Report of the committee on nomenclature

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The guidelines outlined below are based on the decisions made at an interim meeting of the committee held on April 3-4, 1975. These guidelines, including a list of suggested names for enzyme loci, were approved during a plenary session of the Gene Mapping Workshop in Baltimore, 1975.

Consideration was confined to enzyme nomenclature because the blood group antigens have been dealt with in the standard text by Race and Sanger (1), while participants in the Histocompatibility Testing workshops have handled the terminology problems in that area (2). In general, the guidelines for naming enzymes can also be applied to the plasma proteins.

Guidelines for Genetic Nomenclature of Human Enzymes

Essential to a satisfactory terminology are that it be precise and unambiguous, that it clearly distinguish between genotypes and phenotypes, and that as far as possible, the symbols used should readily identify the particular enzyme. In addition it should be sufficiently flexible to permit some unusual symbols which were used to designate certain enzymes in the original papers and have subsequently been widely adopted in the literature. It should also be capable of incorporating new discoveries as they are reported.

The following general scheme appears to meet these requirements and is reasonably convenient in practice.

I. Genotypes

Genotypic symbols, i.e. for loci or alleles, are italicised (or underlined in typescript) to distinguish them clearly from symbols used to designate phenotypes, which are not italicised or underlined.

A. Loci

1. Loci are designated by letters, either all capitalized (preferred) or just the first letter. Usually two or three letters will suffice, but sometimes four or even five may be required.

   Examples: ADA for adenosine deaminase
   UMPK for uridine monophosphate kinase
   Gd for glucose-6-phosphate dehydrogenase

   (Obviously, when lower case letters are used to designate one locus, it is undesirable to use the same letters but in capitals (e.g. GD) to designate another locus.) The letters chosen for locus names are preferably based on the recommended name given by the Enzyme Commission on Nomenclature. However, this is sometimes inconvenient or confusing because of past usage. Thus, GOT is preferred for glutamic-oxaloacetic transaminase, although the E.C. recommended name is aspartate aminotransferase. In some cases, Greek letters are also needed for clarity. Example: αGAL for α-galactosidase to distinguish it from β-galactosidase (βGAL).

2. There are often two or more loci coding for different polypeptide chains which are contained in separate enzyme proteins having very similar or identical catalytic properties. Such loci are best differentiated by appropriate subscripts.

Examples:

PGM_1, PGM_2 and PGM_3 for the three phosphoglucomutase loci

ADH_1, ADH_2 and ADH_3 for the three alcohol dehydrogenase loci

Although numerical subscripts are often most convenient, sometimes because of past usage or ease of identification, letters are preferred to avoid confusion.

Examples:

LDH_A, LDH_B and LDH_C for the three lactate dehydrogenase loci

$PGAM_M$ and $PGAM_B$ for the two phosphoglycerate mutase loci which are active in muscle and brain, respectively.

Some enzymes occur in a so-called soluble (or supernatant or cytosol) form and also in a mitochondrial form, with the two forms being catalytically similar but coded at separate loci. In such cases, the use of S and M as subscripts may be less confusing than numerical or alphabetical designations.

Example:

GOT_S and GOT_M for the soluble and mitochondrial forms of glutamic-oxaloacetic transaminase.

B. Alleles

Different alleles at the same locus are designated by superscripts.

Example:

$\underline{PGM}_1^1$, $\underline{PGM}_1^2$, $\underline{PGM}_1^3$, $\underline{PGM}_1^4$ etc., for alleles at the $\underline{PGM}_1$ locus.

The superscripts may be numerical or alphabetical. In rare cases, + and - signs, when used extensively in the past, may be retained.

Example:

$\underline{Gd}^B$, $\underline{Gd}^A$, $\underline{Gd}^{A-}$ for the three common alleles at the glucose-6-phosphate dehydrogenase locus in Black populations.

In other cases, place names are best used as the allele superscript to avoid confusion.

Example:

$\underline{Gd}^{Mediterranean}$, $\underline{Gd}^{Canton}$, $\underline{Gd}^{Athens}$, $\underline{Gd}^{Seattle}$

(Abbreviation of the place name may be more convenient.)

So-called "null" or "silent" alleles with little or no associated enzyme activity are best designated by the superscript 0 (i.e. zero), although the letter s may be retained because of common usage.

