consisting of 1 ml Krebs bicarbonate buffer with half the normal calcium concentration (1.25 mM) and containing glucose (1 mg/ml). The ovaries were then transferred to new flasks containing fresh medium with the addition of 50 µl of extracted substances. Incubations were performed at 37 °C in a shaking water bath and with 95% O_2+5% CO_2 as gas phase. At the end of the incubation, the ovaries were immediately frozen in Frigen 11 (chilled with dry ice).

Analysis of cAMP. The ovaries were stored at −80 °C until analysis. The tissue content of cAMP was determined according to Gilman[7]. Total ovarian protein content was determined according to Lowry[8].

Statistical methods. Values are given as mean±SEM. Significance was tested with Student's t-test. A p-value of less than 0.05 was obtained and considered as significant.

The effect of PLS from *P. acnes* on prepubertal ovary is shown in the figure. As can be seen, PLS increased the cAMP content approximately 2-fold. The known stimulators of the cAMP system are gonadotropins (for references see Selstam et al.[9]), catecholamines (for references see Condon and Black[10]) and prostaglandins (for references see Selstam et al.[6]). Since a lipid fraction of *P. acnes* was investigated the above mentioned substances, except prostaglandins, can be excluded. Therefore, the present study gives further evidence that the lipid fraction of *P. acnes* contains prostaglandins or prostaglandin-like substances. If these substances interfere with the surrounding tissue, there is a new possibility to explain, at least in part, the inflammatory response to *P. acnes*. The hypothesis that can be put forward is that substances such as PLS, produced by the bacteria, may, besides a reaction to the bacteria itself, play a role in the inflammation. Prostaglandins are known to possess many diverse biological effects, including their role as important inflammatory mediators[11] and may therefore also directly contribute in the inflammatory response in acne vulgaris.

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Decreased cyclic GMP levels in rat cecum mucosa during adaptive stimulation of Na-K-ATPase[1,2]

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Summary. In rat cecal mucosa, Na-K-ATPase specific activity and sodium and fluid absorption were increased by giving polyethylene glycol administration with the drinking water. Whereas cyclic AMP levels were unchanged, cyclic GMP was reduced by about 50%. This finding suggests a regulatory role of cyclic GMP in intestinal sodium and fluid absorption.

Active sodium absorption in the intestine is stimulated in acute experiments by several alpha-adrenergic and muscarinic cholinergic agonists[4]. Under these conditions, the guanosine 3′:5′-monophosphate (cGMP) concentration of the cell increased, whereas the concentration of adenosine 3′:5′-monophosphate (cAMP) was unaffected[5]. On the basis of these results, a functional connection between active sodium absorption and the cGMP content of the transporting cell has been considered[5]. The hypothesis, however, has not been tested in other situations involving stimulation of active sodium transport in the intestine.

In rat cecum mucosa, active sodium absorption and the specific activity of the Na^+-K^+-activated adenosine triphosphatase (Na-K-ATPase) increase persistently when the nonabsorbable polymer, polyethylene glycol (PEG), is added to the diet[6-9]. The effect is significant after a few days and maximal after about 2 weeks, and is not due to the concomitant increase in cell number, i.e., the hyperplasia[6,7]. In the present communication, we report that the intracellular concentration of cGMP in the mucosa fell parallel with this adaptive increase in active sodium transport and Na-K-ATPase, whereas the cell content of cAMP remained unchanged.

Materials and methods. Male Wistar rats (160–200 g) were used. Control animals received tap water ad libitum. In experimental rats, polyethylene glycol 4000 (160 g/l, Serva, Heidelberg) was added to the drinking water. After 4 to 56 days, rats were anaesthetized with sodium thiobarbital (Inactin®, 80 mg/kg). The cecum was excised and washed with ice-cold 0.9% (w/v) NaCl solution. The mucosa was gently scraped off as described previously[8] and transferred to a tube containing 4 ml of 1 N perchloric acid, about 0.1 pmoles ^{3}H-cAMP (38.4 Ci/mmole, NEN) and 0.2 pmoles ^{3}H-cGMP (21 Ci/mmole, Amersham) for determination of cyclic nucleotide recoveries. After homogenization and centrifugation, cyclic nucleotides were purified by chromatography on a 0.65×2.2 cm column of aluminium oxide (90 neutral, activity grade I, Merck, Darmstadt)

Influence of the time interval between cecum excision and mucosa homogenization on cAMP levels in rat cecum

Time (sec)	cAMP (pmoles/mg protein)
20–29	6.7± 2.6 (3)
30–39	8.0± 0.6 (23)
40–49	11.5± 0.9 (6)
50–59	25.1± 6.0 (6)
60–69	25.1±13.4 (4)
70–99	21.6± 3.5 (7)

Data are means±SEM with the number of observations in parentheses.

followed by a 0.65×3 cm Dowex 1 column (Dowex 1×2, 200–400 mesh, $HCOO^-$ form, Serva) according to Jakobs et al.[10]. Cyclic AMP was determined by a protein-binding assay[11] using a protein kinase partially purified[12] from bovine skeletal muscle. Cyclic GMP was determined by radioimmunoassay[13]. Overall average recoveries were 71% for cAMP and 65% for cGMP. Protein was measured according to Lowry et al.[14] with bovine serum albumin as a standard. Values are given as arithmetic means ± SEM.

