285	17157	8786	1775	218	12091	154	4341	1612	6473	3340	10558	3851	4711	22979	569	113299	99522
udder depth	2460	680	7022	818	1104	2285	17157	8786	1775	218	12091	154	4318	1612	6473	3340	10558	0	4711	22979	569	109110	95924
front teat placement	2727	638	7022	818	1194	2285	17157	8576	1775	218	12091	154	4341	1612	6473	3340	10558	3851	4711	22979	569	113089	99313
teat length	2460	688	7022	818	1194	2283	17151	8783	1775	218	12091	154	4318	1343	6473	3193	10558	0	4711	22979	569	108781	95608
rear teat placement	994	597	6998	806	0	1493	2229	4826	1695	214	12060	151	2391	0	5422	1411	5780	3779	1964	9281	0	72091	63449
overall conformation	2727	685	7022	818	1104	2285	17156	8670	1775	218	7358	154	4339	1612	6473	3340	10557	3851	4707	22883	0	107734	94693
overall udder	2727	688	7022	818	1104	2285	17157	8825	1775	218	11767	154	4085	1612	6473	3340	10558	3851	4711	22979	0	112149	99029
overall feet & legs	2460	631	7022	818	1104	2276	13783	8818	1771	217	7310	0	4060	1338	6009	3068	10553	0	4696	21257	0	97191	85162
locomotion	0	492	5262	349	0	0	6289	8579	0	0	7305	0	3496	0	5936	0	4746	0	0	21247	0	63701	57751
body condition score	0	555	0	512	0	0	6359	2452	0	0	7293	141	3394	0	6333	0	6778	0	0	22931	0	56748	52098

INTERBULL - praktická stránka somatické bunky

Table 1. Number of national bull evaluations used in the Interbull evaluation for milk somatic cell and for clinical mastitis (within parenthesis) (August 2009)

Country	Red Dairy Cattle	Brown Swiss	Guernsey	Holstein	Jersey	Simmental	
Australia	480		105	5442	1089		
Belgium				691			
Canada	569	136	77	7885	373		
Czech Republic				2174		1445	
Denmark, Finland + Sweden	7069(6561)			9635	(8534)	1486(1239)	
Estonia	272			237*	(137)		
France		234		576		254	
Germany	321	4113		12429		2937****	
Hungary				170**		14222	
Ireland				19044		104	
Israel				1679			
Italy		1195		1433			
Japan				878		895	
Netherlands		103(66)		7412			
New Zealand	857	31	55	3673		138 (99)	
Norway	2957(2973)			11234	(10440)	86(48)	
Spain				4883		2798	
Switzerland		2201		1800		2245	
United Kingdom	229		167	970			
United States	395	718	574	1378****			
Rep. South Africa	91			4100	366		
Slovak Republic				25796	2666		
				909	390		
				646		299	
Across country	12480(11996)	7442(7442)	775	105896	(104649)	7794(7559)	21429 (21427)

INTERBULL - praktická stránka

Interbull Routine Genetic Evaluation for Udder Health Traits

August 2009

Changes in national data

NLD ALL : introduction of mastitis trait

CZE HOL,SIM : test day record for SC excluded if less than 80% of samples within HTD have somatic cells analysis

DFS ALL : updating of the Danish database, some of the oldest data got excluded

SVK HOL,SIM : submitting somatic cell

INTERBULL - praktická stránka dlhovekost'

Table 1. Number of national bull evaluations used in the Interbull routine evaluation for Direct Longevity (August 2009)

Country	Red Dairy C.	Brown Swiss	Guernsey	Holstein	Jersey	Simmental
Australia	458		108	5340	1197	
Belgium				636		
Canada	567	131	83	7716	358	
Denmark (Holstein) (Red Holstein)	1619			6358	1857	
Finland	2979			221		
France		223		1001		
Germany	304	4773		11940		3114
Hungary				17106		
Ireland				2160		
Israel				1472		
Italy				864		
The Netherlands		1413		6949		
New Zealand	826	94		10378	83	97
Spain		31	50	4785	3000	
Sweden	2867			1723		
Switzerland (Hol) (RHol)		2370		2162		
United Kingdom	303		198	958		
United States	413	719	648	1201	4855	473
				24864	2677	
Across Country	10336	9754	1087	112689	9645	3211

INTERBULL - praktická stránka plodnost'

HOL Country	Traits				
	T1 = HC	T2 = CY	T3 = C1	T4 = C2	T5 = IT
BEL		638		700	638
CAN	4516	4881	4999	4379	4368
CHE		844	855	866	
CHR		1165	1165	1170	
CZE	2114		2042	2068	
DEU	15714	18203	17962	17038	16970
DFS	9630	9520	9540	9589	9336
ESP		1506		1568	1506
FRA	9909		11143	11187	
GBR		4042	4321	4128	4042
IRL		1388		1471	1388
ISR			838	850	
ITA		6851	6786	6411	6377
NLD		10683	10581	10773	10681
NZL		4819		4841	4819
USA	7174	25583	10284	25605	25583
Across Country	49057	90123	80516	102644	85908

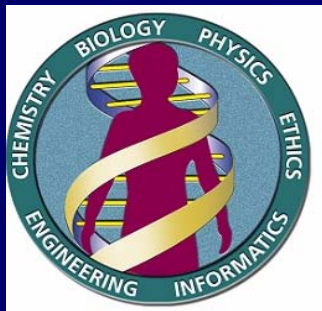
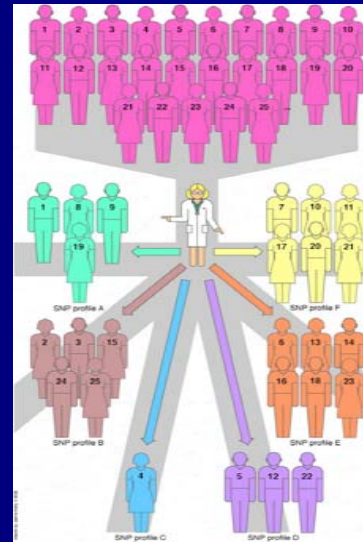
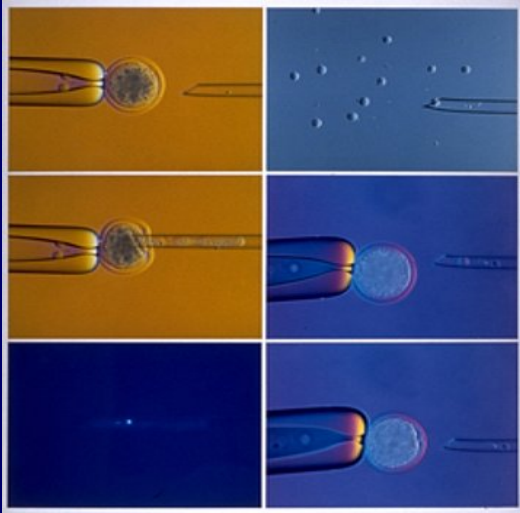
SIM Country	Traits				
	T1 = HC	T2 = CY	T3 = C1	T4 = C2	T5 = IT
CZE			1403	1403	
NLD			35	35	
Across Country			1438	1438	