Examples:

$\underline{PGM}_1^0$, $\underline{E}_1^S$ ("silent" allele of the serum cholinesterase first locus)

When heterogeneity between "null" alleles can be demonstrated, the allele designation should be qualified, as by a place name.

Example:

$\underline{ADA}^{0\ Calcutta}$

C. Examples of Genotypes

The following are some typical examples of genotypes written in accordance with the above recommendations and section D (below).

1. Heterozygote for the two common alleles at the ADA locus:

   $\underline{ADA^1ADA^2}$ (or $\underline{ADA^1}/\underline{ADA^2}$)

2. Heterozygotes for one or the other of these common ADA alleles and a "null" allele not separable from other "null" alleles at this locus:

   $\underline{ADA^1ADA^0}$ and $\underline{ADA^2ADA^0}$ (or $\underline{ADA^1}/\underline{ADA^0}$ and $\underline{ADA^2}/\underline{ADA^0}$) ;

3. Genotype of an individual heterozygous for the two common alleles of $\underline{PGM_1}$, homozygous for the common allele of $\underline{PGM_2}$ and heterozygous for the two common alleles of $\underline{PGM_3}$ (3 unlinked loci):

   $\underline{PGM_1^1}/\underline{PGM_1^2}$, $\underline{PGM_2^1}/\underline{PGM_2^1}$, $\underline{PGM_3^1}/\underline{PGM_3^2}$

   or

   $$\frac{\underline{PGM_1^1}}{\underline{PGM_1^2}} \quad \frac{\underline{PGM_2^1}}{\underline{PGM_2^1}} \quad \frac{\underline{PGM_3^1}}{\underline{PGM_3^2}}$$

D. Linkage and Phase

A slash, either horizontal or semivertical (— or /) separating alleles, implies chromosomal location. The slash may be omitted in designating the genotype at a single locus. However, if two or more loci are involved, a horizontal line is recommended, particularly if the loci are syntenic.

1. Non-syntenic loci may be designated either by an interrupted horizontal line or by individual slashes and separation by commas.

Example:

$$\frac{ADA^1}{ADA^2} \quad \frac{PGM_1^1}{PGM_2^2} \quad \text{or} \quad ADA^1/ADA^2, \quad PGM_1^1/PGM_2^2$$

2. When the loci are in the same linkage group and the phase is known, the horizontal line is continuous.

Example:

$$\frac{AMY_1^A \quad AMY_2^B}{AMY_1^B \quad AMY_2^A}$$ (i.e. AMY_1^A and AMY_2^B are in cis position, as are their alleles)

3. When the loci are in the same linkage group but the phase is not known, a semicolon is used.

Example:

$$\frac{AMY_1^A}{AMY_1^B} ; \frac{AMY_2^A}{AMY_2^B}$$

4. To designate loci which are syntenic but not in the same linkage group, a colon is used.

Example:

$$\frac{AMY_2^A}{AMY_2^B} : \frac{PGM_1^1}{PGM_1^2}$$

II. Phenotypes

A. The phenotypic designation should have the same letters and subscripts as the locus (but not italicised or underlined), followed by the numerical, alphabetical or other symbol for the alleles, but not as superscripts. In the case of homozygotes for any allele or heterozygotes for a "null" allele, only one allele symbol is used.

Examples:

Genotype	Phenotype
$\underline{ADA^1}\underline{ADA^1}$	ADA 1
$\underline{ADA^1}\underline{ADA^2}$	ADA 2-1
$\underline{ADA^2}\underline{ADA^2}$	ADA 2
$\underline{ADA^1}\underline{ADA^0}$	ADA 1
$\underline{ADA^2}\underline{ADA^0}$	ADA 2
$\underline{PGM_1^1}/\underline{PGM_1^2}$, $\underline{PGM_2^1}/\underline{PGM_2^1}$, $\underline{PGM_3^1}/\underline{PGM_3^2}$	PGM_1 2-1, PGM_2 1, PGM_3 2-1

For hemizygotes, heterozygotes and homozygotes of the X-linked phosphoglycerate kinase alleles $\underline{PGK^1}$ and $\underline{PGK^2}$,

Genotype	Phenotype
$\underline{PGK^1}$	PGK 1
$\underline{PGK^2}$	PGK 2
$\underline{PGK^1}\underline{PGK^1}$	PGK 1
$\underline{PGK^1}\underline{PGK^2}$	PGK 2-1
$\underline{PGK^2}\underline{PGK^2}$	PGK 2

III. Isozyme Subunits

When two or more loci code for different polypeptide chains which occur together as subunits of single isozymes in a set of isozymes, it is useful to designate the subunit structure of the individual isozymes. Greek letters are convenient symbols for the polypeptide chains. A different letter can be used for the peptide product of each locus, by analogy with the α, β, γ and δ chains of hemoglobin. Whenever there are two or more alleles at a given locus coding for structurally different forms

of the same polypeptide, superscripts are incorporated which are the same as the superscripts used to designate the corresponding alleles.

