De la Rosa, M.E., J.G. de Jiménez, O. Olvera R. and R. Félix. National Institute of Nuclear Energy, Mexico City, Mexico. Monosodium glutamate effects on X chromosome loss and non-disjunction in D. melanogaster.

Schaumburg (1968) proposed monosodium glutamate (MSG) as the cause of the Chinese restaurant syndrome in man. Further studies (Schaumburg et al. 1969) reported MSG as the cause of such syndrome, as it was determined that both intensity and duration of symptoms were related to the ingested amount of MSG. Onley & Sharpe (1969) and Arees & Mayer (1970) induced brain lesions in the hypothalamus of newborn mice and Rhesus monkey by subcutaneous injection of MSG. Bazzano et al. (1970), Blood (1969), and Morselli and Garattini (1970) demonstrated that relatively high doses of MSG orally administered did not provoke any symptoms of Chinese restaurant syndrome. No morphological differences were found in the hypothalamic regions of treated and control monkeys by Raynolds et al. (1971). Like Arees and Mayer (1970), they found lesions in one brain region when fixation was poor, while immediately adjacent areas showed a well-fixed appearance.

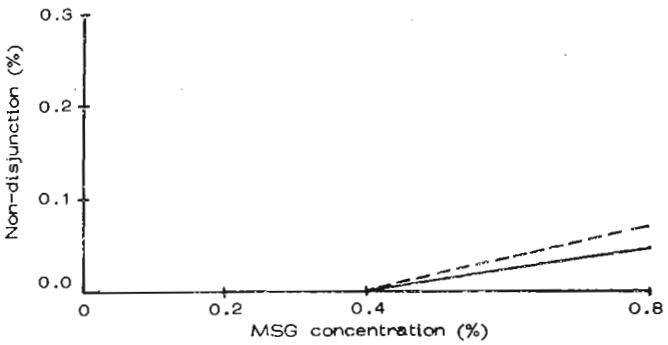

Fig. 1. MSG mutagenic effect on D. melanogaster non-disjunction.

—— definition 1.
--- definition 2.

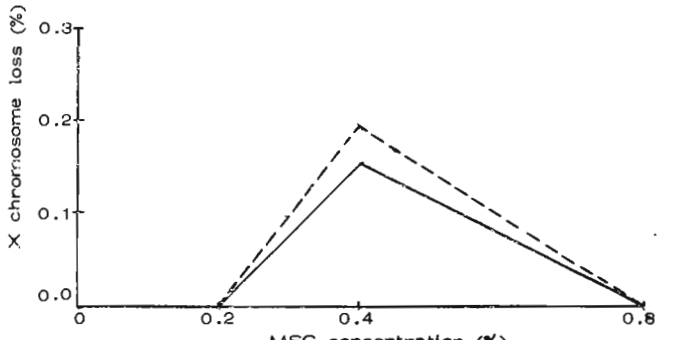

Fig. 2. MSG mutagenic effect on D. melanogaster. X chromosome loss.

—— definition 1.
--- definition 2.

Table 1. MSG mutagenic effect on D. melanogaster

Treatment	Non-disjunction (%) definition 1	Non-disjunction (%) definition 2	X loss (%) definition 1	X loss (%) definition 2
Control	0.00	0.00	0.00	0.00
MSG 0.2%	0.00	0.00	0.00	0.00
MSG 0.4%	0.00	0.00	0.15	0.19
MSG 0.8%	0.05	0.07	0.00	0.00

Since Back and associates (1952) have insisted on the importance of the amino groups presence in some radioprotective substances, the present work was made to determine the action of MSG as a radioprotective substance on D. melanogaster, as well as its mutagenic effect, because this compound is widely used as a food additive.

Table 2. MSG radioprotective effect on D. melanogaster.

Treatment	Non-disjunction (%) definition 1	Non-disjunction (%) definition 2	X loss (%) definition 1	X loss (%) definition 2
2500 r	1.09	1.20	4.30	6.10
MSG 0.2%+2500 r	0.90	1.10	2.60	3.20
MSG 0.4%+2500 r	0.10	0.12	1.99	2.52
MSG 0.8%+2500 r	0.45	0.64	1.26	1.77

MSG was administered to Drosophila adults mixed with the food rather than by injection, in order to test its effects as a food additive (human dietary concentration: 0.2% to 0.5%).

Three concentrations were tested feeding all stages of development of $y^2\ w^a/y^2\ w^a$ D. melanogaster females. The applied method for detecting non-disjunction and X chromosome loss gives particularly reliable evidence concerning the origin of each exceptional female and male making use of a tester male stock with attached $Y^S.X.Y^L$ chromosomes.

Virgin females of the genotype $y^2\ w^a/y^2\ w^a$ were taken from cultures containing agar-cornmeal medium with MSG. In each culture a treated female was mated with 3 attached $Y^S.X.Y^L$ males and eliminated after 48 hours. In the second part of the experiment virgin females feeding on MSG medium were irradiated at 2500 r before being mated to males with the markers described above. All the cultures were kept at 25°C throughout the experiment.

The F_1 flies were scored for non-disjunction and X chromosome loss 13 to 15 days after the MSG treatment of the females. From Traut (1964) the X chromosome loss and non-disjunction frequencies can be based on either the number of regular males (definition 1), or on the number of regular females (definition 2) in the F_1.