CZE

T1=HC
T3=C1
T4=C2

CR=Heifers' Conception rate (pregnant or not after 3 months)
CR=Cows' Conception rate (pregnant or not after 3 months)
CR=Cows' Conception rate (pregnant or not after 3 months)

$$P = G + E$$



Human Genome Project

$$P = G + E$$

Number of QTL by Year When They were Published

Year	Number of QTL
1997	2
1998	91
1999	63
2000	125
2001	98
2002	66
2003	306
2004	194
2005	183
2006	123
2007	282
2008	556
2009	255

$$P = G + E$$

Number of QTL by Cattle Chromosomes

Chromosome	Number of QTL
X	7
1	84
2	127
3	105
4	61
5	153
6	212
7	114
8	47
9	75
10	68
11	90
12	57
13	50
14	222
15	56
16	55
17	48
18	75
19	84
20	105
21	52
22	43
23	69
24	43
25	39
26	72
27	31
28	35
29	65

Chromozóm	počet SNP	%
X	1672	3,14
1	3343	6,28
2	2764	5,19
3	2566	4,82
4	2541	4,77
5	2181	4,10
6	2535	4,76
7	2294	4,31
8	2362	4,44
9	2036	3,82
10	2179	4,09
11	2267	4,26
12	1683	3,16
13	1802	3,38
14	1722	3,23
15	1688	3,17
16	1606	3,02
17	1585	2,98
18	1351	2,54
19	1378	2,59
20	1564	2,94
21	1419	2,66
22	1299	2,44
23	1083	2,03
24	1294	2,43
25	987	1,85
26	1086	2,04
27	977	1,83
28	942	1,77
29	1048	1,97

$$P = G + E$$

Number of QTL by Cattle Trait Classes

Trait Class	Number of QTL
Exterior	63
Health	175
Meat	314
Milk	741
Production	540
Reproduction	511

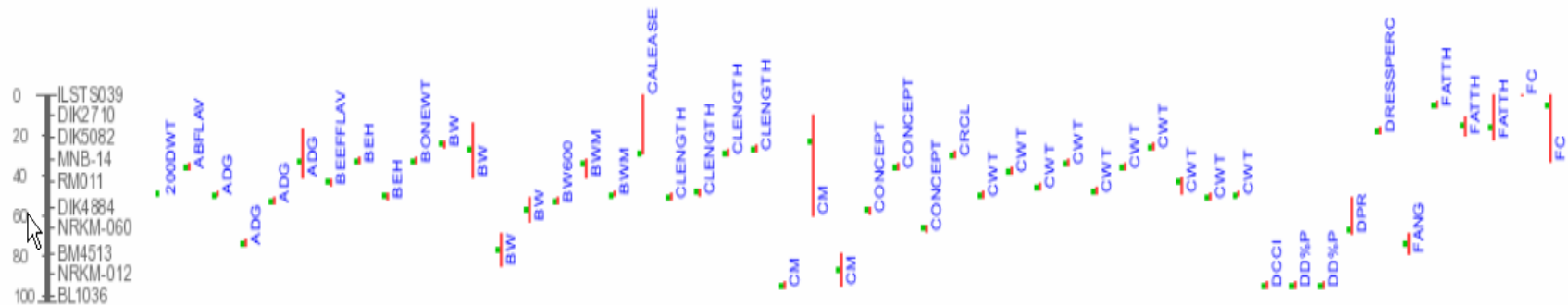
$$P = G + E$$

A Snapshot of QTL on Cattle Chromosome 14

(There are too many QTL to display; Use the browse hint below the graph to see more)

Align QTL from: (cM) to: (cM)

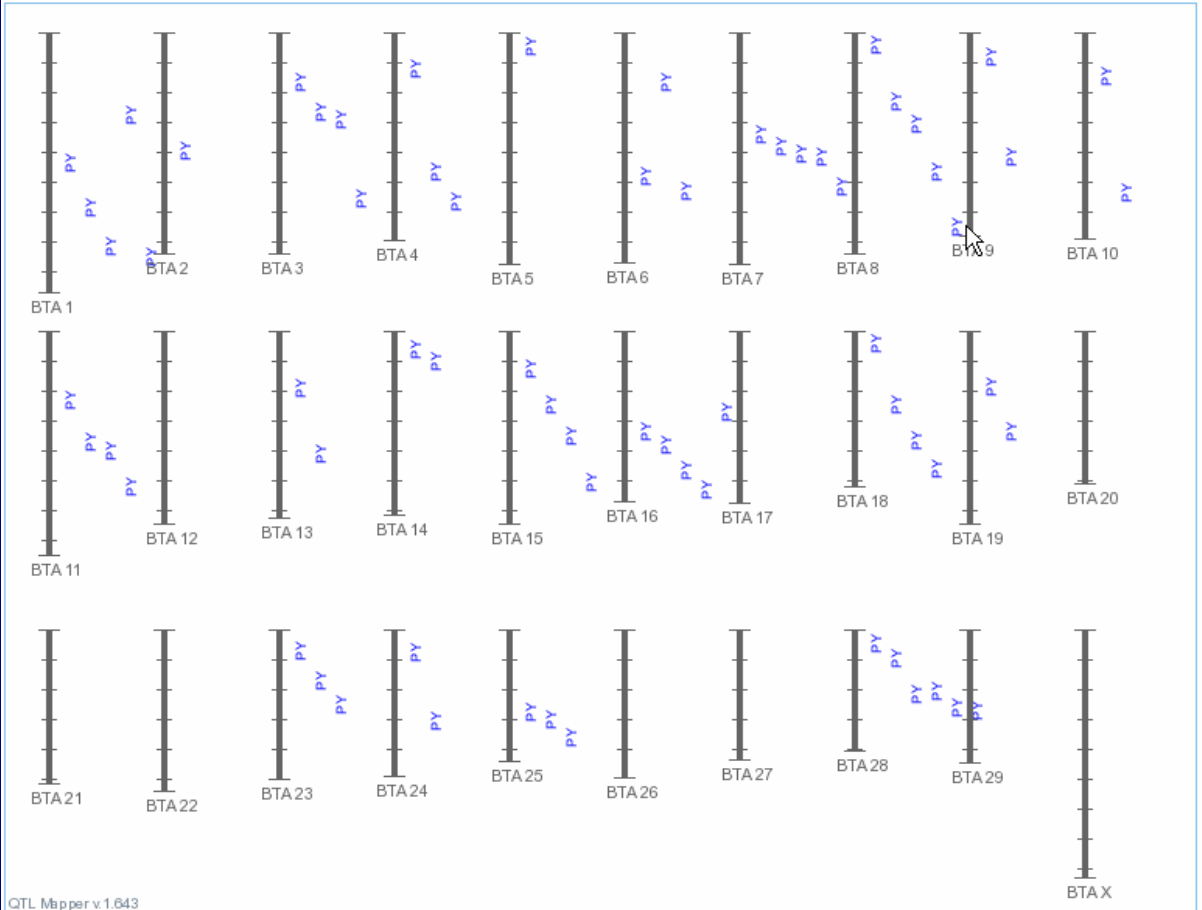
to Baylor Cattle SNPs aligned to bovine genome