Example:

The three loci of alcohol dehydrogenase, $\underline{ADH_1}$, $\underline{ADH_2}$ and $\underline{ADH_3}$ are thought to code for three different polypeptide chains: α, β and γ. There is evidence for two common alleles at the $\underline{ADH_2}$ locus: $\underline{ADH_2^1}$ and $\underline{ADH_2^2}$. These alleles code for polypeptides β^1 and β^2. There are also two common alleles at the $\underline{ADH_3}$ locus: $\underline{ADH_3^1}$ and $\underline{ADH_3^2}$, which code for polypeptides γ^1 and γ^2. All of the ADH isozymes are dimeric and the subunits interact with each other. In adult liver, all three loci are active. Thus, some of the isozymes are homodimers and some are heterodimers. The heteromeric isozymes contain polypeptides coded by alleles at either the same locus or at different loci. Thus, if an individual has the genotype

$$\underline{ADH_1^1ADH_1^1};\quad \underline{ADH_2^1ADH_2^1};\quad \underline{ADH_3^1ADH_3^2}$$

the phenotype is ADH_1 1, ADH_2 1, ADH_3 2-1

and in the electrophoretic pattern of a liver extract, there are ten isozymes with the following subunit structures:

$$\begin{array}{cccc} \alpha\alpha & \gamma^1\gamma^1 & \alpha\gamma^1 & \beta^1\gamma^1 \\ \alpha\beta^1 & \gamma^1\gamma^2 & \alpha\gamma^2 & \beta^1\gamma^2 \\ \beta^1\beta^1 & \gamma^2\gamma^2 & & \end{array}$$

References

1. Race, R.R. and Sanger, R.: Blood Groups in Man. London: Blackwell, 1975 (6th ed.).

2. Svejgaard, A., Hauge, M., Jersild, C., Platz, P., Ryder, L.P., Nielsen, L.S. and Thomsen, M.: The HLA System: An Introductory Survey. Vol. 7 of Monographs in Human Genetics. Basel: S. Karger, 1976.

In the following table, the enzyme name given is usually that recommended in 1972 by the Enzyme Commission.* When the E.C. name has not been used as the basis for the symbol, or if another name is much more familiar, the E.C. name is given first, and enclosed in brackets. (In a few instances the E.C. name is not given because it is so similar to the more familiar name.) The locus symbol given first is that recommended by this committee. Alternatives are also listed; these are based on systematic or obsolete names which can nearly always be found in the reference.* The computer symbols in the table are meant to be initial suggestions; they may require individual revision. The final column indicates that the given locus has been reported to be polymorphic in at least one large ethnic group.

*Enzyme Nomenclature: Recommendations (1972) of the International Union of Pure and Applied Chemistry and the International Union of Biochemistry. Published in 1973 by Elsevier (Amsterdam) and American Elsevier (New York).

