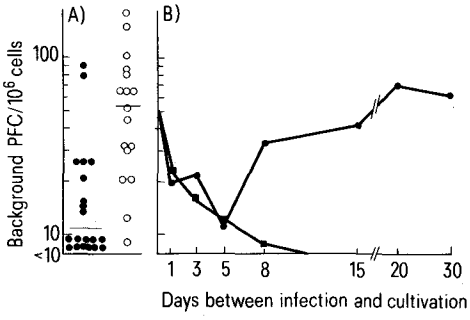
production in vitro of background plaque forming cells (BPFC) against sheep erythrocytes (SE) by spleen cells is depressed.

Adult BALB/c mice were injected with either Rowson-Parr virus (RPV) or FLC as described[5]. 5 million pooled splenocytes obtained at various times after infection, from 3 or more mice, were cultured in Marbrook chambers[6] exactly as reported[5], but the addition of SE was omitted. Since BPFC development in vitro is influenced by the source of serum used to supplement the medium[6,7], a single batch of fetal calf serum (Flow Lab., Rockville, Md.) was used. After 5 days incubation, the cells were collected, counted, tested for viability and assayed for BPFC with SE as test antigen[2]. The results are expressed as number of BPFC/10^6 viable nucleated cells recovered.

The figure A shows the effects of RPV infection performed 5 days before cultivation on BPFC production. Despite the use of spleen pools, individual values were rather variable in both normal and infected cultures. However, in the latter a reduction of BPFC numbers was evident. The mean number of BPFC was 11 in the infected cultures and 54 in the controls ($p < 0.01$). It is noteworthy that cell survival in infected and control cultures was similar: nucleated cells recovered were respectively $1.09 \pm 0.42 \times 10^6$ and $1.17 \pm 0.39 \times 10^6$ (mean±SD) per culture.

The figure B depicts the relation between time of RPV or FLC infection and number of BPFC developed. Both infections depressed PBFC production rapidly. However, the depression caused by RPV had waned by the 2nd week of infection, while that induced by FLC was irreversible and progressive. Thus the effects of RPV and FLC on BPFC parallel those on antibody-forming cells produced by SE-stimulated cultures[5].

These results show that nonspecifically stimulated antibody responses in vitro are depressed by FLC viruses in a manner similar to specifically stimulated antibody responses. It seems reasonable to assume that there is a strict correlation between BPFC produced in vitro by spleen cells and BPFC present in the spleen of unimmunized animals, since both a) are produced without manifest stimulation, b) release IgM antibody, c) are independent from T cell activity[8,9], d) are enhanced by B cell mitogens[10,11], e) are probably triggered by cross-reacting antigens; but proof is lacking because in vivo studies with germ-free animals have been inconclusive[12] and in vitro BPFC arise also in the absence of serum[13], supposedly the main source of cross-reactions[6,7]. If this assumption is correct, the results presented here lend support to the idea that the enhancement of splenic BPFC induced by FLC viruses in vivo is not due to increased generation rate but to changed behavior. An altered circulation pattern appears the most plausible explanation[2,14].



Effects of infection with viruses of the Friend leukemia complex (FLC) on background plaque-forming cells (BPFC) production by spleen cells in culture. *A* Numbers of BPFC produced by individual cultures from uninfected mice (○) and from mice infected with RPV 5 days before cultivation(●). *B* Mean number of BPFC produced by cultures from mice at various times from RPV (●) or FLC infection (■) (each point represents the average of at least 5 cultures).

1 Supported in part by a grant from the Italian Research Council (Progetto finalizzato virus, CT 77.00248.84).
2 M. Bendinelli, A. Toniolo and M. Campa, Infect. Immun. *11*, 1024 (1975).
3 S. Hirano, H. Friedman and W.S. Ceglowski, J. Immun. *107*, 1400 (1971).
4 P.B. Dent, Prog. med. Virol. *14*, 1 (1972).
5 M. Bendinelli, G.S. Kaplan and H. Friedman, J. nat. Cancer Inst. *55*, 1425 (1975).
6 J. Marbrook, Lancet *2*, 1279 (1967).
7 R.I. Mishell and R.W. Dutton, J. exp. Med. *126*, 423 (1967).
8 J.S. Hege and L.J. Cole, J. Immun. *99*, 61 (1967).
9 M.K. Hoffman, O. Weiss, S. Koenig, J.A. Hirst and H.F. Oettgen, J. Immun. *114*, 738 (1975).
10 J. Andersson, O. Sjöberg and G. Möller, Eur. J. Immun. *2*, 349 (1972).
11 H.H. Freedman, H. Nakano and W. Braun, Proc. Soc. exp. Biol. Med. *121*, 1228 (1966).
12 A.A. Nordin, Proc. Soc. exp. Biol. Med. *129*, 57 (1968).
13 A. Coutinho and G. Möller, Eur. J. Immun. *3*, 531 (1973).
14 D.R. Bainbridge and M. Bendinelli, J. nat. Cancer Inst. *49*, 773 (1972).