$$P = G + E$$

QTL for Protein Yield (EBV) in the Cattle Genome

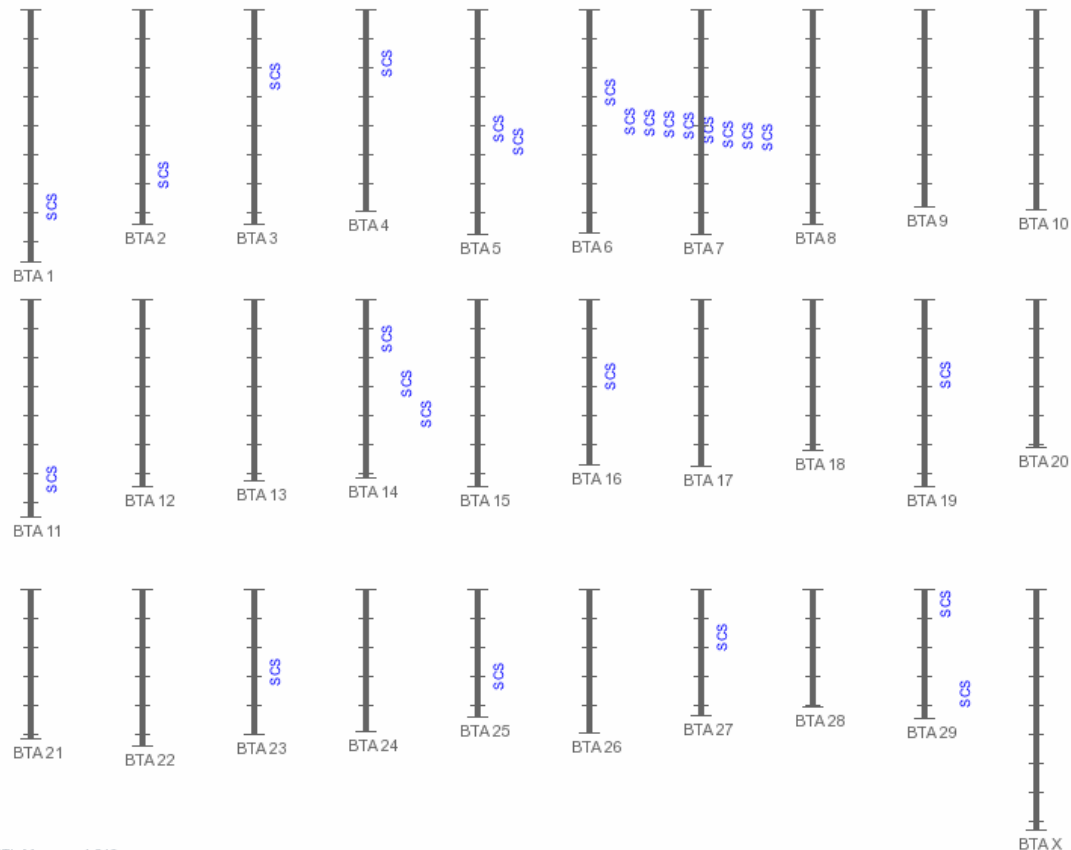
(Click on a chromosome to show all QTL on that chromosome; Click on a QTL name to get its details.)



$$P = G + E$$

QTL for Somatic cell score (EBV) in the Cattle Genome

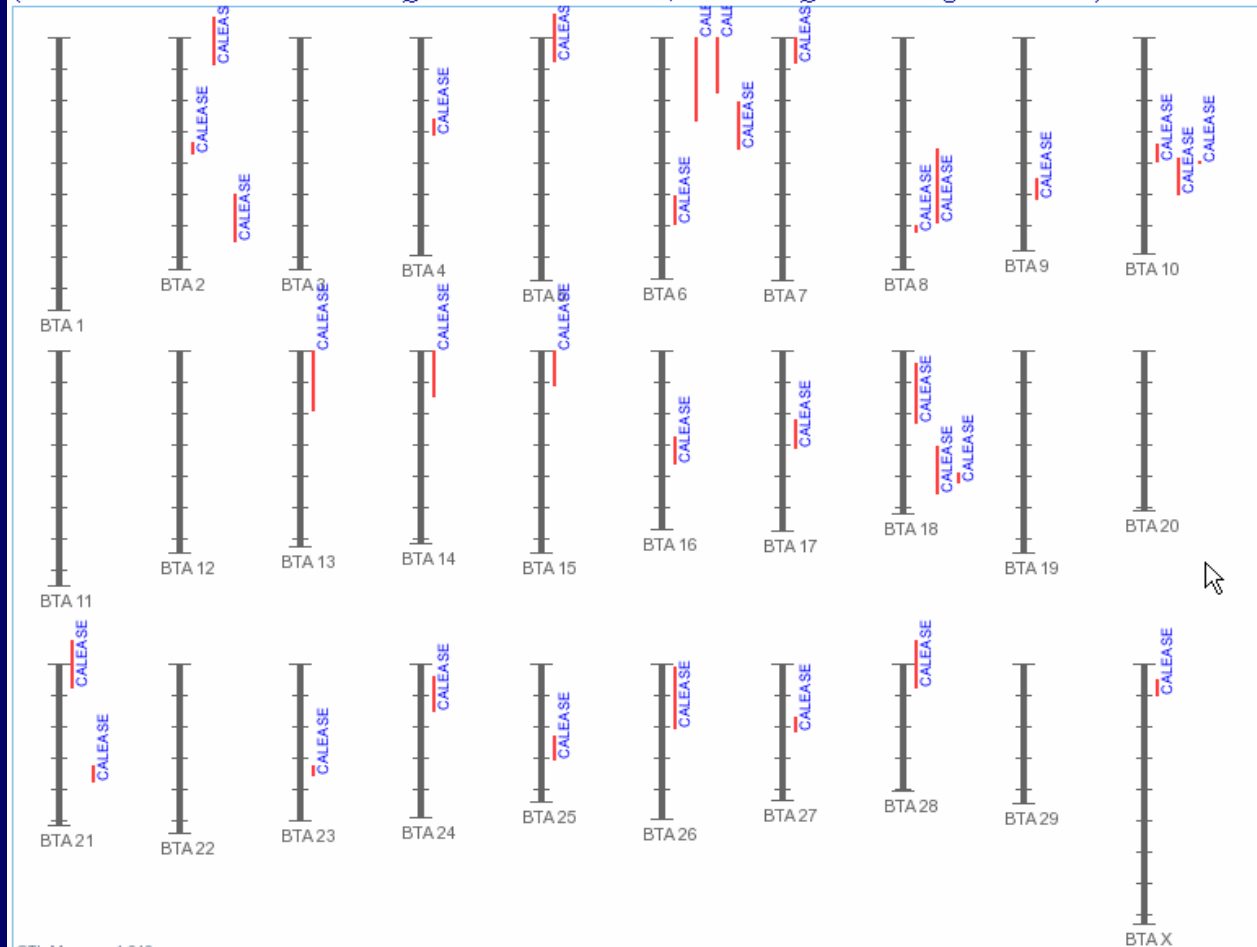
(Click on a chromosome to show all QTL on that chromosome; Click on a QTL name to get its details.)



