tern of their behaviour in non-dividing as opposed to actively-dividing cells (i.e. 2 days versus 11 days) is quite similar. If the inhibitory compounds are in the same cell compartment as the IAA-D enzymes, the level of IAA-D activity in K-grown cells would be approximately $^1/_{10}$ the level in IAA-grown and 2,4-D-grown cells. But if the 2 components are in separate compartments, IAA-D activity of K-grown cells is still only $^1/_3$ that of 2,4-D-grown cells. Under both circumstances there would be a tendency for higher endogenous levels of IAA to be achieved in cells grown in the presence of K. Experiments are underway to measure endogenous levels of IAA, and to determine both the isozymic pattern of IAA-D enzymes and the structure of the inhibitory compounds.

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Sterilising activity of methoprene and hydroprene in *Tribolium castaneum* (Herbst)[1]

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Summary. The productivity of *T. castaneum* adults, previously reared in flour incorporating either the IGR methoprene or hydroprene, was found to be impaired depending on the concentration of the IGR in the flour, whether or not the individual was morphologically deformed, and its sex.

Insect growth regulators (IGRs) possessing juvenile hormone activity disrupt the life functions of insects which may result in a reduction or suppression of productivity, or in the production of lethal morphogenetic effects[2]. The IGRs methoprene and hydroprene show considerable potential as commodity protectants[3-6], but little attention has been given to sub-lethal effects that they may have on insect pests[7]. Some degree of sterility induced by a sub-lethal dose of an IGR may be an advantage particularly when it is used as a commodity protectant because such sub-lethal effects would extend the period of protection by retarding or even preventing a build-up of an infestation.

Using a malathion susceptible strain of *T. castaneum* (Herbst)[8], sub-lethal concentrations of methoprene and of hydroprene were tested for sterilising activity. Flour (wholemeal) incorporating either methoprene or hydro-

Table 1. Viability and productivity of adults of *T. castaneum* previously reared in flour containing either methoprene or hydroprene

IGR and concentration (ppm)	Adult type (N or D)* crossed with control adult	Male Number of crosses set up	Number of crosses producing progeny	Mean number of progeny****	Female Number of crosses set up	Number of crosses producing progeny	Mean number of progeny****
Methoprene							
0.001	D	14	11	142.7^{ab}	26	15***	131.6^{a}
	N	30	27	129.8^{ac}	30	30	138.9^{a}
0.01	D	18	14	173.9^{b}	22	15***	138.9^{a}
	N	28	27	132.6^{a}	30	25	121.3^{a}
0.1	D	28	3***	69.3^{c}	30	5***	99.6^{a}
	N	30	16***	80.8^{c}	30	27	119.7^{a}
Hydroprene							
0.001	D	4**	4	112.0	3**	0	–
	N	30	24	121.2^{a}	29	27	138.1^{a}
0.01	D	29	19***	145.8^{a}	28	8***	126.4^{ab}
	N	30	27	146.5^{a}	30	26	143.3^{a}
0.1	D	30	20***	130.1^{a}	30	16***	98.4^{b}
	N	30	28	161.0^{a}	29	27	135.0^{a}
Control		30	29	135.6^{a}	30	29	135.6^{a}

* N denotes morphologically normal, and D morphologically deformed, adults bred in flour containing either methoprene or hydroprene. ** Too few crosses set up to permit any statistical analysis. *** Significantly different from control (X^2-test). **** The mean number or progeny produced per viable cross; means followed by a different letter are significantly different at $p = 0.05$, Duncan's Multiple Range Test.

Table 2. Viability and productivity of morphologically normal and deformed adults of *T. castaneum* previously reared in flour containing 0.1 ppm of either methoprene or hydroprene

IGR	Test cross* (♂ × Q)	Number set up	Number viable	Number progeny (m̄)
Methoprene	D × D	30	0	-
Hydroprene	D × D	30	6	9.1
	N × N	30	30	156.1

* N, Morphologically normal; D, morphologically deformed.

prene was prepared to give concentrations of 0.001, 0.01 and 0.1 ppm; flour treated only with acetone (the solvent used for these IGRs) served as a control[9].