Results and discussion. In preliminary experiments, we tested the influence of the time interval between cecum excision and mucosa homogenization on the cAMP levels. The cAMP concentration was essentially unchanged when homogenization was performed within 50 sec after excision (table). With prolonged intervals, a rapid increase in the cAMP concentration occurred. The reason for this time-dependent rise is not clear. It may involve the release of neurotransmitters, prostaglandins or other endogenous factors. In all subsequent experiments, tissue was homogenized within 30–35 sec after excision. Similar analyses of cGMP levels were performed. It was found that during the 30–35-sec time interval between excision and fixation cGMP levels remained essentially unchanged (data not shown).

Figure 1, a, shows that the cAMP concentration was not changed in the mucosa of PEG-treated rats compared with control animals. It was about 8 pmoles/mg protein and

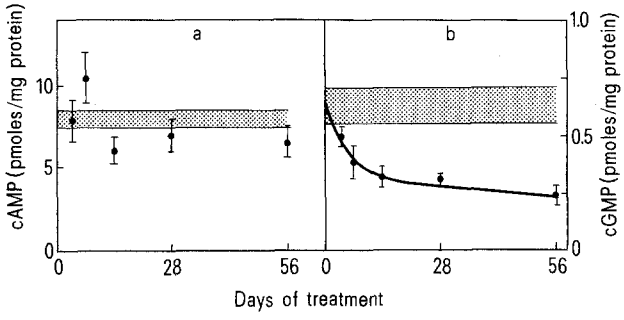

Fig. 1. Effect of dietary polyethylene glycol on cAMP and cGMP levels in rat cecum mucosa. cAMP(a) and cGMP(b) levels for PEG-treated animals are given as means±SEM of 6 to 16 determinations per group. Dotted areas indicate the 2 SEM range of controls, pooled for groups of 3 to 11 rats sacrificed at the times indicated for PEG-treated animals. cGMP levels of PEG animals were significantly different from controls after 7 days ($p < 0.05$) and at longer time intervals ($p < 0.0025$ at days 14–56).

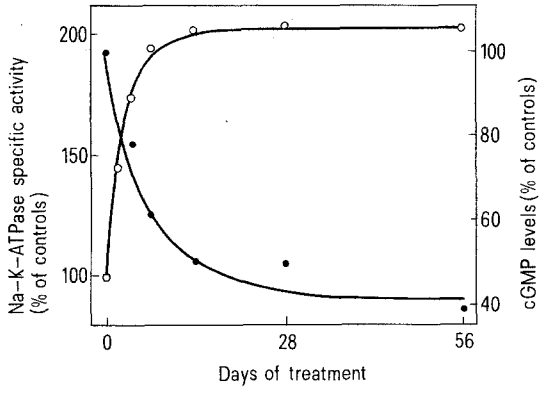

Fig. 2. Changes in cGMP concentrations (●) and microsomal Na-K-ATPase specific activity (○) of rat cecum mucosa during dietary adaptation. Data are given as percent of control values, with values for Na-K-ATPase recalculated from Schiffl and Loeschke[7].

essentially constant for both PEG-treated and control rats when tested over a period of up to 56 days.

As demonstrated in figure 1, b, the cGMP concentration was approximately 600 fmoles/mg protein in the cecum mucosa of controls. After beginning the PEG treatment, the cGMP concentration decreased by about 50% within 2 weeks and remained at this reduced level during the subsequent 6 weeks.

The fact that cAMP concentration was unchanged in adapting cecum mucosa supports the concept that cAMP is not involved in the Na-K-ATPase-mediated sodium absorption in the intestine[15–18]. The decrease in cGMP content, on the other hand, could be related to the stimulated sodium and fluid absorption found during cecum adaptation[6]. As shown in figure 2, the fall in the cGMP level exhibited a time course that was like a mirror-image of the previously described rise in Na-K-ATPase specific activity[7] and net sodium transport[6].

These results can be interpreted in several ways. The decrease in cGMP could be totally independent of the concomitant transport changes, and rather related to another underlying process, e.g., to the observed epithelial cell hyperplasia[6,8]. However, the fall in cGMP content apparently does not reflect mucosal growth, since cGMP levels have been shown to be elevated in dividing intestinal crypt cells[19] and in other growing cells or tissues[20,21]. Furthermore, the time courses of PEG-induced cecal growth and of the change in cGMP levels are different. Whereas the decrease in cGMP is complete after 2 weeks, cecal growth is still observed after 8 weeks of continuous PEG treatment[6,8]. Therefore, the decreased cGMP concentration is unlikely to be related to cellular growth.

