

## Responsiveness of Intestine Motility to Different Substances

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THE OBJECT of this investigation is to study the responsiveness of the intestine to vitamins, antibiotics and anthelmintic drugs *in vitro*. When Vitamin B6 was used in small dose (10mg), it stimulated the intestinal motility to a great extent but larger dose (100mg) completely inhibited it. Moreover, doses of 20-40mg produced an inhibition followed by stimulation of the intestinal motility. Small doses of vitamin B<sub>12</sub> (0.5-0.8mg) were without a pronounced effect on the intestinal motility, while larger dose (1.0mg) produced slight stimulation. Vitamin C relaxed the intestine musculature when used at levels of 1: 10000 to 1: 2500. Oxytetracycline produced an inhibitory action followed by stimulation when used at levels of 1:25 to 1:6.25

Anthelmintic drug (Piperazine) produced a stimulated effect on the intestinal motility when used at levels of 8-48 mg. Adrenaline was shown to inhibit the intestinal motility to a great extent in all doses used ( $5 \times 10^{-7}$  -  $1 \times 10^{-5}$ g). Acetylcholine seems to have a strong stimulate effect on the intestinal motility when used in doses of ( $5 \times 10^{-6}$  -  $1 \times 10^{-5}$  g).

The intestine of birds undergo peristaltic movement characteristic of the intestines of mammals (Malgold, 1929 and Groebbels, 1932). This has been demonstrated also *in vitro* studies, in which the intestine was placed in oxygenated Ringer's solution at 40-43° (Malgold, 1950). The peristaltic wave proceeds aborally. Nolf (1934), who stimulated the cephalic end of an intestinal preparation in Ringer's solution, reported the spread of the wave aborally. Stimulation of the caudal end, however, produced contraction only a short distance orally. In the opened bird, with a balloon in the intestine, the wave is always aboral, according to Groebbels (1932). It is presumed that the intestine receives sympathetic and parasympathetic fibers, which are concerned in their motility, since the automatic movements of the organs *in vitro* are inhibited by epinephrine and stimulated by acetylcholine (Groebbels, 1932).

### Material and Methods

White Baladi hens used in this study were taken at random from the flock bred by the Poultry Research Centre, Animal Science Department, Faculty of Agriculture, Cairo University. To study the effect of the different drugs used on the spontaneous motility of the intestine (*in vitro*) using the glass bath apparatus described by Elhabbak (1975). After hens were sacrificed,

the intestine was carefully removed and immersed in a dish filled with Dales solution. A strip of about one inch long from the ileum was suspended in the oxygenated physiological solution of the inner bath. Then the lever was left to record the normal motility on a smoked kymographic drum paper slowly moving and drugs were added to the inner bath in different doses, the responsiveness of the intestine to these drugs were recorded.

*Preparation of solutions for investigation*

1- *Dalés solution*: This solution was prepared by dissolving 90g sodium chloride, 4.2g of potassium chloride, 2.4g of calcium chloride and 0.05g of magnesium chloride in 1 l of distilled water. A 200ml of this solution was completed to 2 l and 1g of each of glucose and sodium bicarbonate was then added.

2- *Vitamin B<sub>6</sub>*: Aqueous solution of this vitamin was used as pyridoxine hydrochloride injections "Ecavit" B<sub>6</sub> 100mg/2ml diluted to the level of 10, 20, 40 and 100 mg.

3- *Vitamin B<sub>12</sub>*: Aqueous solution of this vitamin was used in the form of the commercial preparation, vitacid B<sub>12</sub> 1000 mcg/ml diluted in the inner bath in doses of 0.5, 0.8 and 1.0mg.

4- *Vitamin C*: Aqueous solution of this vitamin was used in the form of ascorbic acid injection 500 mg/5ml "Ceutal". It was diluted with distilled water to the doses of 5, 10 and 20mg.

5- *Tetracycline*: water soluble power veterinary preparation of this antibiotic was used as "Terramycin", Oxytetracycline chloride, 55 g/kg and was dissolved in distilled water in the inner bath at levels of 0.2, 0.4 and 0.8 g.

6- *Piperazine*: Aqueous veterinary preparation of this drug was used in the form of "Dido-Zal", Piperazine chloride 5g/30 ml and was diluted with distilled water in doses of 8, 16 and 48 mg.

7- *Adrenaline*: Aqueous solution of the hormone was used as adrenaline injection 1 ml, adrenaline 1:1000, and was diluted with distilled water in the inner bath at levels of  $5 \times 10^{-7}$ ,  $1 \times 10^{-6}$  and  $1 \times 10^{-5}$  g.