$$P = G + E$$

QTL for Calving ease in the Cattle Genome

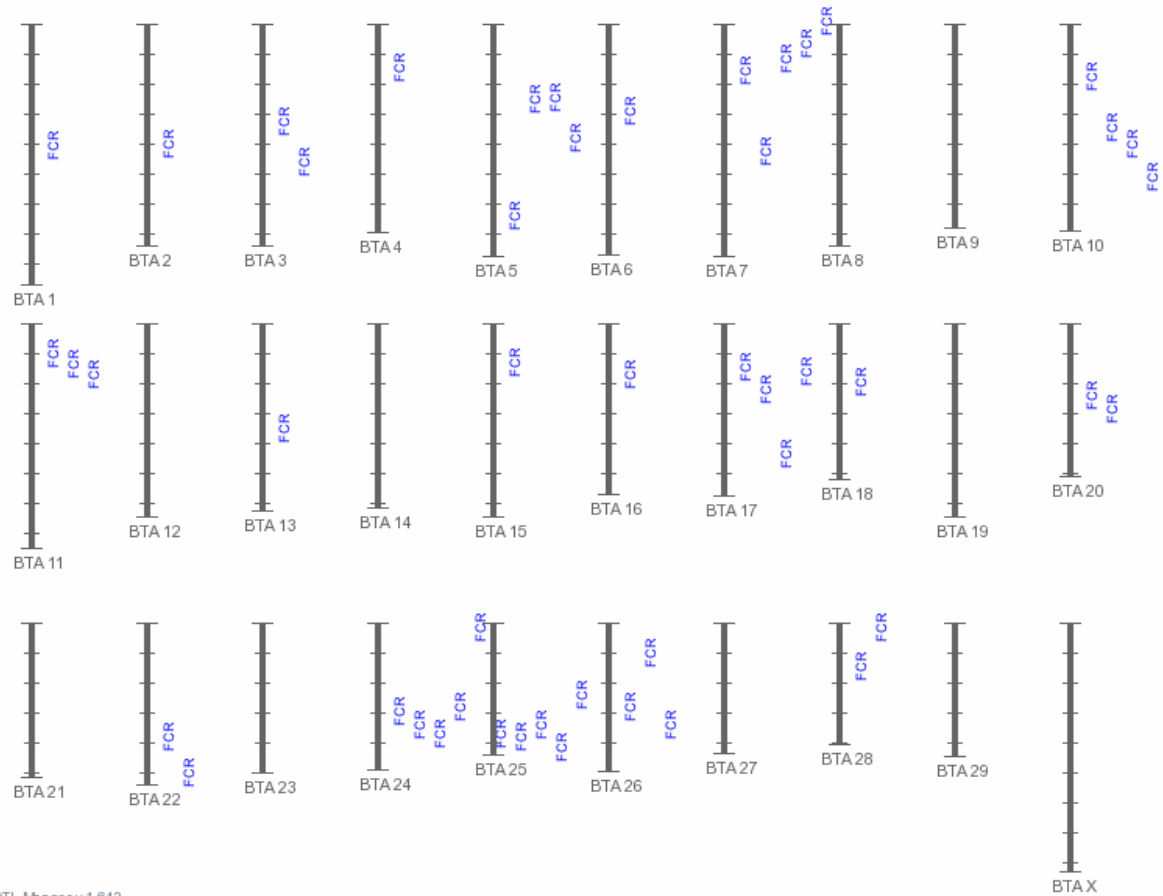
(Click on a chromosome to show all QTL on that chromosome; Click on a QTL name to get its details.)



$$P = G + E$$

QTL for Feed conversion ratio in the Cattle Genome

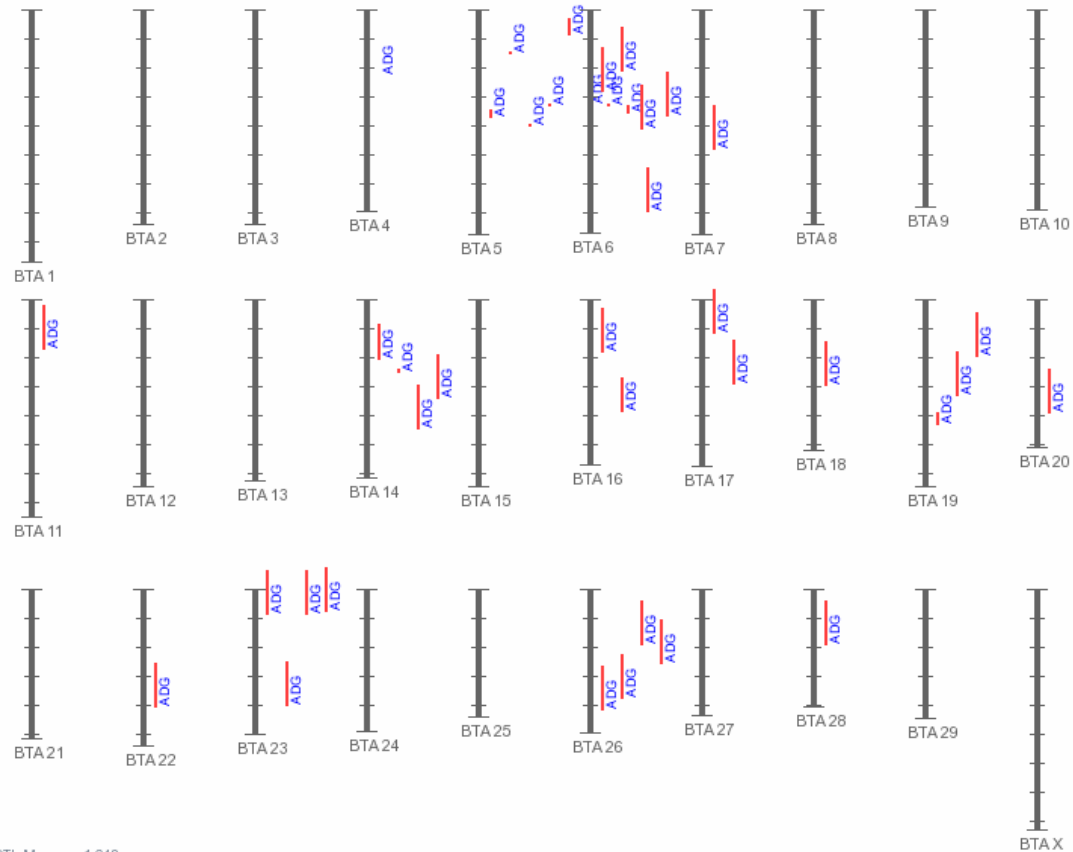
(Click on a chromosome to show all QTL on that chromosome; Click on a QTL name to get its details.)



$$P = G + E$$

QTL for Average Daily Gain in the Cattle Genome

(Click on a chromosome to show all QTL on that chromosome; Click on a QTL name to get its details.)



