Application note

GVG Diagnostics

Genotyping of the Y-chromosome of inbred animals using highly informative STR marker panel

The unclear or misclassified genetic background of laboratory rodents or a lack of strain awareness causes a number of difficulties in performing or reproducing scientific experiments.

The Y-chromosome of mice plays a crucial role in sex determination, gender equilibrium and male fertility. In addition it acts as mediator of physiological traits like behavior, metabolism, susceptibility to infections, autoimmune and heart dieases or weight and size of adult animals. A father's "wrong" Y-chromosome can result in clear differences even in phenotypes of daughters (Nelson et al, 2010).* Due-to errors in the breeding strategy (recipient male not crossed in), a considerable percentage of male transgenic animals harbors a Y-chromosome which differs from the targeted genetic background.

GVG has identified a series of highly informative, strain- and substrain-specific STR-markers (Short Tandem Repeats, microsatellites) covering the Y-chromosome. These markers can be used for validation of strains, their substrains and parentage lines to ensure consistency with genetic background of reference strains.

Method

- Genotyping by GVG's Y-chromosomal panel of STR-loci
- Determination of Y-chromosome STR-haplotype and comparison with haplotypes of different strains or substrains
- Checking for the presence of C57BL/6-specific mutations

Our service: Fast results, customer-friendly presentation of analysis data

- Genotyping results within 10 working days
- Analysis data in customer-friendly tabular form (see example overleaf)

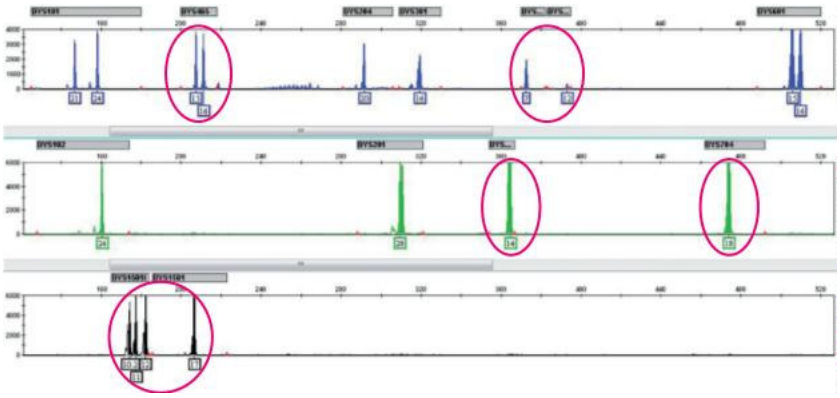
We'd be delighted to explain to you the details of our method, work with you to plan your project, and put forward an attractive proposal. Just get in touch with us!

* Nelson et al. 2010. Transgenerational genetic effects of the paternal Y chromosome on daughter´s phenotype. Epigenomics. 2(4) 513–521.

GVG Diagnostics GmbH
Deutscher Platz 5e I 04103 Leipzig I Germany I info@gvg-diagnosticsde I www.gvg-diagnostics.de

Example: Characterization of C57BL/6-derived inbred mice

Step 1: Genotyping of Y-chromosomal STR-markers



Y-chromosomal STR-genotyping: Circles characterize strain-specific loci, others are used to differentiate between substrains.

	DYS101	DYS102	DYS201	DYS204	DYS301	DYS601
JCrl	21-24	24	28	20	16	14-16
JRj	21-23	24	28	20	16	14-16
JOlaHsd	21-24	23	28	20	16	14-16
JRccHsd	21-24	24	28	21	15	15-16
JBomTac	21-24	24	27	20	16	0-0
NCrl	21-24	22	28	21	16	14-16
NHsd	21-24	23	28	21	16	14-16
NTac	24-24	23	28	21	17	14-16
NRj	21-24	23	28	21	17	14-15

Each substrain has its characteristic combination of alleles (Y-STR haplotype). Two alleles: PCR-primers target two different sites.

Step 2: Genotyping of C57BL/6-specific markers

The combination of C57BL/6-specific markers with Y-chromosomal STR haplotype allows fast assignment of inbred mice to strains and substrains. Mixed genetic background of BL6/J and BL/6N as well as of non-BL/6 can be detected easily.

Crb 1rd8		DIP 686		DIP1606			*Snca 1*		*Nnt*		Substrain
Chr 1 / 139,2		Chr 6 / 86,4		Chr 16 / 6,1			Chr 6 / 60,7		Chr 13 / 119,3		Chrom. No / MBp
wt	mut	wt	mut	wt	mut-A	mut-B	wt	mut	wt	mut	
											C57BL/6N
	+	+				+	+		+		NTac, NRj
	+	+			+		+		+		NHsd, NCrl, NTjl
											C57BL/6J
+			+		+		+			+	JCrl, JRj, JTjl
+			+		+			+	+		JOlaHsd
+			+		+		+		+		JBomTac, JRccHsd
+		+		+			+		+		no C57BL/6

Identification of C57BL/6 strain- and substrain-specific markers (deletion-insertion-polymorphism – DIP)