8- *Acetylcholine*: Powder preparation of this drug was used as "Acetylcholine chloride" ampoule of 200 mg and was dissolved in distilled water in doses of  $5 \times 10^{-6}$ ,  $1 \times 10^{-5}$  and  $15 \times 10^{-6}$  g.

### Results and Discussion

*The intestinal motility as affected by*

1- *Vitamin B<sub>6</sub>*: The level of 10 mg vitamin B<sub>6</sub> produced strong stimulation. At higher levels of 20 and 40mg, this vitamin resulted in strong inhibition followed by strong stimulation. When the dose was as high as 100mg, it caused complete inhibition (Table 1).

2- *Vitamin B<sub>12</sub>*: Vitamin B<sub>12</sub> was without a pronounced effect, but only in large doses (1.0 mg), it produced slight stimulation to the intestinal movements (Table 1).

TABLE 1. The effect of different substances on the intestinal motility (*in vitro*).

| Doses added                   | Dilution used | Responses                                      |
|-------------------------------|---------------|--|
| <i>Vitamin B<sub>6</sub></i>  |               |  |
| 10 mg                         | 1:5000        | Strong stimulation                             |
| 20 mg                         | 1:2500        | Strong inhibition followed by stimulation      |
| 40 mg                         | 1:1250        | Strong inhibition followed by stimulation      |
| 100 mg                        | 1:500         | Very strong inhibition followed by stimulation |
| <i>Vitamin B<sub>12</sub></i> |               |  |
| 0.5 mg                        | 1:10000       | No apparent effect                             |
| 0.8 mg                        | 1:6250        | No apparent effect                             |
| 1.0 mg                        | 1:5000        | No apparent effect                             |
| <i>Vitamin C</i>              |               |  |
| 5 mg                          | 1:10000       | Inhibition                                     |
| 10 mg                         | 1:5000        | Strong inhibition                              |
| 20 mg                         | 1:2500        | Very strong inhibition                         |
| <i>Terramycin</i>             |               |  |
| 0.2 g                         | 1:25          | Inhibition followed by stimulation             |
| 0.4 g                         | 1:12.5        | Strong inhibition followed by stimulation      |
| 0.8 g                         | 1:6.25        | Very strong inhibition followed by stimulation |
| <i>Piperazine</i>             |               |  |
| 8 mg                          | 1:625         | Stimulation                                    |
| 16 mg                         | 1:3125        | Strong stimulation                             |
| 48 mg                         | 1:1041        | Very strong stimulation                        |
| <i>Adrenaline</i>             |               |  |
| $5 \times 10^{-7}$ g          | 1:100000000   | Strong inhibition                              |
| $1 \times 10^{-6}$ g          | 1:50000000    | Very strong inhibition                         |
| $1 \times 10^{-5}$ g          | 1:5000000     | Very strong inhibition                         |
| <i>Acetylcholine</i>          |               |  |
| $5 \times 10^{-6}$ g          | 1:10000000    | Stimulation                                    |
| $1 \times 10^{-5}$ g          | 1:500000      | Strong stimulation                             |
| $15 \times 10^{-5}$ g         | 1:3333333     | Very strong stimulation                        |

3- *Vitamin C*: Vitamin C, relaxed the intestine musculature. The inhibitory effect depends on the concentration used, being minimum at the smallest dose and maximum at the largest one (Table 1).

4- *Oxytetracyclin*: oxytetracycline when added in the from of terramycin produced inhibitory action followed by stimulation (Table 1).

5- *Piperazine*: Piperazine hydrochloride (Dido-zal) when added at the levels mentioned, resulted in a stimulating action at all levels used and that higher doses produced the maximal effect (Table 1).

6- *Adrenaline*: Adrenaline inhibited the motility of intestine markedly in all doses used (Table 1).

7- *Acetylcholine*: It is clear that acetylcholine seems to have a strong stimulate effect on the intestinal motility in all doses used (Table 1).

Generally most drugs used stimulated the intestinal motility at different degrees of potency, but on the other hand vitamin C, and adrenaline inhibited this motility.