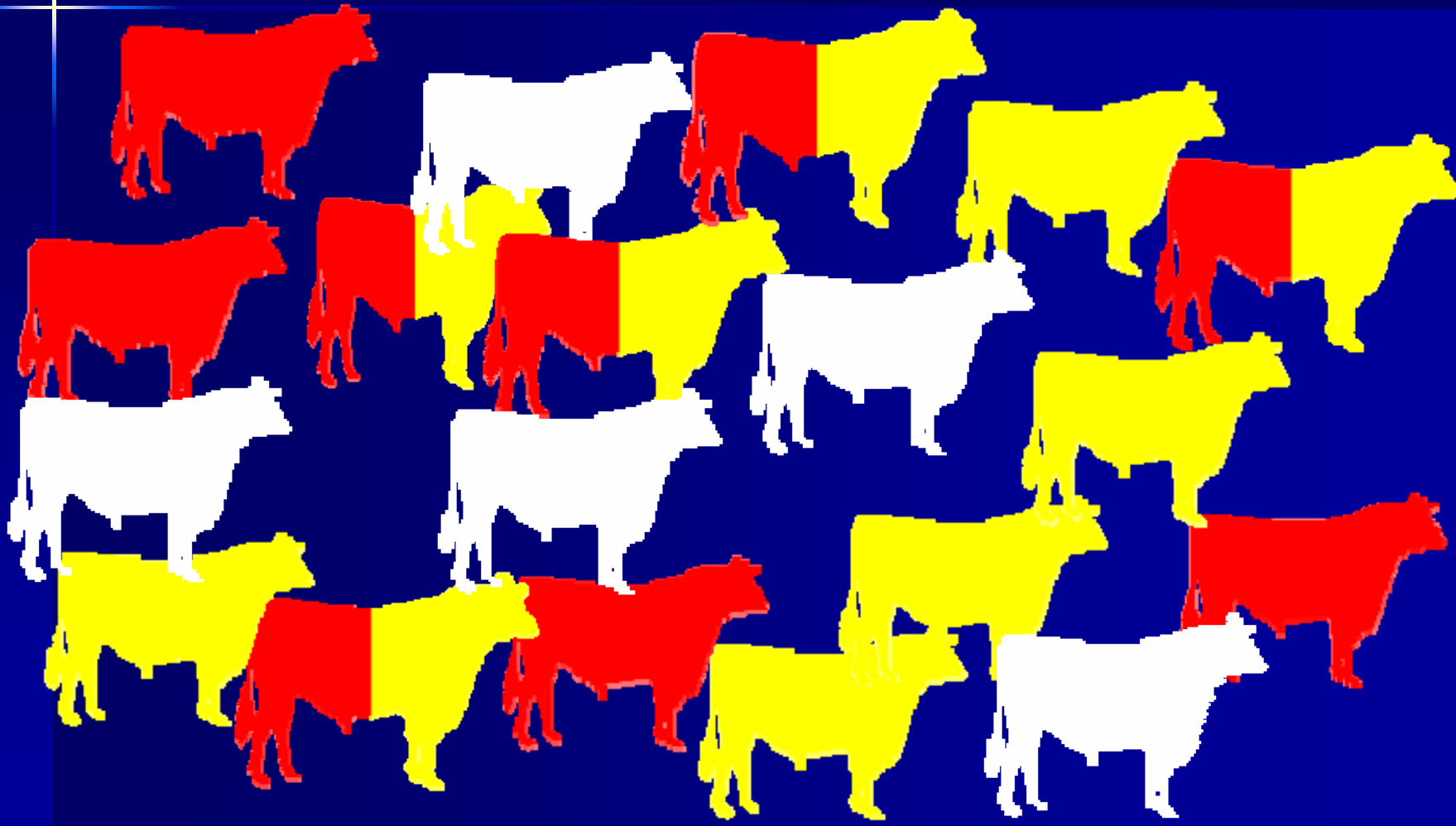
$$P = G + E$$

(Trait Class) ▪ (Trait Type) ▪ (Trait Name)

1. [Reproduction](#) ▪ [Fertility](#) ▪ [Calving ease](#)
2. [Reproduction](#) ▪ [Fertility](#) ▪ [Conception rate](#)
3. [Reproduction](#) ▪ [Fertility](#) ▪ [Gestation length](#)
4. [Reproduction](#) ▪ [Fertility](#) ▪ [Heat intensity \(n/a\)](#)
5. [Reproduction](#) ▪ [Fertility](#) ▪ [Inseminations per conception](#)
6. [Reproduction](#) ▪ [Fertility](#) ▪ [Interval from first to last insemination](#)
7. [Reproduction](#) ▪ [Fertility](#) ▪ [Interval to first estrus after calving \(Interval calving to first insemi\)](#)
8. [Reproduction](#) ▪ [Fertility](#) ▪ [Interval to first estrus after calving \(EBV\)](#)
9. [Reproduction](#) ▪ [Fertility](#) ▪ [Non-return rate \(n/a\)](#)
10. [Reproduction](#) ▪ [Fertility](#) ▪ [Offspring born alive](#)
11. [Reproduction](#) ▪ [Fertility](#) ▪ [Ovulation rate \(n/a\)](#)
12. [Reproduction](#) ▪ [Fertility](#) ▪ [Pregnancy rate](#)
13. [Reproduction](#) ▪ [Fertility](#) ▪ [Still birth \(n/a\)](#)
14. [Reproduction](#) ▪ [Fertility](#) ▪ [Twinning](#)

Gene Assisted Selection

"DNA Chips"



Genomics - Genomika

Štruktúrna genomika

Bioinformatika

Funkčná genomika

Genomika

Zložitost' - jednoduchost' problému

Organism type	Organism	Genome size (base pairs)	mass - in pg	Note
Virus	Bacteriophage MS2	3,569	0.00000352	First sequenced RNA-genome ^[8]
Virus	SV40	5,224		^[9]
Virus	Phage Φ -X174	5,386		First sequenced DNA-genome ^[10]
Virus	Phage λ	48,502		
Bacterium	<i>Carsonella ruddii</i>	159,662		Smallest non-viral genome. ^[12]
Bacterium	<i>Buchnera aphidicola</i>	600,000		
Bacterium	<i>Wigglesworthia glossinidia</i>	700,000		
Bacterium	<i>Haemophilus influenzae</i>	1,830,000		First genome of living organism, July 1995 ^[11]
Bacterium	<i>Escherichia coli</i>	4,600,000		^[13]
Bacterium	<i>Solibacter usitatus</i> (strain Ellin 6076)	9,970,000		Largest known Bacterial genome
Yeast	<i>Saccharomyces cerevisiae</i>	12,100,000		^[17]
Nematode	<i>Pratylenchus coffeae</i>	20,000,000		Smallest animal genome known ^[19]
Fungus	<i>Aspergillus nidulans</i>	30,000,000		
Plant	<i>Genlisea margaretae</i>	 63,400,000		Smallest recorded flowering plant genome, 2006. ^[15]
Nematode	<i>Caenorhabditis elegans</i>	100,300,000		First multicellular animal genome, December 1998 ^[18]
Insect	<i>Drosophila melanogaster</i> (fruit fly)	130,000,000		^[20]
Plant	<i>Arabidopsis thaliana</i>	157,000,000		First plant genome sequenced, December 2000. ^[15]
Fish	<i>Tetraodon nigroviridis</i> (type of puffer fish)	385,000,000		Smallest vertebrate genome known
Plant	<i>Populus trichocarpa</i>	480,000,000		First tree genome, September 2006
Moss	<i>Physcomitrella patens</i>	480,000,000		First genome of a bryophyte, January 2008 ^[16]
Insect	<i>Bombyx mori</i> (silkworm)	530,000,000		
Insect	<i>Apis mellifera</i> (honey bee)	1,770,000,000		
Mammal	<i>Homo sapiens</i>	3,200,000,000		
Plant	<i>Fritillaria assyrica</i>	130,000,000,000		
Fish	<i>Protopterus aethiopicus</i> (marbled lungfish)	130,000,000,000		Largest vertebrate genome known
Amoeboid	<i>Polychaos dubium</i> (<i>Amoeba dubia</i>)	670,000,000,000	678.824	Largest known genome. ^[14]

Zložitosť - jednoduchosť problému

Máme správny algoritmus na zarovnávanie, čo viac nám chýba?

