Trisomy of the T6 Translocation Chromosome in the Mouse

Reports of the occurrence of autosomal trisomy in the mouse are few[1,2]. The position in man is different, for autosomal trisomy with survival to birth is by no means a rare occurrence, being found in approximately 1 in 500 new-born infants, when there is usually a characteristic clinical picture of several, often severe, abnormalites. In the mouse cases, no such abnormalities occurred, but a feature which does typify autosomal trisomy compatible with survival in mice and man and also in the water vole[3] and chimpanzee[4], is that the extra chromosome is usually one of the smaller sized autosomes. The present paper reports the finding of trisomy of the smallest of the autosomes of the mouse, the T6 translocation chromosome.

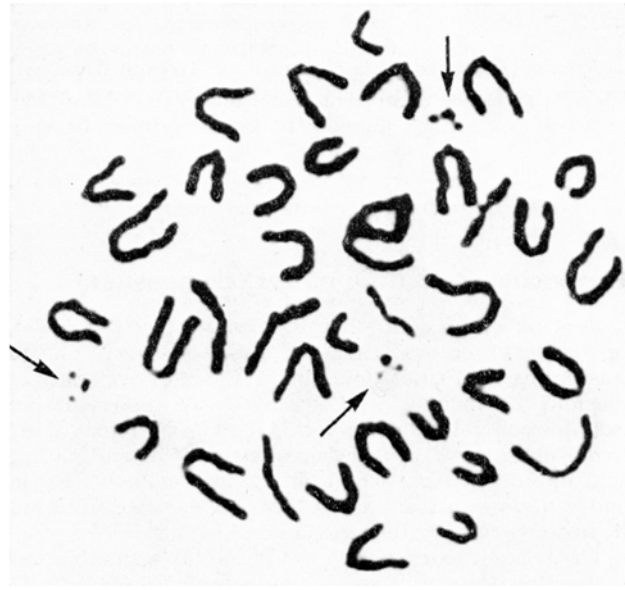
This chromosome is easily identifiable, being approximately half the size of the smallest autosome of the normal series. It can thus usefully be assigned as a cell marker, and mice bearing it have been widely used in transplantation experiments. It was in the course of one such experiment that a line of cells trisomic for the T6 chromosome was discovered, and one notable feature was that these cells seemed to have little selective disadvantage in competition with normal cells.

Genetically anaemic mice of the W series (genotypes W^v/W^v, severely affected, and $W^v/+$, slightly affected) have a normochromic, macrocytic anaemia, which may be permanently cured by the transplantation of normal haemopoietic tissue[1-5]. There is a large scale repopulation of the myeloid and lymphoid systems by descendants of the injected cells, which takes place gradually over the course of time[8].

In the present case the normal haemopoietic tissue was derived from CBA/H – T6T6 mice. A cellular suspension was prepared from the pooled livers of a litter of 17-day-old foetuses (as described in SELLER and POLANI[6]), and 1 million cells were injected i.v. into new-born anaemic recipients. Mice were killed at intervals as they grew up, and mitotic chromosome preparations made of the bone marrow, spleen, thymus and lymph nodes by the air dry method of FORD[9]. 100 metaphase plates were scored from each tissue.

One mouse, sacrificed at 4 weeks of age, had, as expected from previous experiments, many cells of donor origin in its tissues. However, unlike all mice hitherto examined, a small proportion of these cells had a modal number of 41 chromosomes, each cell bearing 3 T6 chromosomes (Figure). Some of these aneuploid cells were found in all 4 tissues examined from this animal (Table, mouse 1).

Four other mice had been treated with the same foetal liver cell inoculum, and mitotic preparations were subsequently made from these individuals. Trisomic cells were found in 3 of them (see mice 2–5, Table), though the percentage was lower than in the first mouse and they did not necessarily occur in all tissues. In all, 1500 metaphase plates were scored from the 4 mice with evidence of trisomy: 52 cells had 3 T6 chromosomes and 623 cells had 2 T6 chromosomes. No observations were made on the spleen of mouse 3, as previously an attempt had been



Mitotic metaphase plate with a modal number of 41 chromosomes and 3 T6 chromosomes. × 1878.

