

Data on the effect of two substances on the development of *Spodoptera littoralis* Boisduval

		Substance tested (0.1% conc.)		Control
		Giberellic acid	β -Sitosterol	
Larval duration (days) \pm S.E.		14.7 \pm 0.12	15.7 \pm 0.12	11.9 \pm 0.03
Pupal duration (days) \pm S.E.		7.0 \pm 0.57	8.8 \pm 0.09	6.8 \pm 0.09
Pupal weight (mg) \pm S.E.	Male	227.9 \pm 12.1	196.6 \pm 9.11	241.0 \pm 13.3
	Female	265.5 \pm 66.7	209.8 \pm 8.27	267.1 \pm 13.2
Emergence (%)		100	80	92
Longevity (days) \pm S.E.	Male	8.7 \pm 0.34	9.1 \pm 0.44	9.1 \pm 0.37
	Female	8.0 \pm 0.45	8.1 \pm 0.53	9.1 \pm 0.31
Mean egg No. per female*		104.8 \pm 35.9 (15-380)	433.5 \pm 68.8 (75-750)	472.4 \pm 19.1 (150-894)
Hatching (%)		1.4	8.5	99.4

* 30 pairs were used in each test (all females laid eggs in all tests).

effect of the tested compounds on the larval and pupal development was determined. 30 pairs of moths reared from the treated as well as the untreated diets were placed individually in one litre glass jars provided with leaves of *Nerium oleander* as oviposition sites and fed on 10% honey solution. The egg production per female as well as the fertility were determined. The pupae were weighed and the percentage of emergence was estimated.

Results. The data are given in the Table. Both substances significantly prolonged the larval duration as compared with the check. Giberellic acid had no effect on the pupal duration, while β -sitosterol significantly prolonged it as compared with the untreated individuals. The pupal weight was significantly reduced as a result of larval treatment with sitosterol, while giberellic acid had no effect. Male and female moths ensuing from treated larvae copulate normally, since immobile sperms were detected in the spermatheca of all females confined with treated males. Both substances affected the fecundity and fertility of the resulting moths where they induced sterility. All females laid eggs but there was a significant reduction in the egg production after larval treatment with giberellic acid, 104.8 \pm 35.9 (15-380) eggs as compared to 472 \pm 19.1 (150-894) eggs in the control check. The percentage of egg hatching was greatly reduced being 1.4 and 8.5% as a result of larval treatment with giberellic acid and sitosterol, respectively, compared to 99.4% in the control moths.

There was no marked difference in the percentage of emergence of moths between treated and untreated individuals. Giberellic acid and sitosterol exerted some effect on the larval and pupal development of *Heliothes* species⁹. The fecundity and fertility of these species were partially affected by sitosterol, while giberellic acid only affected the fecundity.

The foregoing results suggest that these plant substances could act as chemosterilants and may be recommended for mass production of sterile insects in the laboratory for large scale research programme in the field.

Zusammenfassung. Wird Gibberellinsäure und Sitosterol der Larven-Diät von *Spodoptera littoralis* zugegeben, so kommt es zu deutlicher Sterilität bei den ausgebrüteten Motten und zu einer Beeinflussung der Dauer ihrer Entwicklungsphase.

H. S. SALAMA and A. M. EL-SHARABY

Plant Protection Laboratory,
National Research Centre, Dokki, Cairo (UAR),
24 August 1971.

⁹ A. A. GUERRA, J. econ. Ent. 63, 1518 (1970).

Influence of Continuous and Intermittent (R-Wave Triggered) Electrical Stimulation of the Carotid Sinus Nerve on the Static Characteristic of the Circulatory Regulator

Electrical stimulation of the carotid sinus nerve (CSN) and depressor nerve as a treatment of hypertension has become known as 'baropacing' (GRIFFITH and SCHWARTZ¹; BILGUTAY et al.²). There are several methods to optimize the parameters of stimulation. Besides determining the effect of reduction in arterial pressure and the blood pressure level in case of longer stimulating influence (adaptation), it is also possible to describe the effect of electrical stimulation by recording characteristics of the blood pressure control system (BRATTSTRÖM and WARZEL³). Thus, it is possible to follow the effect of baropacing over the entire control range. In addition, the position of the blood pressure lowered by electrical stimulation of the CSN within the control range may be localized.