Časová zložitosť: $O(nm)$ na sekvenciách dĺžky n a m .

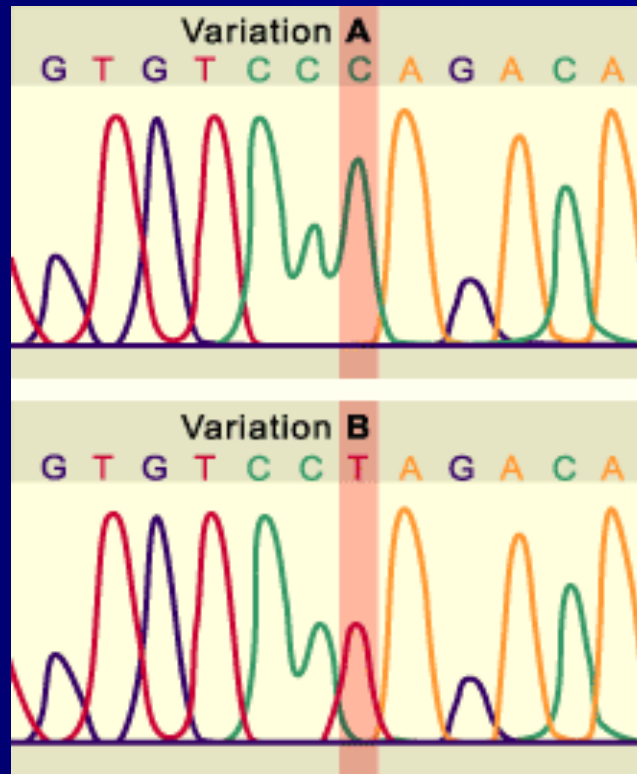
Koľko je to času v skutočnosti?

(jednoduchá implementácia, náhodné sekvencie dĺžky n ,
bežný moderný počítač)

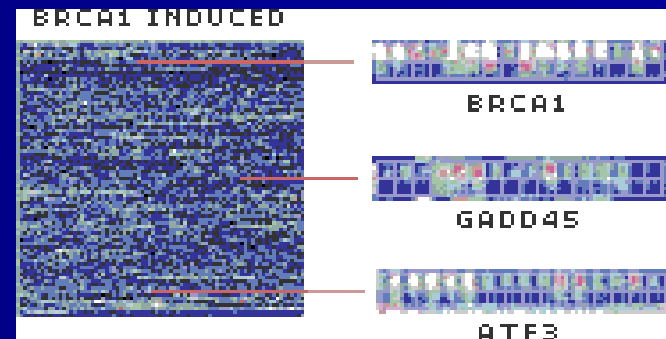
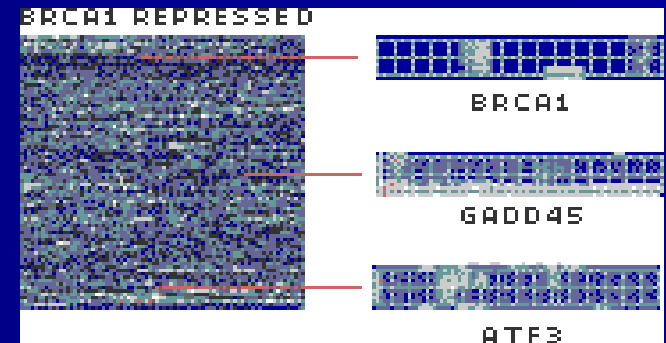
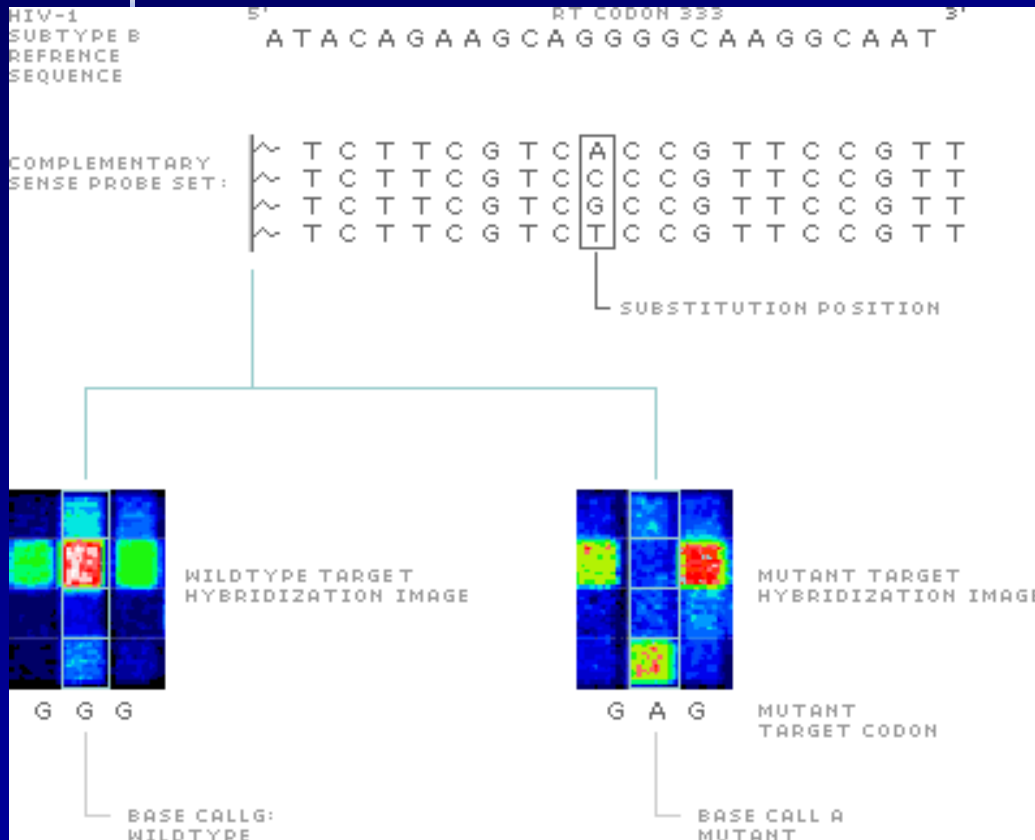
n	time
100	0.0008s
1,000	0.08s
10,000	8s
100,000	13 minút (*)
1,000,000	22 hodín (*)
10,000,000	3 mesiace (*)
100,000,000	25 rokov (*)

Potrebujeme efektívnejší algoritmus, najmä ak chceme pracovať s celými genómami

Genomics - Genomika



"DNA Chips"



Genomika

Moderné prístupy

Genomics

ILLUMINA® SNP GENOTYPING

BovineSNP50 Genotyping BeadChip

Developed in collaboration with leading bovine researchers, the BovineSNP50 BeadChip features more than 54,000 evenly spaced SNP probes that span the bovine genome. This 12-sample BeadChip presents a cost-effective and high-quality solution for cattle researchers interested in genome-wide genotyping applications.