Table of Phenotypes for which Information on Chromosomal Assignment is Available

Name of Phenotype	VAM No. ††	E.C. No** (unless not applicable = NA)	Locus	Alternatives	Chromosome Assignment or Linkage Group	Computer Symbol †	Polymorphic?
ABO blood group	11030	NA	ABO		9	ABO	Yes
Acid phosphatase-1	17150	3.1.3.2	AcP1		2	ACP-1	Yes
Acid phosphatase-2	20095	3.1.3.2	AcP2		11	ACP-2	
Aconitase, ? mitochondrial	10084	4.2.1.3	Aco		3(P)	ACO	
Aconitase, soluble	10085	4.2.1.3	Aco_S		9(P)	ACO-S	
Adenine phosphoribosyltransferase	10260	2.4.2.7	APRT		16	APRT	
Adenosine deaminase	10270	3.5.4.4	ADA		20	ADA	
Adenosine kinase	10275	2.7.1.20	AdK	AdoK	10(P)	ADK	
Adenovirus-12 chromosome modification site-1	10293	NA	AdV12-CMS-1		1	ADV12-CMS-1	
Adenovirus-12 chromosome modification site-17	10297	NA	AdV12-CMS-17		17	ADV12-CMS-17	
Adenylate kinase-1	10300	2.7.4.3	AK_1		9	AK-1	Yes
Adenylate kinase-2	10302	2.7.4.3	AK_2		1	AK-2	
Adenylate kinase-3	10303	2.7.4.3	AK_3		9(P)	AK-3	
Amylase, pancreatic	10465	3.2.1.1	Amy_2	Amy_P	1	AMY-2	Yes
Amylase, salivary	10470	3.2.1.1	Amy_1	Amy_S	1	AMY-1	Yes
Aniridia, type II (Baltimore)	10620	NA			1(L)	AN-2	
α_1-antitrypsin	10740	?	Pi		2(I) or 12(L)	PI	
Anti-viral protein	10745	NA	AVP		21	AVP	

** Footnotes on last page.

Name of Phenotype	VAM No.	E.C. No. (unless not applicable = NA)	Locus	Alternatives	Chromosome Assignment or Linkage Group	Computer Symbol	Polymorphic?
Auriculo-osteodysplasia	10900	NA	AOD		1(L)	AOD	
B factor (see properdin factor B)							
Cataract, zonular pulverulent	11620	NA	Cae		1	CAE	
Chido blood group	11043	NA	Ch		6	CH	
Citrate synthase, mitochondrial	11895	4.1.3.7	CS		12(P)	CS	
Complement component-2	12060	NA	C2		6	C2	
Complement component-4	12080	NA	C4		6	C4	
Complement component-8	12095	NA	C8		6	C8	
Desmosterol-to-cholesterol enzyme	12565	?	DCE	D:CE	20	DCE	
Diphtheria toxin sensitivity	12615	NA	DTS		5(P)	DTS	
Dombrock blood group	11060	NA	Do		1(L)	DO	
Duffy blood group	11070	NA	Fy		1	FY	
Echo 11 sensitivity	12915	NA	E11S		19(L)	E11S	
Elliptocytosis-1	13050	NA	El_1		1	EL-1	
Enolase-1	17243	4.2.1.11	Eno_1	PPH_1	1	ENO-1	
Enolase-2	13136	4.2.1.11	Eno_2	PPH_2	12(P)	ENO-2	
Esterase activator	13325	?			4(P) or 5	ES-ACT	
Esterase-A4	13322	3.1.1.1	EsA_4	$Es\text{-}A_4$	11	EsA4	
Esterase D	13328	3.1.1.1	EsD		13	ESD	Yes
Factor B (see properdin factor B)							
Formylglycinamideribotide (FGAR) amidotransferase	10255	?	adeB		4(P) or 5	ADEB	

Name of Phenotype	VAM No.	E.C. No. (unless not applicable = NA)	Locus	Alternatives	Chromosome Assignment or Linkage Group	Computer Symbol	Polymorphic?
α-L-fucosidase	23000	3.2.1.51	αFuc		1	A-FUC	Yes
Fumarate hydratase (fumarase), mitochondrial	13685	4.2.1.2	FH_m	FH^2	1	FH-2, FH-M	
Fumarate hydratase (fumarase), soluble	13686	4.2.1.2	FH_s	FH^2_1		FH-1, FH-S	
Galactokinase	23020	2.7.1.6	GalK	GK, GAK	17	G^K	
Galactose $^+$ activator	13703		Gal^+-Act		2(P)		
Galactose-1-phosphate uridyltransferase	23040	2.7.7.12	GalT	Gt, Gal-1-PUT	3	GAPUT, GALT	Yes
α-galactosidase (Fabry disease)	30150	3.2.1.22	αGal		X	A-GAL, A-GAL	
Glucose-6-phosphate dehydrogenase	30590	1.1.1.49	Gd	G6PD	X	G6PDH, G6PD	Yes
β-Glucuronidase	25322	3.2.1.31	βGus	β-Glcu, β-Gcu	7(I) or 9(I)	GUS, B-GLCU	
Glutamate-γ-semialdehyde synthetase	13825	?	GSS	GSASyt, GSAS	10(P)	GSS, GSASYT	
Glutamate oxaloacetic transaminase-1	13818	2.6.1.1	GOT_S	GOT-1, GOT_1	10	GOT-1	
Glutathione reductase	13830	1.6.4.2	GSR		8(P)	GSR	Yes
Glyceraldehyde-3-phosphate dehydrogenase	13840	1.2.1.12	GAPDH	GAPD	12(P)	GAPDH, GAPD	
Glyoxylase I	13875	4.4.1.5	GLO_1	GLY-1, Glx-1	6	G-1, GLO-1	Yes
Gm immunoglobulin types (also see immunoglobulin heavy chains)	14710-14719	NA			12 (I)	Gm	Yes
Guanylate kinase-1	13927	2.7.4.8	GuK_1	Guk_1, $GUMPK_1$	1	GMPK-1, GUMPK-2	
Guanylate kinase-2	13928	2.7.4.8	GuK_2	Guk_2, $GUMPK_2$	1	GUK-1 & 2	
Hageman factor	23400	NA	HaF		7(P)	HAF	

