Zuitin, A.I. A Third Chromosome Balancer

The lines carrying numerous mutant genes in the third chromosome may be balanced by means of the chromosome ru h D (Fiodorova), carrying the inversion which almost completely suppresses crossing over (to be described in one of the following issues of C.R. Ac. Sc. U.S.S.R.). The stock is : ru h D inv/ru cu ca; Cy sp/L^2.

Muller, H.J. Labor-Saving Method of Starting Homozygous or Balanced Stocks of ♂-fertile Sex-linked Genes

(1) Balancer stock "Patroclinous" ("Pat")
P_1 ClB, sc v/sc v lx f bb/Y ♀ (non-disjunction)
X dl-49, lz^s/Y ♂
Eggs: ClB, sc v (half carry Y) sc v lx f bb (half carry Y)
ClB sc v/sc v lx f bb (non-disjunction) Y (non-dis.)
Sperm: lz^s dl-49 Y
F_1 ClB, sc v/dl-49, lz^s ♀ (1/2 carry Y) ClB, sc v/Y (1/2 YY) (dies)
sc v lx f bb/dl-49, lz^s ♀ (" " ") sc v lx f bb/Y (" " ")
ClB, sc v/sc v lx f bb/dl-49, lz^s ♀ (dies) ClB, sc v/sc v lx f bb/Y ♀
dl-49, lz^s/Y ♂ Y/Y (dies)
To perpetuate, breed sc v B ♀♀ (need not be virgin) by dl-49, lz^s brothers or fathers (Selection needed to retain sc v lx f bb).
(2) Let "a" represent sex-linked gene or combination of genes. Then:
P_1 ClB, sc v/sc v lx f bb/Y ♀ X a/Y ♂
Eggs: ClB, sc v (1/2 carry Y) sc v lx f bb (1/2 carry Y)
ClB, sc v/sc v lx f bb (non-disjunction) Y (non-dis.)
Sperm: a Y
F_1 ClB sc v/a ♀ (1/2 carry Y) ClB, sc v/Y ♂ (1/2 YY) (dies)
sc v lx f bb/a ♀ (" " ") sc v lx f bb/Y ♂ (1/2 YY) (dies)
ClB, sc v/sc v lx f bb/a ♀ ClB, sc v/sc v lx f bb/Y
(3X ♀, dies or sterile) Y/Y (no X- dies)
a/Y ♂
To form stock of "a", breed B (not sc or v) ♀♀ (need not be virgin) by any brothers or fathers: ClB, sc v/a ♀ (1/2 carry Y) X a ♂.
If "a" has good viability and fertility when homozygous, this stock will automatically become a/a/(Y) ♀ X a/Y/(Y) ♂ after a few generations; otherwise, it will remain balanced and this will then be the more desirable condition to have it in. If presence of supernumerary Y in stock is undesirable, a stock of "Patroclinous" should be used in which the Y is marked by Cy owing to a translocation between Y and a chromosome 2 containing Cy. In this case only the non-Cy B F_1 ♀♀ are used for breeding. This stock is called "Curly Pat".

Muller, H.J. Balancing of Duplications by Deficiencies or Lethals and Vice versa -(Bridges, Muller)

Example: P_1 y w/sc^{jl} ljl ♀ X y/del-24/Y ♂ (del-24 is a deleted-X = duplication covering locus of ljl, y and sc).
F_1 sc^{jl} ljl/del-24/Y ♂ X y ♀

Sperm: sc^{jl} $\underline{l}jl$/del-24 : sc^{jl} $\underline{l}jl$/Y : sc^{jl} $\underline{l}jl$: del-24 /Y : del-24 : Y

Eggs	y	Y
F_2	y/sc^{jl} $\underline{l}jl$/del-24 ♀ (sterile)	Y/sc^{jl} $\underline{l}jl$/del-24 ♂ (fertile
	y/sc^{jl} $\underline{l}jl$/Y ♀ (sterile)	Y/sc^{jl} $\underline{l}jl$/Y ♂ (dies)
	y/sc^{jl} $\underline{l}jl$ ♀ (sterile)	Y/sc^{jl} $\underline{l}jl$ ♂ (dies)
	y/del-24/Y ♀ (fertile)	Y/del-24/Y ♂ (dies)
	y/del-24 ♀ (fertile)	Y/del-24 ♂ (dies)
	y/Y ♀ (fertile)	Y/Y (dies)

Fertile F_2 ♀♀ bred with fertile F_2 ♂♂ give same classes as before; hence stock is now self-perpetuating.

<u>Muller, H.J.</u> <u>Detection of Mutations</u>

1. Visibles arising in X of ♂: (Cross ♂ to y/Y ♀ and examine sons)

P_1 y/Y ♀ X X/Y ♂ (donor)
F_1 y/X ♀ (3X, sterile) y/Y ♀ X/Y ♂ (examine) Y/Y (dies)

2. Lethals and visibles arising in X of ♂. (ClB method)

Key: B = Bar eye; C = inversion preventing crossing-over; n = new mutant, lethal, or visible; sc v f and car are recessive markers.

P_1 sc v f car/Cl B, sc v ♀ X X/Y ♂ (donor)
F_1 ClB, sc v/n? ♀ X sc v f car ♂ (breed in individual ♀ cultures)
F_2 sc ClB v/sc v f car ♀ (discard) ClB, sc v/Y ♂ (dies)
n?/sc v f car ♀ n?/Y ♂ (if lethal, di

Let "n" represent possible newly arisen mutant gene (lethal or visible). No crossing-over in F_1 ♀ because of inversion. If there is no "n" in given culture, ♀♂♂ will appear ≠. If there is a visible "n", all ♂♂ will manifest it. If there is a lethal "n", no ♂♂ will hatch (except occasional non-disjunctional sc v f car); this is determinable without etherization. If "n" proves to be present in a culture, make mass culture of F_2 n/sc v f car ♂♂ X brothers (visible), or, if "n" is lethal X sc v f car ♂♂; either way provides stock of "n" and count of F_3 ♂♂ shows locus of "n".

3. Visibles arising in X of ♀ are directly evident in sons.

4. Lethals arising in X of ♀

lz - lozenge-spectacled eye, sterile in homozygous ♀
dl-49 - inversion, preventing crossing-over to left of garnet.

P_1 ≠/≠ ♀ (donor) X dl-49, lz^s B/Y ♂

Obtain virgin F_1 ♀♀ and breed in individual ♀ cultures to dl-49,B ♂♂ (cross by brothers would yield some ≠ F_2 ♂♂ by non-disjunction.) If $\underline{l}$ is present, no ≠ ♂♂ appear; determinable without etherization. (If $\underline{l}$ is to right of garnet, a few ≠ ♂♂ appear).

F_1 $\underline{l}$/dl-49, lz^s B ♀ X dl-49,lz^s B/Y ♂
F_2 $\underline{l}$/dl-49, lz^s B ♀ $\underline{l}$/Y ♂ (dies) dl-49, lz^s B/dl-49,lz^s B ♀ (lz^s B ♀ sterile) dl-49, lz^s B/Y ♂

If $\underline{l}$ is present, F_2 provides balanced stock of it unless to right of garnet.

5. Detection of mutations in autosomes same as method for getting homozygous stock. Method there given may be split for use with 2 alone or 3 alone.