Screening of newly synthesized non-alkylating sterilant compounds against the adult *Chrotogonus trachypterus* Blanch. (Orthoptera: Acrididae)[1]

S.C. Saxena and Sushma

Toxicology Laboratory, Department of Zoology, University of Rajasthan, Jaipur 302004 (India), 16 January 1978

Summary. Out of the 9 new non-alkylating compounds screened against *C. trachypterus*, the compounds 62206, 24220 and 51160 have been found most effective, 51007 and 50882 exhibit intermediate effectiveness, 61914 only slightly effective and 50994, 2406 and 51240 almost non-effective.

9 newly synthesized non-alkylating compounds[2] were screened against the adult *Chrotogonus trachypterus* Blanch., an acridid pest, to determine their effect on the reproductive capacity when applied by dipping method.

Materials and methods. The compounds employed in the present investigation were dissolved in glass-distilled water (GDW) to the required concentration, except 3-amidino dithiocarbazic acid (61914) which was dissolved in solvent

50% dimethyl sulfoxide (DMSO). Insects were treated by the dipping method.
Experiments were performed to record the effects on fecundity and fertility. Mortality data were recorded daily.

Sterility was calculated according to Chamberlain[3] by the following formula:

$$\text{corrected sterility} = \frac{\text{percent hatch in control} - \text{percent hatch in treated}}{\text{percent hatch in control}} \times 100$$

Effect on the fertility of *C. trachypterus* on injecting the non-alkylating compounds into the virgin adults

Compound	Concentration	Sex treated	Pairs crossed	Egg-pod per pair	Percent hatch of eggs	Percent corrected sterility	Mortality after 7 days
51,007	5%	Male	5	Insect died before laying could occur			50
		Female	5				30
		Both	5				60
	2.5%	Male	8	0.50	30.88	61.99	25
		Female	8	0.125	53.33	34.36	0
		Both	8	0.25	26.09	67.89	25
	1%	Male	8	1.00	41.67	48.71	12.5
		Female	10	0.40	56.10	30.95	0
		Both	10	0.60	40.95	49.60	25
	0.5%	Both	8	1.25	60.0	26.15	0
GDW	Control	Both	10	1.60	81.25	-	10
62,206	5%	Both	8	Died before laying eggs			62.5
	3%	Male	8	0.25	0	100	25.0
		Female	8	0	-	100	12.5
		Both	8	0	-	100	37.5
	1%	Male	8	0.25	0	100	12.5
		Female	8	0.125	0	100	0
		Both	8	0	-	100	25.0
	0.5%	Male	8	0.50	29.76	67.26	6.25
		Female	8	0.25	47.06	48.23	0
		Both	8	0	-	100.00	12.25
GDW	Control	Both	10	1.50	90.91	-	0
24,220	5%	Both	5	Experiment was discarded due to excess mortality			100
	2.5%	Male	8	0.25	0	100	50
		Female	8	0	-	100	25.0
		Both	8	0	-	100	62.5
	1%	Male	8	0.50	32.69	59.77	25.0
		Female	8	0.25	55.0	32.31	12.25
		Both	8	0	-	100.00	50.0
	0.5%	Both	8	0.25	38.46	52.66	12.5
	0.25%	Both	8	0.25	46.67	42.56	6.5
	0.1%	Both	8	0.25	49.02	39.67	0
GDW	Control	Both	10	1.60	81.25	-	10.0
51,160	1%	Male	5	0.60	0	100	40
		Female	5	0.40	0	100	10
		Both	5	0.00	-	100	50
	0.5%	Male	5	0.80	19.61	80.39	20
		Female	5	0.60	35.0	65.00	0
		Both	5	0.00	-	100.00	40
GDW	Control	Both	5	2.40	100	-	10
50,994	2%	Both	10	3.0	57.47	30.69	15
	1%	Both	10	2.3	65.22	21.35	10
	0.5%	Both	10	2.5	64.44	22.29	5
	0.25%	Both	10	2.1	68.03	17.96	0
GDW	Control	Both	10	3.0	82.92	-	0
50,882	4%	Both	10	1.60	25.0	70.97	30
	2%	Both	10	2.20	33.67	60.90	20
	1%	Both	10	1.80	58.48	32.09	10
GDW	Control	Both	10	1.60	100	-	10
2,406	4%	Both	5	1.80	55.56	44.44	20
	2%	Both	5	3.0	63.77	36.23	10