It is very interesting to notice that vitamin B<sub>6</sub> when used in small doses (10mg) stimulate the intestinal matility to a great extent, but larger doses(100mg) produce inhibition. It is moreover noticed that doses of 20-40mg produce an inhibition followed by stimulation of the intestinal motility. It is suggested, therefore, to consider the doses when vitamins are used in poultry, since some activate the intestine, such as vitamin B<sub>6</sub>, while others as vitamin C inhibited it. The responsiveness of the intestine in poultry explains the nervous mechanism of the intestinal wall. It is interesting too, to notice that acetylcholine stimulates the intestinal motility at all concentrations used and on the other hand adrenaline produced consistent inhibition of this motility. The variability in this responsiveness of the intestine *i.e.*, inhibition by adrenaline and stimulation by acetylcholine, may indicate the presence of the sympathetic and parasympathetic nerve endings in the intestine. It seems probable that the application of adrenaline will produce constipation in poultry and acetylcholine will produce stimulation, since adrenaline stimulates the sympathetic nerve endings which are inhibitory to the intestine and acetylcholine stimulates the parasympathetic nerve endings which are motor to the intestine. These findings as demonstrated in this present work, on acetylcholine and adrenaline confirm that of Greobbels (1932), who claimed that the intestine receives sympathetic and parasympathetic nerves which are concerned in their motility, since the automatic movements of the organs *in vitro* are inhibited by epinephrine and stimulated by acetylcholine. Piperazine was selected for this investigation at it is one of the main anthelmintics used against *ascaridia golli*. When the effect of this substance was examined *in vitro*, it was noticed that it activates the intestinal motility in poultry to a great extent. This effect on the intestine *i.e.* stimulation, may explain its vermifugal property.

## References

- El Habbak, M.M. (1975) *The Responsiveness of the oviducts and intestine in poultry to different substances*. M. Sc. Thesis, Faculty of Agriculture, Cairo, University.
- Groebbels, F. (1932) "Der vogel. Ester Band : Atmungswelt and Nahrungswelt." verlag von Gebruder Borntraeger, Berlin. Cited by sturkie, P.D. (1965)
- Manglod, E. (1929) "Handbuch der Ernährung und des stoffwechsels der landwirtschaftlichen Uulztica" Zweiter Band. Verlag von julius spring, Berlin Cited by Sturkie, P.D. (1965),
- Mongold, E. (1950) "Die verdauung bei den Nutztieren" Akademie, Berlin. Cited by Strukie, P.D. (1965)
- Nolf, P. (1934) Les nerfs extrinseque de lintestin chez l'oiseaux . II-Les nerfs coeliaques et mesentriques" *Arch. Int. Physiol.* 39, 165.

## استجابة حركة الأمعاء للمواد المختلفة

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تتضمن هذه الدراسة مدى استجابة حركة الأمعاء الدقيقة فى الدجاج لكل من الفيتامينات ( ب<sup>٦</sup> ، ب<sup>١٢</sup> ، ج ) والمضادات الحيوية ( أوكسى تتراسيكلين هيدروكلوريد والمتداول تحت اسم تيراميسين) وكذلك البيرازين هيدروكلوريد والمروف باسم الديدوزال والهرمونات ( الادرينالين والاسيتيل كولين ) وكانت النتائج كما يلى :

فيتامين ( ب<sup>٦</sup> ) : عندما أضيف هذا الفيتامين بجرعة صغيرة مقدارها ١٠ مجم وجد أنه ينشط حركة الأمعاء بينما عند زيادة الجرعة الى ١٠٠ مجم كان تأثيره مثبط لهذه الحركة . أما الجرعات المتوسطة من ٢٠ - ٤٠ فقد وجد أن لها تأثيرا مثبطا متبوعا بتأثير منشط .

( فيتامين ب<sup>١٢</sup> ) : لم يكن للجرعات الصغيرة من هذا الفيتامين ( ٥ - ٨ مجم ) تأثيرا ملحوظا على حركة الامعاء بينما عندما زيدت الى ١ مجم كانت ذات تأثير منشط بدرجة ضعيفة .

فيتامين (ج) : دلت النتائج على أن هذا الفيتامين ذو تأثير مثبط على حركة الأمعاء عند استخدامه فى جرعات من ٥ - ٢٠ مجم .

أوكسى تتراسيكلين هيدروكلوريد : وجد أن هذا المضاد الحيوى له تأثير مثبط متبوعا بتأثير مثبط عند اضافته بتركيزات من ١ : ٢٥ الى ١ : ٢٥٠

بيبرازين هيدروكلوريد : دلت النتائج على أن هذا العقار ينشط حركة الامعاء بدرجة قوية عند استخدامه فى جرعات من ٨ - ٤٨ مجم .

الادرينالين : عند اضافة هذا الهرمون فى تركيزات من ١٠ × ٥ - ١٠ × ١ جم وجد أنه ينشط حركة الامعاء الى حد كبير .

الاسيتيل كولين : دلت النتائج على أن هذا الهرمون له تأثير منشط جدا عندما أضيف بكميات من ١٠ × ٥ - ١٠ × ١٥ جم .