arginine of the medium into the cell to the incorporation into the protein, was 0.1 m*M* in the fed animal and 0.6 m*M* in the fasted animal (Figure 2).

Discussion. The incorporation of ^{3}H-arginine into the liver protein of fasted chickens of the NGL strain is decreased, as compared with the fed controls, to a larger extent than that of ^{3}H-leucine. This does not occur in other strains, such as the white leghorn: there fasting is not followed, as is typical for the NGL strain, by the large increase of an arginase activity with low Km for arginine.

Many factors could influence the labelling of the liver protein by ^{3}H-leucine and ^{3}H-arginine. First, a larger isotopic dilution in the fasted as compared with the fed animal could be the reason. This, however, is not the case. In fact, at the beginning of the experiment, the intracellular leucine content was 9 nmoles per 100 mg of liver in the fasted and 6.2 nmoles in the fed animal, while the arginine content was 9.2 nmoles per 100 mg in the fasted and 4.1 nmoles in the fed animal. These differences are not important since the equilibration between the extra- and the intracellular amino acids is rapid[10–12] and the amount of the added labelled leucine and arginine was much in excess (0.5 nmole) of that present in the cells.

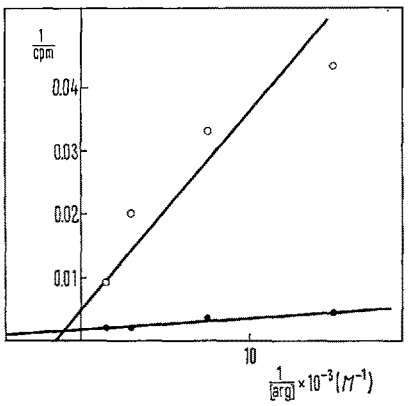

Fig. 2. Incorporation of ^{3}H-arginine in the liver protein of fed and 48 h fasted NGL chickens as a function of arginine concentration. The incubation mixtures were prepared as described under Figure 1. The concentration of ^{3}H-arginine (specific activity 960 cpm per nmole) was: 0.66, 0.33, 0.132; 0.06 m*M*. Temperature was 38 °C, pH was 7.4. After 1 h of incubation the reaction was stopped by the addition of 5 ml of 8% trichloroacetic acid and the protein precipitate was prepared for counting and counted as described under Figure 1.

Fasting could slow down the protein synthesis by decreasing the concentration of unknown factors. This, however, could hardly explain why, under the same experimental conditions, arginine is incorporated to a lesser extent than leucine.

It seems, on the contrary, reasonable to relate the larger decrease of arginine incorporation to the higher level of the liver arginase activity of the fasted NGL chickens (Figure 1, Table). This conclusion is also supported by the observation that the effect of fasting on arginine incorporation into the liver protein can be almost completely removed by increasing the arginine concentration (Figure 2).

The arginase level can thus control, in the liver of the chickens of the NGL strain, the rate of arginine incorporation and therefore the synthesis of protein, particularly of the basic protein such as histones. On the contrary, synthesis of the acidic protein, such as arginase from chicken liver, should be influenced to a lesser extent. The proposed mechanism of regulation could represent, in all conditions where food is scarce, a useful mechanism to spare the energy supply and thus to provide a survival advantage to the animal.

Riassunto. La comparsa, da digiuno, di una nuova attività arginasica nel fegato di pulcino del ceppo Nuova Livornese Dorata, è associata al decrescere della incorporazione di arginina nelle proteine epatiche. Il fenomeno potrebbe avere interesse nella regolazione della sintesi proteica.

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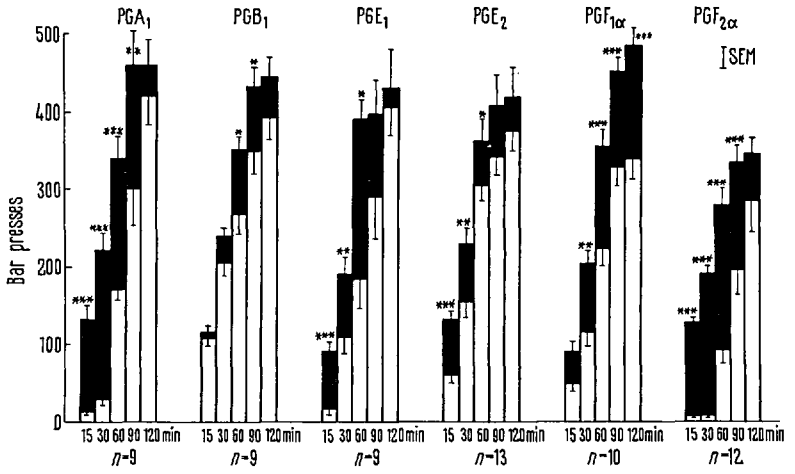
Prostaglandins and Food Intake of Rats

To our knowledge, the effects of prostaglandins (PG) on food intake have not been reported. Because PG are ubiquitous and have been shown to have many effects on physiological and biochemical functions which play some part in the regulation of energy balance, it is conceivable that they may be a component of the food intake regulatory system.