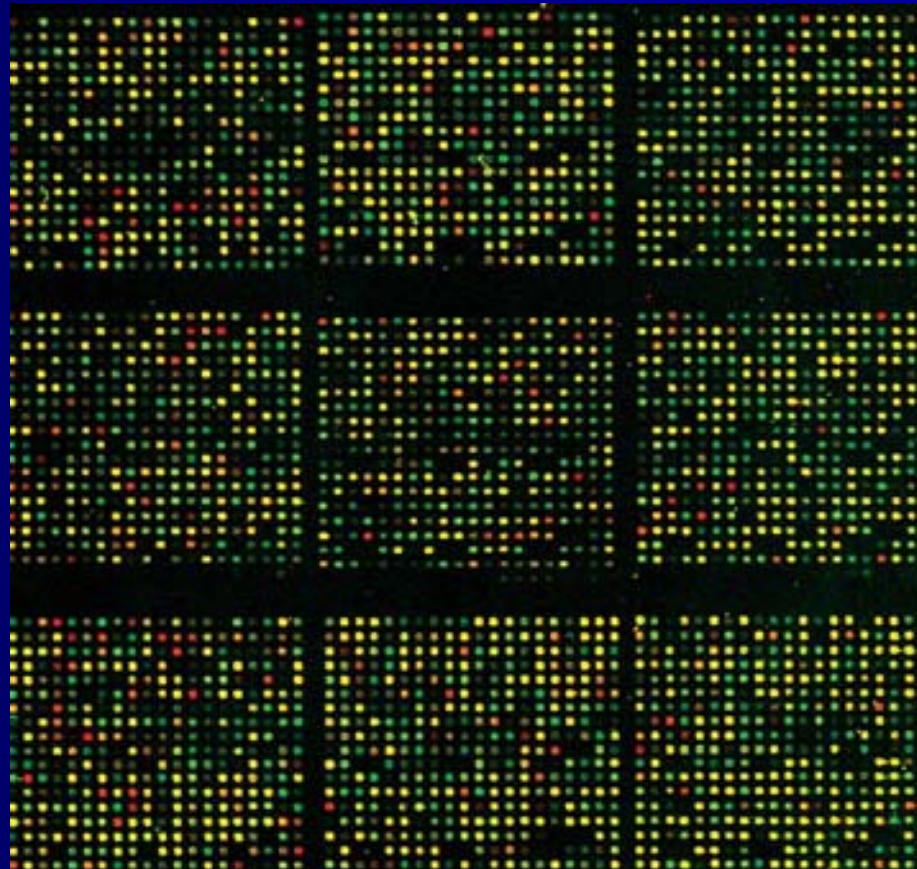
Január 2009

www.illumina.com

Zaplat' a my dekódujeme Tvoju DNA



Zaplat' a my dekódujeme DNA



“DNA Chips”

Very recent → genotyping of single nucleotide polymorphisms (SNP)

- Genotyp = „Allels“ at a given location
- State of the art technology
→ ~ 50.000 SNPs from an individual animal for 200 EUR

Genotype:

Tier 1:	...AGGCACC GCAATCCACG GAGGC T ACGC CCTCACCGGA GGTTTCGCTC TCCACGG...	TT
Tier 2:	...AGGCACC GCAATCCACG GAGGC A ACGC CCTCACCGGA GGTTTCGCTC TCCACGG...	AA
Tier 3:	...AGGCACC GCAATCCACG GAGGC T ACGC CCTCACCGGA GGTTTCGCTC TCCACGG...	AT
Tier n:	...AGGCACC GCAATCCACG GAGGC A ACGC CCTCACCGGA GGTTTCGCTC TCCACGG...	AA

e. g. Position: Chromosom 6 # 43.675.239



Genomika

Praktické pristupy

**Dairy
Bulls**
.com

2009
August Global Dairy
Sire Genetic Evaluations

[Home](#) [Dairy Bulls](#) [Register](#) [Background](#) [Links](#) [Contact Us](#)

Genetic Base United States 08/2009

Page 1
Records 1 - 10

Search Results: 58 record(s)

- For best results print this page in landscape mode.
- Click on any of the bull's names for a detailed report.

[New Query](#)

Breed: HO																						
IAAB	Interbull ID	Name	Lbs. Milk	% Fat	Lbs. Fat	% Prot	Lbs. Prot	PL	SCS	CE	HM\$	FM\$	CM\$	MF Rel	GIIM	GB-Prod	PTAT	Type Rel	UDC	F&L C	GB-Type	TPI
	FRAM005996003942	MAIZEFIELD	452	-0.03	8	-0.03	7	-0.9	2.88	8	16	39	0	83		USA-I	-0.24	65	-0.48	-0.63	HA-M	1055
	USAM000001726712	MAIZEFIELD ACTIVATION	-2252	0.15	-47	0.01	-65	1.8	2.94	0	-320	-328	-311	68		USA-D	0.00	0	0.00	0.00	HA-	0
007HO04927	USAM000002224080	MAIZEFIELD ADAM BLAIR-ET	517	0.03	27	-0.03	7	1	2.7	5	142	172	123	91		USA-D	-0.13	81	0.20	-3.05	HA-	1173
	USAM000001601385	MAIZEFIELD ASTRONAUT	-1752	0.06	-49	0.01	-49	0.1	2.9	0	-319	-331	-308	68		USA-D	0.00	0	0.00	0.00	HA-	0
011HO03922	USAM000002210646	MAIZEFIELD BALANCE-ET	39	0	1	-0.02	-5	0.5	2.91	8	-23	-1	-37	85		USA-D	0.06	78	0.05	-0.46	HA-	1012
029HO08199	USAM000002236317	MAIZEFIELD BARNABY-ET	-404	0.04	-5	-0.02	-17	0.8	2.74	9	-62	-44	-72	85		USA-D	0.00	0	0.00	0.00	HA-	0
004HO01017	USAM000002155510	MAIZEFIELD BELARE-ET	-758	-0.01	-31	-0.01	-26	0.8	2.83	6	-89	-77	-95	78		USA-D	0.00	0	0.00	0.00	HA-	0
011HO03243	USAM000002103297	MAIZEFIELD BELLWOOD-ET	953	-0.01	32	-0.01	26	-1.9	2.88	7	53	61	46	99	G	USA-I	-0.17	99	-1.18	-0.57	HA-	1131
100HO06881	USAM000002203671	MAIZEFIELD BENNETT-ET	-410	0.1	9	-0.08	-33	0.7	3.01	11	-89	-15	-134	84		USA-D	-0.42	78	-0.33	-0.17	HA-	882
	USAM000002155509	MAIZEFIELD BERT-ET	168	0.03	15	-0.05	-9	0.4	2.96	0	54	104	23	60		USA-D	0.00	0	0.00	0.00	HA-	0

Genomika

Praktické pristupy

SEMEX'S GENOMIC PROGRAM



genomic SELECTION

Table 1: Semex has been involved in genomics research for many years

YEARS	COLLABORATORS	OBJECTIVE OF THE PROJECT	OBJECTIVE OF THE PROJECT	OBJECTIVE OF THE PROJECT
1999-2006	Agriculture Canada (Leamoxville)	Assisted selection	1000 sires	155 *
2003-2007	University of Guelph	Assisted selection	800 Sires	10,000**
2006-2007	University of Alberta	Assisted selection	380 Sires	1536**
2007-2008	USDA, Guelph, Alberta	Assisted selection	5000 Sires	50,000**
2005-2007	Holstein Canada and others	DNA collection	3100 Cows	55*
2003-2007	DairyGen	Genomics projects	Variable	Variable

Type of markers: *microsatellites; **SNP

Table 2: Reliability of genomic evaluations (North American project)

TRAIT	PARENT AVERAGE RELIABILITY	GENOMIC EVALUATION RELIABILITY	ADDITIONAL DAUGHTER EQUIVALENTS
Milk Yield	35	58	10
Fat Yield	35	68	18
Protein Yield	35	57	9
Productive Life	27	45	21
SCS	30	51	18
Fertility	25	41	35
Final Score	24	42	5

Based on a group of 1,759 validation bulls from the USDA project.