The experiments were performed on 14 mongrel dogs (12-18 kg) anesthetized with morphin and urethane. The

right carotis sinus nerve for electrical stimulation and a 'Karotissinuspräparat' on the contralateral side were prepared.

The object of baropacing is to reduce the blood pressure increased in case of hypertension. When the CSN is stimulated the blood pressure decreases, wandering from point A to point B (Figure 1), provided that the characteristic is non-effected by the artificial stimulation. Thus, for an additional reduction in blood pressure, e.g. by hemorrhage, no regulatory effects would be possible. How-

¹ L. S. C. GRIFFITH and S. J. SCHWARTZ, Circulation 28, 703 (1963).

² A. M. BILGUTAY, J. BILGUTAY and C. W. LILLEHEI, in *Baroreceptors and Hypertension* (Ed. P. KEZDI, Pergamon Press, Oxford 1967).

³ A. BRATTSTRÖM and H. H. WARZEL, Acta biol. med. germ., in press.

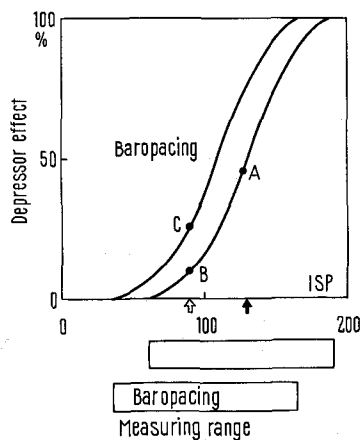


Fig. 1. Relative depressor effect with increasing intrasinal pressure (ISP). Right: Non-effected characteristic. Left: Desired operating point on the resetted characteristic with baropacing.

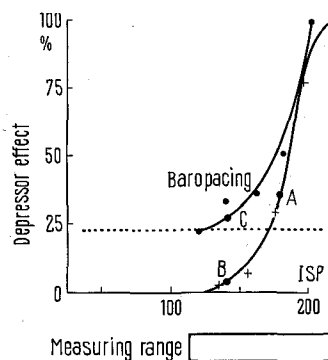


Fig. 2. Relative depressor effect with increasing intrasinal pressure (ISP). The measuring range is identical for the non-effected characteristic and for that with continuous stimulation (80 Imp/sec; 4 V; 2 msec) of the CNS. With decrease in ISP from 180 mm Hg to 140 mm Hg, the blood pressure control system is almost completely covered both at point B and C.

ever, if the measuring range is also displaced in baropacing, point C on the reset characteristics can be reached as an operating point. The relative reduction in blood pressure for an increasing static intrasinal pressure (ISP) in a carotid sinus preparation (KOCH⁴; PALME⁵) with (BRATTSTRÖM and WARZEL³) and without (KALKOFF⁶; BRATTSTRÖM and KALKOFF⁷) baropacing is plotted in Figure 1.

On principle, the stimulation can be performed both with continuous and intermittent impulse sequence (BILGUTAY et al.; MYERS et al.⁸; ÖBERG and SJÖSTRAND^{9,10}; RICHTER et al.¹¹; ZERBST et al.¹²; VATNER et al.¹³; BRATTSTRÖM and WARZEL³). Apart from the decrease in blood pressure, the reduction in control range as compared to the non-effected characteristics, is common to both types of stimulation, since in each case an excessive measurement quantity becomes centrally effective. On the other hand, differences between the two could exist with regard to position and size of the measuring range. For baropacing with continuous repetitive impulses, an adaptation to the stimulation is to be expected, similar to that observed for static pressure application to the pressoreceptors. As a result, only the control range would be reduced; however, the measuring range remains identical with the non-effected characteristics.

On the other hand, no adaptation should exist for baropacing with pulse-synchronous impulse trains, since an additional application of stimulus is effected during pulse elevation only. Furthermore, apart from the reduction in control range already mentioned, this should now be coverable by lower pressures (ISP), since this type of stimulation simulates a more sensitive measuring system.