Name of Phenotype	VAM No.	E.C. No. (unless not applicable = NA)	Locus	Alternatives	Chromosome Assignment or Linkage Group	Computer Symbol	Polymorphic?
Haptoglobin, alpha	14010	NA	Hp		16	A-HP	
Hemoglobin, alpha or beta	14180, 14190	NA	Hb , Hb		2(I) & 4(I)	A-HB, B-HB	
Hexokinase-1	14260	2.7.1.1	Hk_1	Hk_I	10	HK-1	
Hexosaminidase A	27280	3.2.1.30	Hex_A	$NAGA_A$	15	Hex-A, Hex A	
Hesosaminidase B	14265	3.2.1.30	Hex_B	$NAGA_B$	5	Hex-B, Hex B	
HLA: Major histocompatibility complex	14280, 14283, 14284, 15785	NA	HLA-A, HLA-B (Several) HLA-C, HLA-D		6	HLA	
Hypoxanthine-guanine phosphoribosyltransferase	30800	2.4.2.8	HPRT		X	HGPRT	
Immune response	14685	NA	Ir		6(L)	IR	
Immunoglobulin heavy chains (also see Gm immunoglobulin types)	14710-14719	NA			2(I)	Ig	
Indophenoloxidase (see superoxide dismutase)							
Inosine triphosphatase	14753	3.6.1.19	ITP		20	ITP	
Interferon-1	14757	NA	If_1		2(P)	IF-1	
Interferon-2	14758	NA	If_2		5(P)	IF-2	
Isocitrate dehydrogenase-1	14770	1.1.1.42	ICD_S	IDH_S, IDH-1	2	ICDH-1, IDH-1	
Isocitrate dehydrogenase, mitochondrial	14765	1.1.1.42	ICD_M	IDH_M, IDH-2	15(P)	ICDH-2, IDH-M	
Lactate dehydrogenase A	15000	1.1.1.27	LDH_A	LDH-A	11	LDH-A	
Lactate dehydrogenase B	15010	1.1.1.27	LDH_B	LDH-B	12	LDH-B	
Lecithin-cholesterol acyltransferase	24590	2.3.1.43	LCAT		15	LCAT	

Name of Phenotype	VAM No.	E.C. No. (unless not applicable = NA)	Locus	Alternatives	Chromosome Assignment or Linkage Group	Computer Symbol	Polymorphic?
Lethal antigen	15125-15127	NA	a1, a2, a3		11	AL	
Malate dehydrogenase-1	15420	1.1.1.37	MDH_S	MOR_S, MOR-1, MDH-1	2	MDH-1	
Malate dehydrogenase, mitochondrial	15410	1.1.1.37	MDH_M	MOR_M, MOR-2, MDH-2	7	MDH-2	
Malic enzyme-1	15425	1.1.1.40	ME_S	MOD_S, MOD-1, ME-1	6	ME-1	
Mannosephosphate isomerase	15455	5.3.1.8	MPI		15	MANPI, MPI	
β2-microglobulin	10970	NA	β2M		15	B-2M	
MNSs blood group	11130	NA	MNSs		2(L)	MNS	
Nail-patella syndrome	16120	NA	NPa	NP	9	NPA	
Nucleoside phosphorylase	16405	2.4.2.1	NP		14	NP	
P blood group	11140	NA	P		6(L)	P	
Pepsinogen	16970	3.4.23*	Pg	Pg-5	6	PEPSG, Puc	Yes
Peptidase A	16980	3.4.11.*	PepA		18	PEPA	Yes
Peptidase B	16990	3.4.11.*	PepB		12	PEPB	
Peptidase C	17000	3.4.11.*	PepC		1	PEPC	Yes
Peptidase D	17010	3.4.13.9	PepD		19(P)	PEPD	Yes
Phosphoglucomutase-1	17190	2.7.5.1	PGM_1		1	PGM-1	Yes
Phosphoglucomutase-2	17200	2.7.5.1	PGM_2		4(P)	PGM-2	Yes
Phosphoglucomutase-3	17210	2.7.5.1	PGM_3		6	PGM-3	Yes