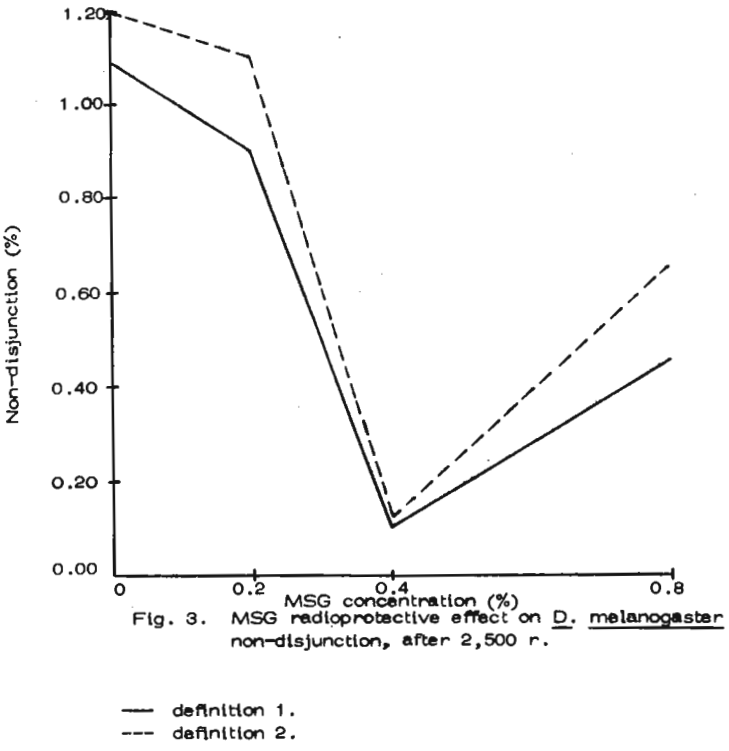

Fig. 3. MSG radioprotective effect on D. melanogaster non-disjunction, after 2,500 r.

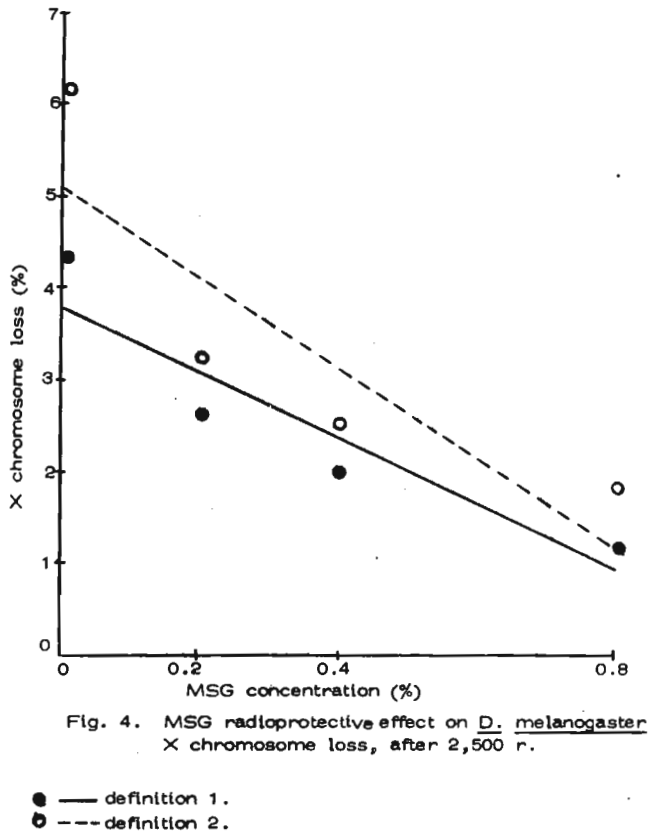

Fig. 4. MSG radioprotective effect on D. melanogaster X chromosome loss, after 2,500 r.

MSG effect on non-disjunction (Table 1 and Fig. 1) was observed only at the highest concentration assayed (0.8%). X chromosome loss was observed after feeding with 0.4% MSG concentration (Table 1 and Fig. 2).

Data on Table 2 shows that MSG has a radioprotective effect on non-disjunction frequency which, however, is not significant (Fig. 3). Table 2 and Fig. 4 show that the increase of MSG concentration in relation to frequency of X chromosome loss are also not significant (χ^2 test).

References: Adamo, N.J. 1970 Science 169:673-674; Arees, E.A. and J. Mayer 1970 Science 170:549-550; Bazzano, G., J.A. D'Elia, R.E. Olson 1970 Science 169:1208-1209; Bacq, Z.M. and A. Herve 1952b, J. Suissue Med. 82:1018; Blood, F.R., B.L. Oser and P.L. White 1969 Science 165:1028; Morselli, P.L. and S. Garattini 1970 Nature 227:611-612; Olney, J.W. 1969 Science 164:719-721; _____ 1969 Science 165:1028-1029; Olney, J.W. and O.L. Ho 1970 Nature 227:609-610; Raynolds, W.A., N.L. Johnston, L.J. Filer, R.M. Pitkin 1971 Science 172:1342-1344; Schaumburg, H.H. and R. Byck 1968 New Engl. J. Med. 279:105; Schaumburg, H.H., R. Byck, R. Gerstl, J.H. Mashman 1969 Science 163:826-828; Traut, H. 1964 Mutation Res. 1:157-162.