# IMGT overview: the mouse immunoglobulin heavy IGH genes

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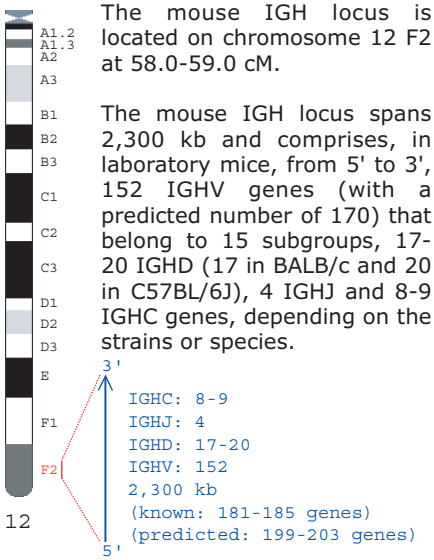
## How many IGH genes?

### Chromosome 12 F2

The total number of known immunoglobulin heavy IGH genes per haploid genome in *Mus musculus* laboratory mice is 181-185, with a predicted number of 199-203.




The mouse IGH locus is located on chromosome 12 F2 at 58.0-59.0 cM.

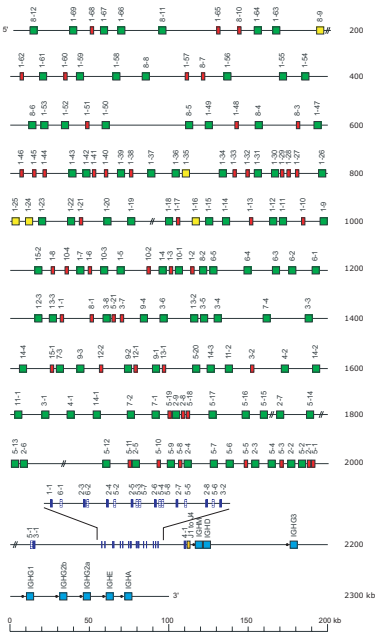
The mouse IGH locus spans 2,300 kb and comprises, in laboratory mice, from 5' to 3', 152 IGHV genes (with a predicted number of 170) that belong to 15 subgroups, 17-20 IGHD (17 in BALB/c and 20 in C57BL/6J), 4 IGHJ and 8-9 IGHC genes, depending on the strains or species.

*Lefranc, M.-P. et al., In Silico Biology, 5, 45-60 (2005)*

## How are IGH genes organized?

### IGH locus

Locus representation: Mouse *(Mus musculus)* IGH on chromosome 12 F2




*Lefranc, M.-P. et al., Nucl. Acids Res., 33, D593-D597 (2005)*

## How many functional IGH genes?

### Potential repertoire

The potential IGH repertoire per haploid genome comprises 119-124 functional genes: 97 IGHV genes that belong to 15 subgroups, 10-14 IGHD genes (10 in C57BL/6J and 14 in BALB/c) that belong to 4 subgroups, 4 IGHJ, and 8-9 IGHC genes.

Overview

| | Number of genes | Functional genes |
|---|---|---|
| IGHV | 152 | 97 |
| IGHD | 17-20 | 14 |
| IGHJ | 4 | 4 |
| IGHC | 8-9 | 8-9 |
| Total | 181-185 | 119-124 |

The definitive IMGT nomenclature of the mouse IGHV genes and the correspondence with the provisional nomenclature have been established.
The mouse IGH genes and alleles and the corresponding IMGT reference sequences were provided to Mouse Genome Informatics MGD in July 2002 and are available in IMGT/GENE-DB.

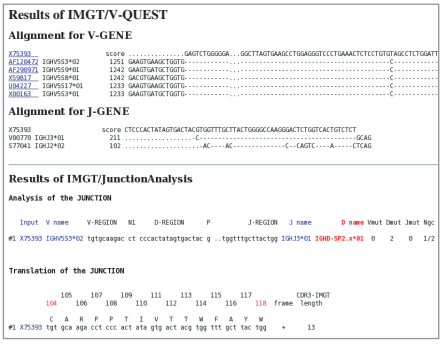
*Giudicelli, V. et al., Nucl. Acids Res., 33, D256-D261 (2005)*

## IMGT tools to analyse expressed variable genes

## IMGT/V-QUEST IMGT/JunctionAnalysis

### Sequence analysis

Analysis of the IGHV genes (germline or rearranged) can be performed by IMGT/V-QUEST and analysis of the V-D-J junctions by IMGT/JunctionAnalysis.

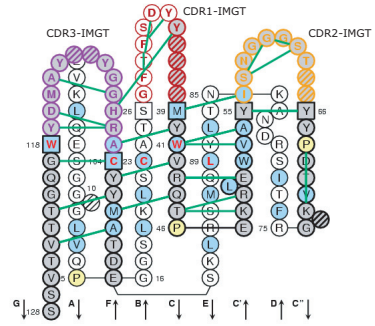



*Giudicelli, V. et al., Nucl. Acids Res., 32, W435-W440 (2004)*
*Yousfi Monod, M. et al., Bioinformatics, 20, I379-I385 (2004)*

## IMGT Colliers de Perles

### 2D representations

*Mus musculus* (Mouse) IGHV_1 V-DOMAIN from 231 (1igt_B)
CDR-IMGT lengths [8.8.11]



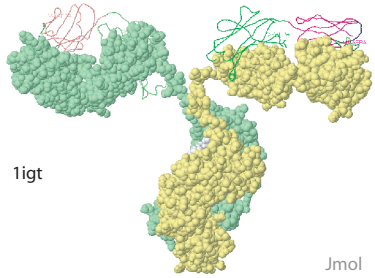

IMGT Colliers de Perles are according to the IMGT unique numbering for V-DOMAIN. Hydrogen bonds are shown as green lines.

*Lefranc, M.-P. et al., Dev. Comp. Immunol., 25, 55-77 (2003)*
*Lefranc, M.-P. et al., Dev. Comp. Immunol., 29, 185-203 (2005)*

## IMGT/3Dstructure-DB IMGT/StructuralQuery

### 3D structures

Three-dimensional structures of 422 mouse VH domains encoded by rearranged IGHV-IGHD-IGHJ genes are available in IMGT/3D-structure-DB. Two complete IG (1igt, 1igy) have been crystallised.




The IG heavy chains (green and yellow) are shown in spacefill (light chains are in wireframe).

*Kaas, Q. et al., Nucl. Acids Res., 32, D208-210 (2004)*

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