Genomika

Praktické přístupy



UNCEIA, CRV, DHV a VIT, VIKING GENETICS

Genomika

Praktické prístupy

TABLE 3: BOVINENP50 BEADCHIP CONTENT VALIDATION

BREED	SAMPLES	POLYMORPHIC LOCI*	MEAN MAF [†]	MEDIAN MAF [†]
Angus	60	41,491	0.21	0.21
Beefmaster	24	42,925	0.22	0.21
Bos indicus Gir	24	23,971	0.11	0.02
Bos indicus Nelore	21	25,814	0.11	0.02
Brahman	25	30,284	0.13	0.08
Brown Swiss	24	36,347	0.19	0.17
Charolais	26	42,589	0.22	0.21
Guernsey	21	38,632	0.19	0.17
Hereford	32	42,992	0.20	0.23
Holstein	64	42,730	0.22	0.22
Jersey	28	35,976	0.18	0.14
Limousin	45	42,821	0.22	0.22
N'Dama	25	29,049	0.14	0.08
Norwegian Red	21	42,782	0.22	0.21
Piedmontese	24	42,185	0.22	0.21
Red Angus	15	40,188	0.21	0.20
Romagnola	24	38,830	0.20	0.19
Santa Gertrudis	24	42,064	0.22	0.21
Sheko	20	35,726	0.17	0.12
Outgroup [‡]	18	11,206	0.05	0.00
Overall	565	47,545	0.25	0.24

*MAF > 0.05

[†]Across all 54,001 loci

[‡]*Bos bison*, *Bos gaurus*, *Bos grunniens*, *Bos javanicus*, *Bubalus depressicornis*, and *Syncerus caffer*.

Genomika

EU - nariadenie

European Commission Decision 427 , from June 20th, 2006

“III Genetic evaluation

‘1 Principles... The breeding value of an animal is calculated on the basis of the results of the performance of the individual and/or of its relatives. The statistical methods applied in genetic evaluation must comply with the principles agreed by competent international bodies (for example, the ICAR) and guarantee a genetic evaluation unbiased from the influences of the main environmental factors and data structure. The reliability of the genetic evaluation must be measured as the coefficient of determination in accordance with principles agreed by competent international bodies (for example, the ICAR). When publishing the evaluation results, the reliability as well as the date of evaluation must be given.’ ‘2 (a) ... the minimum reliability of the genetic evaluation of AI bulls of the dairy breeds must be at least 0,5 for the main production traits according to ICAR principles taking into account all information from relatives”

Genomika

Výhody

**Vyššia presnosť plemennej hodnoty (GEBV)
ako presnosť rodokmeňovej PH**

**Možnosť jej získania
už pri narodení zvierat'a**

**Možné zmeny v šľachtiteľských programoch
? ? ?**

Genomika

Nevýhody

Odhady SNP efektov sa časom menia

Nutnosť vykonávať opakované odhady

Rozdiely medzi plemenami a populáciami

Zmena SNP techniky (počet SNPs)

Možné zmeny v šľachtiteľských programoch

Patentované gény

**DGAT1 (US007537888), GHR (US007407750), ABCG2 (WO2007/002735,
PCT/US2006/025117)**

Komerčné záujmy

Genomika

INTERBULL


Posúdenie, overenie a vypracovanie návrhu odporúčaní pre možnosti využitia genomických informácií v systémoch genetického hodnotenia HD

Žiadosť o zaslanie genomických informácií

Genomika

INTERBULL

Table 1 – Number of GEBVs sent to Interbull Centre for the May 2009 test run.

Category	Trait Group	France	New Zealand	the Netherlands	Poland
Young Bulls 	Production	929	1318	905	
	Conformation	1218	1487	905	
	Udder Health	929	1631	905	
	Longevity		1415	905	
	Calving			905	
	Fertility	998	1415	905	
	Workability			905	
Proven Bulls	Production	2267	4944		1086
	Conformation	2228	4944		1077
	Udder Health	2266	4944		
	Longevity		4944		
	Calving				
	Fertility	2198	4944		
	Workability				

Genomika

INTERBULL

October 26, 2009

INTERBULL PROVISIONAL STRATEGIC PLAN

INTERBULL

Genomika

INTERBULL

- presnosť
- nezávislosť
- reálna časová dostupnosť
 - transparentnosť
 - finančná efektívnosť

INTERBULL - dlhodobé zámery

- medzinárodné genetické hodnotenie so zohľadnením genomických informácií - 2011
 - ISO certifikát – 2011
- medzinárodné genetické hodnotenie Interbeef – 2011
 - vytvorenie genetickej monitorovacej služby
- ponuka medzinárodného genetického hodnotenia pre neparticipujúce krajiny - 2013

INTERBULL - krátkodobé zámery

- medzinárodné štandardy pre genomické hodnotenia
 - GMACE pilotný projekt
- dátový interaktívny prístup participujúcich krajín
 - vývoj komunikačnej a obchodnej stratégie

december 2009

INTERBULL - krátkodobé zámery

- implementácia novej databázy
- vývoj a implementácia nového prístupu k údajom
- vývoj a implementácia nového prístupu k publikácii a dokumentácii
 - použitie Sire - Dam rodokmeňového súboru
 - použitie viacznakového prístupu pri výpočte EDC
 - definovanie požiadaviek Mendelistického prístupu
 - použitie overovaného súhrnného hodnotenia exteriéru
- vývoj pracovných techník pre SNP efekty pre malé populácie
 - zavedenie viacznakového MACE

december 2010

A na záver . . .

Heslo týždňa

**Vymením sekundové lepidlo
za trojsekundové**

Poznámka - nestačím lepiť

(3x meraj a potom až rež)

Ďakujeme za pozvanie a pozornosť



SVAZ CHOVATELŮ ČESKÉHO STRAKATÉHO SKOTU



a úspešnejší chovateľský rok 2010 . . .

Tato prezentácia bola vytvorená realizáciou projektu „Excelentné centrum ochrany a využívania agrobiodiverzity“, na základe podpory operacneho programu Vyskum a vyvoj financovaneho z Európskeho fondu regionalneho rozvoja a realizáciou projektu VEGA 1/0769/09 „Genetické hodnotenie plodnosti hovädzieho dobytká“.