In our tests on anesthetized dogs, these considerations could be verified. Typically, Figure 2 shows the behaviour of the static characteristic of the blood pressure control system prior to and during continuous stimulation of the CSN. The amount of decrease in blood pressure and reduction in control range is mainly determined by the voltage amplitude of stimulation. The characteristic with baropacing was recorded for 6 min upon onset of stimulation. The parameters of stimulation were 80 square-wave pulses/sec, 4 volts and 2 m/sec duration of single stimulus. The measuring range is identical for both the non-effected characteristic and baropacing. A reduction in ISP from 180 mm Hg corresponding to point A, down to 140 mm Hg indicates the nearly complete exhaustion of the control

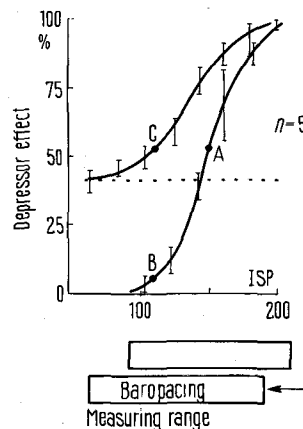


Fig. 3. Relative depressor effect with increasing intrasinal pressure (ISP). With intermittent stimulation (40 Imp/sec; 2 V; 0.5 msec; impulse trains 100 msec; time-difference to the R-wave - 30 msec) of the CSN, the measuring range is displaced towards low ISP. When ISP is decreased from 160 to 120 mm Hg, it wanders from A to B on the non-effected characteristic; for baropacing, however, point C again keeps a mid-position. For intermittent stimulation of the CSN, there is sufficient buffering capacity both in case of reduction and increase in blood pressure.

⁴ E. KOCH, *Die reflektorische Selbststeuerung des Kreislaufes* (Theodor Steinkopff-Verlag, Dresden and Leipzig 1931).

⁵ F. PALME, *Expl. Med. Surg.* 9, 404 (1951).

⁶ W. KALKOFF, *Regensb. Jb. ärztl. Fortbild.* 9, 63 (1961).

⁷ A. BRATTSTRÖM u. W. KALKOFF, *Acta biol. med. germ.* 25, 295 (1970).

⁸ G. H. MYERS, V. PARSONNET, W. HOLCOMB, J. R. ZUCKER and G. LEWIN, *Med. Res. Engineering* 7, 13 (1968).

⁹ P. A. ÖBERG and U. SJÖSTRAND, *Acta physiol. scand.* 75, 287 (1970).

¹⁰ P. A. ÖBERG and U. SJÖSTRAND, *Acta physiol. scand.* 81, 96 (1971).

¹¹ D. W. RICHTER, W. KECK and H. SELLER, *Pflügers Arch. ges. Physiol.* 317, 110 (1970).

¹² E. ZERBST, K.-H. DITTBERNER and V. KÖTTER, *Pflügers Arch. ges. Physiol.* 315, 232 (1970).

¹³ St. F. VATNER, D. FRANKLIN, R. L. VAN CITTERS and E. BRAUNWALD, *Circulation Res.* 27, 495 (1970).

range both on the non-effected characteristic (point B) and for point C on the characteristic for baropacing.

For intermittent stimulation of a CSN, however, apart from the blood pressure reduction, also the measuring range was displaced towards lower pressure values, as compared to the non-effected characteristics. Results of such a test are plotted in Figure 3. When with this animal the blood pressure is decreased from 160 mm Hg (point A) to 120 mm Hg, the control range is almost completely exhausted for the noneffected characteristic (point B). However, for a stimulation of the CSN with pulse-synchronous impulse trains, a mid-position of the operating point is maintained with regard to the static characteristic, as is indicated by point C. Therefore, further reduction in blood pressure can be compensated with intermittent stimulation of the CSN, in contrast to the continuous stimulation. Even for a continuation of the intermittent stimulation over a period of 40 min, no trend of back-displacement of the characteristic towards the non-effected characteristics was observed. The stimulation was effected with impulse trains of 100 msec duration, which started 30 msec after the R-wave of the E.C.G.; the impulse frequency was 40 impulses/sec; the amplitude was 2 volts and the duration of single impulse 0.5 msec. The selection of the parameters of stimulation, the time interval between stimulation and R-wave of the E.C.G. (WARZEL and BRATTSTRÖM¹⁴) and the impulse train duration had been dealt with in preceding studies.

