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Echalier G & Ohanessian A. In vitro culture of *Drosophila melanogaster* embryonic cells. *In Vitro* 6:162-72, 1970.

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A new culture medium for cells from *Drosophila* embryos has been designed. Some cultures persist for months and establish euploid lines. The availability of such cell lines should open new fields of research, particularly in cell physiology and virology. [The *SCI*® indicates that this paper has been cited in over 270 publications.]

Daughters of the Paris Revolution, May 1968

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In order to analyse the mechanisms of action of the arthropod growth hormones (now well-known under the generic name of *ecdysteroids*), I decided, in the late 1950s, to approach the cellular level by devising *in vitro* culture systems.

Thanks to a grant from the US National Academy of Sciences, my decisive training in that field came during a stay at Caltech during the winter of 1960 in the laboratory of R. Dulbecco. On my return to Paris, I organized a small laboratory at the Faculté des Sciences de Paris to design specific culture media and to adapt *in vitro* culture techniques to insect cells. I chose to work on *Drosophila melanogaster* and was joined in my efforts by a young scientist from the French CNRS, Annie Ohanessian.

It must be remembered that, whereas the culture of all sorts of mammal and bird tissues had been extensively developed since the beginning of this century by a number of well-equipped laboratories all over the world and a variety of cell lines was already available, the growing *in vitro* of invertebrate materials had been, thus far, rather occasional, and results, quite fragmentary. The first insect continuous cell line was established only in 1962 by the Australian Tom Grace, from the ovarian sheath of a lepidopteran.

It was clear that the specific biochemical features of insect body fluids had to be taken into consideration for elaborating new media. The designation given to our successful medium, *D22* (*D* for *Drosophila*), reveals the variety of recipes we had to test patiently.

The first satisfactory primary cultures from dissociated embryos of *Drosophila* were not obtained until 1965, but we had to wait three more years before getting the very first continuous cell lines of *D. melanogaster* (French report in 1969[1] and this [English] paper in 1970).

May I introduce here an amusing but meaningful "historical" detail: There still remains something of a mystery about the process of *in vitro* establishment of a permanent cell line. Several phases of cell migration and apparent stagnation may alternate for months in the primary cultures before, suddenly, an ultimate cell wave invades the flask and "spontaneously" acquires the capacity of unlimited multiplication. Between the periods of activity, the cultures looked so dull and lifeless that we would have thrown away the huge series of *Drosophila* cultures that we had set up, if we had had time to look at them. Now that was during May 1968, in Paris, when university professors were rather busy with the "student revolution." I was only able to go to my lab once a week to change the medium in the flasks. Finally, when things quietened down, two cell lines could be successfully subcultured. So, it is right to consider them daughters of the Paris "May '68 revolution."

At the present time, the number of available *Drosophila* permanent cell lines may be more than 40. The worldwide use of those *Drosophila* cell lines has to be correlated with the spectacular revival of interest aroused by this famous little fly in the two connected fields of the physiology of genes and developmental biology. Cell cultures provided molecular biologists with unlimited amounts of homogeneous cellular material.

Moreover, two experimental "models" were developed with our *Kc* cell line for analysing the mechanisms of regulation of eukaryotic genomes: (1) the "heat shock" system (now known to be ubiquitous, from bacteria to man); and (2) the cell responses to ecdysteroid hormones, a system devised by our laboratory and then adopted by several other groups. After the cloning of some hormone-regulated *Drosophila* genomic sequences, we are presently studying their regulatory signals, which remains in the line of my original research project.[2]

Another important by-product of the use of those *Drosophila* cell lines in molecular biology was the first detection in higher animals of mobile genetic elements analogous to those discovered by B. McClintock in maize.

For my part, I am now exploring the possibility that so-called retrotransposons[3]—which are largely amplified in *Drosophila* cell lines and seem to move throughout the genome mostly during the first months of the culture—might play a decisive role (according to Hayward's "promoter insertion model") in the process of cell *in vitro* "immortalization." Someday, I hope to understand what really occurred in our culture flasks during the warm days of the Paris "May '68 revolution."

1. **Echalier G & Ohanessian A.** Isolement, en cultures *in vitro*, de lignées cellulaires diploïdes de *Drosophila melanogaster* (Isolation of *in vitro* cultures of diploid cell strains of *Drosophila melanogaster*). *C. R. Acad. Sci. Paris* 268:1771-3, 1969. (Cited 130 times.)
2. **Fourcade-Peronnet F, Ziarczyk P, Rollet E, Courgeon A M, Becker J, Maisonhaute C, Echalier G & Best-Belpomme M.** *Drosophila* cells as a model for studying the mechanisms of ecdysteroid action. (Koolman J, ed.) *Ecdysone*. Stuttgart, FRG: Thiemer Verlag, 1988.
3. **Echalier G.** *Drosophila* retrotransposons. Interactions with the genome. *Advan. Virus Res.* 36, 1989. (In press.)

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