PG are synthesized in various organs including stomach[1], intestines[2], adipose tissue[3], nerves[4,5], and brain[6]. Of the many effects of PG, those which are related to the control of food intake include: stimulation of gastrointestinal motility[7], inhibition of gastric secretion[8], and inhibition of lipolysis caused by epinephrine, norepinephrine, ACTH, TSH, glucagon and growth hormone[9]. PGE_1 has insulin-like activity in that it increases glucose uptake by adipose tissue and stimulates synthesis of triglycerides from glucose and acetate[10,11]. Also BERGSTRÖM et al.[9] have suggested PG have a role in the control of free fatty acid mobilization. Although the above mentioned physiological and biochemical processes are related to some aspect of the control of food intake, it is not apparent what the net result of any one PG would be. Thus, the objective of the following experiment was to determine the relative effects of 6 of the PG on food intake in rats.

Male rats (Charles River strain) were trained to bar press for pellets (Noyes; 100 pellets = 4.5 g) and were conditioned to one 2-h feeding per day. On experimental days, rats were injected s.c. with 1.0 ml/kg containing a dose of either 1 mg/ml of prostaglandins A_1, B_1, $F_{1\alpha}$, $F_{2\alpha}$, or 0.1 mg/ml of E_1 or E_2[12].

On control days, only the solvent was injected: 0.1 ml ethyl alcohol diluted with 0.9 ml of 0.02% Na_2CO_3 solution in saline (pH between 6.0 and 7.0). Immediately



Effect of prostaglandins on food intake. The blackened-in plus the open bars show the cumulative intakes (bar presses) on control days while the open bars show the cumulative intakes on experimental days. Subcutaneous injection of either 1 mg/kg body weight A_1, B_1, $F_{1\alpha}$, or $F_{2\alpha}$ or 0.1 mg/kg body weight of E_1 or E_2 were given at time '0' on experimental days while the carrier solution only was injected on control days. Each pellet weighed 45 mg. Probabilities are the results of paired t-tests. * = $p < 0.05$; ** = $p < 0.02$; *** = $p < 0.01$.

after injection, each rat was placed in a feeding cage. Differences of food intake on control and experimental days were tested for significance with paired t-tests. At least 9 rats received each of the prostaglandins on different test days.

Of the PG tested only B_1 did not depress feeding during the first half hour (Figure). PGB_1 caused a reduced rate of eating but mainly in the 30–60 min interval. Only $F_{1\alpha}$ injections resulted in a significant decrease of the cumulative intake at the end of the feeding period, although both PGE_1 and $PGF_{2\alpha}$ had a sustained effect. Because in preliminary tests PGE_1 and PGE_2 caused peripheral vasodilatation, diarrhea and general depression of behavior, doses used later were only $^1/_{10}$ that of the other PG given. The doses of PG injected in this experiment caused no apparent symptoms of sickness or discomfort in the rats; they drank water and responded to handling as usual.

Clearly, these doses of PG can inhibit food intake of rats, but a physiological role in either the control of food intake or the regulation of energy balance remains to be established. We do not know either the physiological blood concentrations of PG in the rat or the absorption rates in our experiment. However, it can be assumed that only a very small proportion of the dose injected ever reached the arterial blood since the lungs very efficiently metabolize most of these PG[13]. Presumably, since the action of some of the PG was sustained, only an extremely small proportion of the dose injected was in the arterial blood at any one time.

The food intake depression is probably not the result of an increased body temperature with most of these PG. Injections of only PGE_1 into the cerebral ventricle of cats were consistently effective in causing a rise in body temperature and $PGF_{2\alpha}$ was ineffective[14]. Yet all caused a decrease in food intake with $F_{1\alpha}$ and $F_{2\alpha}$ particularly effective.

We can only speculate at this time on the site of action of PG, but it is conceivable that they affect the central nervous system, e.g. hypothalamus. PG have been shown to be synthesized by neurons and stored at the site of synapses in the brain[6], and they may have a physiological role as feedbacks for the control of free fatty acid mobilization[9]. Perhaps one or more PG which decrease food intake are produced, for example by adipose tissue, at rates that are a function of fat depot level and act as the long sought intermediaries between fat depots and long term regulation of energy balance. Thus, PG are factors possibly involved in lipostasis[15] and may have a role in the hypothesized mechanism of HERVEY[16] in the control of energy balance[17].

Zusammenfassung. Nachweis der Wirkung verschiedener Prostaglandine auf die Nahrungsaufnahme bei der Ratte.

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