According to the results presented, the intermittent stimulation of the CSN appears to be superior to baro-

pacing with continuous impulse frequency. With pulse-synchronous triggering of the impulse trains, the static characteristic of the blood pressure control system is displaced towards lower ISP values (input pressure), without any adaptation being perceptible. The arterial pressure reduced by baropacing keeps its mid-position with regard to the characteristic. In contrast to the findings for continuous stimulation, sufficient buffering capacity exists both in case of reduction and increase in blood pressure.

Zusammenfassung. Bei narkotisierten Hunden wurde der Karotissinusnerv sowohl mit Dauerimpulsen als auch mit R-Zacken-gesteuerten Impulszügen elektrisch gereizt. Die Blutdruckcharakteristik zeigt, dass der Messbereich des Kreislaufreglers unter kontinuierlicher und ohne Reizung bei etwa gleichen Druckwerten liegt. Die Reizung mittels Impulszügen führt dagegen zu einer Verlagerung des Messbereiches zu niedrigeren endosinualen Drücken.

A. BRATTSTRÖM and H. WARZEL

*Physiologisches Institut der Medizinischen Akademie
Magdeburg, Leipziger Strasse 44,
DDR-301, Magdeburg (DDR),
30 September 1971.*

¹⁴ H. WARZEL und A. BRATTSTRÖM, *Experientia* 28, 38 (1972).

DNA Synthesis and Distribution of First and Second Divisions in 72-h-Cultures of Human Leukocytes

Cytological observations have demonstrated that in whole, unmanipulated blood, the level of DNA synthesis is very low and mitoses are undetectable¹. Based on studies of in vitro incorporation of tritiated thymidine, it has been estimated that only 0.06% of unstimulated lymphocytes of human peripheral blood can synthesize DNA². A significant DNA synthesis has been recorded in phytohemagglutinin (PHA) stimulated cultures about 30 h after initiation³.

The purpose of this work has been to collect information on DNA synthesis in human 3-day leukocyte cultures. Cytological observations on mitoses and interphases at 48 and 72 h have been used in order to study the dynamics of this system. An estimate has been made of the distribution of first and second divisions at 72 h.

Materials and methods. The experiments have been carried out with blood cells from a normal 24-year-old male. The cells were grown as described by BRØGGER⁴. Tritiated thymidine (spec. activity 2.0 Ci/mM) was obtained from the Radiochemical Centre (Amersham, England). For the study of DNA synthesis, measurements of incorporated tritiated thymidine were made in a Beckman LS-150 scintillation counter. For the study of mitoses and interphases, 31-h-old cultures were exposed to tritiated thymidine (1 μ Ci/ml) for 2 h. Autoradiographs were made from cultures harvested at 48 and 72 h (colcemid treatment for the last 2 h).

Mitoses were classified by counting silver grains over metaphase chromosomes. A metaphase was scored as labelled if it contained 5 or more grains over the 2 longest chromosomes (No. 1) and unlabelled in all other cases.

The labelled metaphases were scored as first or second divisions depending on the distribution of grains over one or both chromatids. Interphase nuclei were scored as labelled or unlabelled according to the relative number of grains over the nuclei compared to the background.

Results. Two similar experiments were made, and the rate of the DNA synthesis at different times is shown in the Figure. A shoulder on the curves can be seen at about 40 h, after which the incorporation increases steadily.

The distribution of metaphases from cultures harvested at 48 and 72 h are shown in Table I. Provided that not any of the unlabelled cells have finished their DNA synthesis before 31 h, the S- and G₂-period of unlabelled cells at 48 h is 15 h or shorter.

Cells showing labelling at 48 h would do the same at 72 h. The distribution of first and second divisions among these cells can easily be decided. However, it is impossible directly to differentiate among the unlabelled mitoses at 72 h. Their distribution has been estimated in the following way.

At 48 h $0.68/(84.8 + 0.68)$ of the unlabelled cells appear as unlabelled mitoses. Presuming that only cells which are in mitosis at 48 h could appear as second divisions 24 h

¹ M. A. BENDER and D. M. PRESCOTT, *Expl. Cell Res.* 27, 221 (1962).

² V. P. BOND, E. P. CRONKITE, T. M. FLIENDER and P. SCHORK, *Science* 128, 202 (1958).

³ A. MICHALOWSKI, *Expl. Cell Res.* 32, 609 (1963).

⁴ A. BRØGGER, *Translocation in Human Chromosomes* (Universitetsforlaget, Oslo 1967).