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Table I. The percentage of donor cells in the tissues of W-series anaemic mice transplanted at birth with CBA-T6T6 foetal liver cells

Mouse No.	Genotype	Age (weeks)	T6T6T6 and T6T6 cells in the mitoses of: Bone marrow (%) T6T6T6	T6T6	Spleen (%) T6T6T6	T6T6	Thymus (%) T6T6T6	T6T6	Lymph node (%) T6T6T6	T6T6
1	$W^v W^v$	4	19	50	5	70	2	38	8	4
2	$W^v W^v$	6	1	62	3	83	0	70	5	23
3	W^v +	18	0	64	—	—	0	84	8	29
4	$W^v v_+$	20	1	7	1	8	0	31	0	0
5	$W^v v_+$	20	0	3	0	2	0	4	0	0

100 metaphase plates scored in each tissue

made to perpetuate the trisomic cell line, by injecting new-born anaemic mice with a suspension of cells prepared from this spleen after surgical removal. Unfortunately, these mice died shortly after the injection. None of the 5 mice had any obvious abnormality or malformation, and all were healthy at the time of sacrifice.

In the 4 previously reported cases of autosomal trisomy in the mouse the chromosome aberration was almost certainly induced; by a chemical mutagen on the one hand[1] and by irradiation on the other[2]. In the present work, no such treatment was knowingly involved, and it presumably arose spontaneously[10].

Résumé. En utilisant le chromosome T6 pour des expériences de transplantations dans la souris, nous avons trouvé des cellules contenant 41 chromosomes et le trisomique pour le chromosome T6.

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Flavonoids of *Arctium minus* (Compositae)

Arctium minus (Hill) Bernh. (Compositae; Cynareae), or 'burdock', occurs commonly beside roadways and in waste areas in British Columbia. As part of our study of phenolic compounds in Compositae we undertook an examination of this species for flavonoids. NAKABAYASHI[1] found chlorogenic acid, isochlorogenic acid, and caffeic acid in A. *lappa* but could detect no 'flavonols'. Rutin and hyperin were found in the leaves of *A. tomentosum* and *A. leiospermum* by Russian workers[2].

The ethanol extract (70%) of *A. minus* was subjected to fractionation on a polyamide column (Polyclar AT) using water and then water with increasing concentrations of ethanol as eluant. The fractions were purified further through paper chromatography using several solvent systems (see footnote to Table). Two major flavonoids and 5 minor constituents were observed. The 2 major constituents gave quercetin (3,3′, 4′, 5,7-pentahydroxyflavone) on acid hydrolysis. One gave only glucose, the other gave rhamnose and glucose in 1:1 ratio. Ultraviolet data indicated that glycosylation at position 3 was present in each compound. The compounds were identified through co-chromatography as isoquercitrin (quercetin-3-*o*-glucoside) and rutin (quercetin-3-*o*-rhamnoglucoside).

Two of the minor flavonoids gave kaempferol (3,4′, 5,7-tetrahydroxyflavone) on acid hydrolysis. The compounds gave sugar analyses as above and were identified as kaempferol-3-*o*-glucoside (astragalin) and kaempferol-3-*o*-rhamnoglucoside.

The 3 remaining compounds all gave quercetin after acid hydrolysis. One exhibited spectral and colour characteristics of a 7-*o*-glycoside and gave only glucose on acid hydrolysis. It was tentatively identified as quercitin-7-*o*-glucoside (quercimeritrin). The other 2 minor constituents gave 1 equivalent of glucose and arabinose, respectively, with glycosylation at position 3 determined by spectral tests. These compounds are considered to be quercetin-3-*o*-glucoside and quercetin 3-*o*-arabinoside. The former would appear to be an isomer of isoquercitrin, one of the major constituents.

The phenomenon of isomeric glycosides has been recorded for other flavone derivatives. Thus, 2 apigenin-7-*o*-glucosides were found in *Matriccaria chamomilla* which differed only in their Rf values[3]. Quercetin-3-*o*-arabinosides having different physical properties have also been found in nature[4,5]. Rf values for the compounds described above appear in the Table.

Zusammenfassung. Die hauptsächlichen Flavonoide aus *Arctium minus* (Compositae) sind Isoquercetrin und Rutin. Zusätzliche Flavonoide sind Kaempferol-3-*o*-Glukosid und 3-*o*-Rhamnoglukosid, Quercetin-7-*o*-Glukosid, 3-*o*-Arabinosid und ein 3-*o*-Glukosid das mit Isoquercetin isomer ist.

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Rf values of isolated flavonol glycosides

	BAW[b]	PhOH[c]	15%[d]
quercetin-3-glucoside	0.55	0.33	0.50
quercetin-3-glucoside[a]	0.29	0.54	0.15
quercetin-3-arabinoside	0.57	0.35	0.39
quercetin-7-glucoside	0.17	0.21	0.10
quercetin-3-rhamnoglucoside	0.33	0.29	0.60
kaempferol-3-glucoside	0.62	0.65	0.54
kaempferol-3-rhamnoglucoside	0.44	0.55	0.66

[a] Isomeric glucoside. [b] *n*-butanol:acetic acid: water (4:1:5). [c] Phenol: water (80:20). [d] Acetic acid:water (15:85).

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