Table continued

Compound	Concentration	Sex treated	Pairs crossed	Egg-pod per pair	Percent hatch of eggs	Percent corrected sterility	Mortality after 7 days
GDW	Control	Both	5	1.00	90.00	-	10
51,240	5%	Both	5	0.80	53.57	40.48	30
	1%	Both	5	0.80	69.77	22.48	10
GDW	Control	Both	5	1.00	90.00	-	10
61,914	0.5%	Both	5	1.80	44.44	47.77	30
DMSO + H_2O (1:1)	Control	Both	5	2.60	61.54	27.67	20
GDW	Control	Both	5	3.00	85.08	-	0

GDW, glass distilled water; DMSO, dimethyl sulfoxide.

Results and discussion. (table): The compounds 1, 2, 4-dithiazolium-3-(dimethylamino)-5-[(2-hydroxyethyl) methylamino] iodide (62206), 2-(isopropylamino) ethanol (24220) and bis (dimethyl-amino) dithiazolium chloride (51160) has been found most effective at different dose levels, (compound 62206 at dose levels of 3% and 1%, 24220 at dose levels of 2.5% and 1% and 51160 at dose levels of 1% and 0.5%). The compound N, N, N', N'-tetramethyl-P-piperidinophosphonic diamide (51007) and hexamethyl phosphoric triamide i.e. hempa (50882) exhibit intermediate effectiveness at dose levels of 2.5% and 4% respectively. Compound 3-amidino-dithiocarbazic acid (61914) along with the solvent dimethyl sufloxide (DMSO) is only slightly effective at a dose level of 0.5%. Other compounds viz., 2, 4-diamino-6-(dimethylamino)-s-triazine hydrochloride (50994), boric acid (2406) and pentamethylmelamine hydrochloride (51240) are almost non-effective, although little effect is recorded at dose levels of 2%, 4% and 5% respectively.

1 This work was financed out of PL 480 USA funds.
2 Compounds were gifts from Dr A.B. Borkovec, Insect Chemisterilant Laboratory, Environmental Quality, Institute, Beltsville, Maryland, USA.
3 W.F. Chamberlain, J. econ. Ent. *55*, 240 (1962).

Kinetics of interferon action[1]

H. Koblet[2], R. Wyler[3] and U. Kohler[2]

Institute of Medical Microbiology, University of Berne, Friedbühlstrasse 51, CH-3008 Berne; and Institute of Virology, University of Zurich, Winterthurerstrasse 266A, CH-8057 Zurich (Switzerland), 1 September 1977

Summary. A kinetic analysis of the action of interferon with different preparations in chick embryo fibroblast cell culture gives additional evidence for interaction of interferon with the cell surface, compatible with the idea that interferon is not taken up by the cells. With certain assumptions the binding constant is in the range of 10^{13} [l/Mol].

The host protein interferon is supposed to need an intact synthesis of host macromolecules to establish within hours a full state of inhibition of viral growth. The increase of resistance can be interrupted at intermediary levels, if actinomycin D is given at any time in the course of the development of the 'antiviral state'[4-6]. If interferon has a single mechanism of action, it might be summarized[7] as follows. Interferons bind to a specific receptor on the cell surface. This causes changes in the cell membrane, which, possibly through a cyclic adenosine-3':5'-monophosphate effect, result in the production of an inactive precursor of an antiviral substance. After viral infection and formation of a double-stranded viral RNA, this precursor is activated in a step involving phosphorylation to produce an antiviral substance that selectively inhibits a step in the initiation of translation of viral mRNA (review, Friedman[7]). However, it is still not clear whether interferon delivers the signal for this induction at the surface of the cellular membrane or within the cell. Several types of experiments give circumstantial evidence for the former mechanism[8-11].

The purpose of this paper is to add evidence for one of these possibilities on the basis of kinetic data. The rationale for the experiment is as follows.

After adding interferon to cells, a full state of protection is established after about 5-6 h. The degree of protection is given by the reduction of viral replication as compared to uninhibited replication. During the development of the protection, the time-dependent intermediary levels can be estimated by blocking any further increase of protection with actinomycin D; therefore the rate of increase of protection can be estimated. This rate is linear; the rate and final levels are dependent upon concentration of interferon. A presence of a few min is sufficient to trigger a protection[15,16]. Now, if there is an intracellular accumulation, the concentration of interferon should increase within the cell as a function of the time of contact. Therefore, unequal