Name of Phenotype	VAM No.	E.C. No. (unless not applicable = NA)	Locus	Alternatives	Chromosome Assignment or Linkage Group	Computer Symbol	Polymorphic?
6-phosphogluconate dehydrogenase	17220	1.1.1.44	PGD	6PGD	1	6PGD	Yes
Phosphoglycerate kinase	31180	2.7.2.3	PGK		X	PGAK, PGK	
Phosphohexose isomerase	17240		PHI		19	PHI	
Phosphopyruvate hydratase (see enolase)							
Phosphoribosyl glycineamide synthetase	13844	6.3.4.13	GAPS		21(P)	GAPS	
Polio sensitivity	17385	NA	PVS		19	PVS	
Properdin factor B	13847	NA	Bf		6	B	
Pyrophosphatase, inorganic	17903	3.6.1.1	PP		10	PP	
Pyruvate kinase-3 (M2)	17905	2.7.1.40	PK_{M2}	PK_{III}, PK_3	15	PK-M2, PK3	
Retinoblastoma-1	18020	NA	Rb_1		13(L)	RB_1	
Rhesus blood group	11170	NA	Rh		1	RH	
Ribosomal RNA	18045	NA	NA		13, 14, 15, 21, 22	R-RNA	
Rodgers blood group	11171	NA	Rg		6	RG	
5S RNA gene(s)	18042	NA	RN5S		1	RN5S	
Scianna blood group	11175	NA	Sc		1(L)	SC	
Sclerotylosis	18160	NA	Tys		2(L)	TYS	
Serine hydroxymethyltransferase (glycine + A auxotroph completing)	13845	2.1.2.1	SHMT		12(P)	SHMT	
Spherocytosis, Denver type	18290	NA	Sph_1		8(L) or 12(L)	Sph-1	

Name of Phenotype	VAM No.	E.C. No. (unless not applicable = NA)	Locus	Alternatives	Chromosome Assignment or Linkage Group	Computer Symbol	Polymorphic?
Superoxide dismutase-1	14745	1.15.1.1	SOD_S	IPO-A, SOD-A, SOD-1	21	SOD-1	
Superoxide dismutase-2	14746	1.15.1.1	SOD_M	IPO-B, SOD-B, SOD-2	6	SOD-2	
SV40-T antigen	18680	NA	SV40-T		7(P)	SV40-T	
Testis determining factor	--	NA	TDF		Y	TDF	
Thymidine kinase, mitochondrial	18829	2.7.1.75	TK_m	TK_2	16(P)	TK-M	
Thymidine kinase, soluble	18830	2.7.1.75	TK_s	TK_1	17	TK-S	
Trisephosphate isomerase	19045	5.3.1.1	TPI		12	TPI	
Tryptophanyl-tRNA synthetase	19105	6.1.1.2	TrpRS		14	TRPRS	
Uridyl diphosphate glucose pyrophosphorylase	19175	2.7.7.9	UGPP		1(P)	UGPP	
Waardenburg syndrome	19350	NA	WS_1		9(L)	WS-1	
Xeroderma pigmentosum, Egyptian	27870	NA	XP_E		9(L)	XP-E	
X-linked species (or surface) antigen	31345	NA	SAX		X	SAX	
Y histocompatibility antigen	--	NA	H-Y		Y	H-Y	

* Enzyme Nomenclature: Recommendations (1972) of the International Union of Pure and Applied Chemistry and the International Union of Biochemistry, 1973, Elsevier (Amsterdam) and American Elsevier (New York).

† When within the capability of the computer, lower case should be used as in the locus symbols.

†† Number assigned to locus in McKusick's Mendelian Inheritance in Man (4th ed., 1975 with additions).