The sterilising activity of the 2 IGRs was assessed on the basis of the number of progeny produced from crosses of morphologically normal or deformed adults previously reared in flour containing methoprene or hydroprene, with adults reared in untreated flour. Adults for all crosses were reared from eggs (< 24-h-old) placed into either IGR treated or untreated flour media in 240 ml glass jars. Periodically, pupae were removed and sexed, to provide supplies of virgin adults. Each virgin adult (< 2-days-old) from the treated medium was examined for deformity and then placed with a normal virgin adult of the opposite sex in a 75 ml plastic vial containing 5 g of untreated medium. As many pairs as possible were set up for each cross. At weekly intervals for a period of 4 weeks, the adults were transferred to fresh, untreated flour, and the vials of used flour incubated for progeny.

Viability was significantly reduced in all male adults previously reared in flour containing 0.1 ppm methoprene, and in only the deformed males reared in flour with 0.01 and 0.1 ppm hydroprene (table 1). The viability of morphologically deformed female adults reared in either methoprene or hydroprene flour was markedly reduced at all IGR concentrations, whereas that of normal female adults was comparable to control viability. Productivity of female adults reared from methoprene flour was comparable to that of the controls, and in the males a reduction occurred only in those reared in flour containing 0.1 ppm methoprene. When reared from hydroprene flour, the productivity of all adults was comparable to that of the controls except in deformed females reared at 0.1 ppm, which was significantly lower. Interestingly, additional tests (table 2) revealed that in crosses between deformed × deformed, only a small number of the crosses were viable, and these produced relatively few progeny. In the normal × normal cross of adults reared in IGR treated flour there was no marked change in either viability or productivity compared with the back cross to the controls or the controls themselves (table 2).

These sterilising effects of methoprene and hydroprene on *T. castaneum* have not been reported before although sterilising effects in *Trogoderma granarium* (Everts) have been observed for a juvenile hormone analogue when applied topically to the pupal stage[10]. The manner in which these IGRs interfere with the reproductive processes is not known. Nonetheless, the fact that both methoprene and hydroprene possess sterilising activity further enhances their potential as commodity protectants.

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Chain-proteins of the vertebrate lens

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Summary. Some lens proteins exist in a chain-like form in the vertebrate lens fibre cells. They consist of globular proteins arranged on a filamentous backbone.

It has previously been reported that the water-insoluble intracellular matrix of the chick lens contains proteins arranged in the form of chains of particles (12–15 nm in diameter) aligned on a filamentous backbone (7–9 nm in diameter)[2,3]. Intermediate filaments (10–12 nm in diameter) are also found in the matrix material of the lens[2]. Chain-like organization of cytoplasmic lens protein has also been described for the bovine lens[4,5]. This study reports on the presence of chain-proteins in a variety of vertebrate lenses.

Lenses were obtained form the following adult species immediately after death: New Zealand white rabbit, Sprague-Dawley rat, Swiss-Webster mice, White Leghorn chicken, American turkey, and frog *(Xenopus laevis)*. Noncataractous adult human lenses were obtained within 36 h of death. The lenses were dissected free of capsule and epithelial cells and the fibre mass homogenized at 4 °C with 9 vol. of a 0.05 M Tris-HCl, 0.005 M-$MgCl_2$, pH 7.4 solution, containing 0.01 M β-mercapthethanol. Each homogenate was centrifuged at 37,000 × g for 20 min. The supernatant (water-soluble fraction) was collected and the water-insoluble pellet resuspended in the buffer. The water-soluble and water-insoluble fractions were examined by negative stain[2]. Epithelial cells were removed from the lens capsule and fractionated as described above.

Negative stain showed the presence of chain-proteins in the fibre cells of all species examined, but not in the epithelial cells. Such chains were noted in the water-soluble and water-insoluble fractions of the fibre cells. In the water-soluble fraction the chains were often seen as single free elements, whereas in the water-insoluble fraction, where the chains predominate, they were more frequent as large