It appears more likely that cGMP is actually involved in the regulation of intestinal sodium transport, since the present data indicate a close inverse correlation in time course between Na-K-ATPase specific activity, sodium transport and cGMP concentration. This would be in accord with the hypothesis of Brasitus et al.[5] that active sodium transport and cGMP are functionally interrelated. The apparently contradictory findings that the cGMP concentration fell during chronic sodium transport stimulation, as shown above, but rose during acute sodium transport enhancement induced by neurotransmitters in rabbit ileum in vitro[5], are not mutually exclusive for such an interpretation. For smooth muscle, it has been proposed that hormone-stimulated cGMP acts as a negative signal in the excitation of the tissue, e.g. as a negative feedback to elevated cytoplasmic calcium[22]. By analogy, intestinal sodium transport increased by neurotransmitters could lead to elevated cellular cGMP, which in turn could reduce the concentration or efficacy of a more direct regulator of sodium absorption, e.g. of cytoplasmic Ca^{++}. Thus, increased cGMP would eventually reduce the increased absorption. On the other hand, in chronic sodium transport stimulation due to an adaptive process, lowered cGMP would permit increased absorption to continue, since it would not depress the concentration of the putative more direct regulator. Cyclic GMP may therefore be involved in the regulation of intestinal sodium and fluid absorption as a negative modulator or feedback regulator of a more direct regulator. This direct regulator may be calcium, as shown or suggested for other systems[23], or possibly another intracellular factor.

1 Acknowledgments. We thank Miss U. Kautz for engaged technical assistance, Dr G. Schultz, Pharmakologisches Institut der Universität Heidelberg, for valuable discussions and suggestions, and Dr K.D. Schultz, Heidelberg, for generous supply of the cGMP antibody and 125-iodinated succinyl tyrosyl methyl ester of cGMP.

2 Supported by the Deutsche Forschungsgemeinschaft, grant Lo 114/7.
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Aktivitätsmuster eines jungen Steinbockes (*Capra ibex* L.)

The activity pattern of a young ibex (*Capra ibex* L.)

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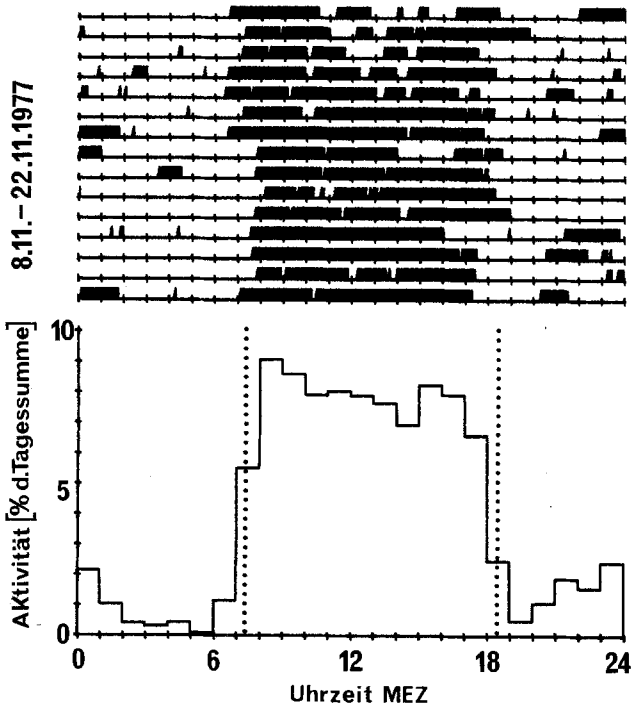
Summary. The activity pattern of a young male ibex obtained by radiotelemetry techniques is described. As is shown, the ibex has mainly been active during the light phase of the day. The pattern corresponds to a so-called Bigeminus.

Biotelemetrische Methoden erlauben heute differenzierte Studien über die Aktivitätsmuster freilebender Wildtiere. Das von uns eingesetzte Telemetriesystem ist für Rothirsche entwickelt worden und von Sonnberger et al.[1] näher beschrieben. Es ermöglicht durch bewegungsempfindliche Halsbandsender und an die Empfangsanlagen gekoppelte Schreiber eine automatische und kontinuierliche Aufzeichnung verschiedener Aktivitäten[2]. Hier soll nur der für Wiederkäuer wesentlichste Aktivitätstyp, Lokomotion mit gleichzeitiger Futteraufnahme, betrachtet werden. Das vorliegende Aktivitätsmuster stammt von einem 18 Monate alten männlichen Steinbock. Das ursprünglich handaufgezogene Tier lebte seit langem völlig frei in einem mit Wald und Fels durchsetzten Berghang.



Tageszeitliche Aktivitätsverteilung eines freilebenden, jungen männlichen Steinbockes während 15 Tagen im November. Zeitraster im oberen Teil der Darstellung 1 Min., im unteren 60 Min.; das Histogramm ist normiert: Gesamtfläche = 100% der Aktivität. Die beiden gepunkteten Linien bezeichnen den Beginn der bürgerlichen Dämmerung am Morgen und deren Ende am Abend.

Wie das Aktogramm zeigt (Figur), war das Tier fast vorwiegend tagaktiv. Ruhephasen von mehr als einer halben Stunde Dauer waren während der Hauptaktivitätszeit selten. Ihr Beginn und Ende fielen mit dem morgendlichen und abendlichen Lichtwechsel zusammen. Dabei streuen die Zeiten des Aktivitätsbeginnes weniger (SD = 35 Min.) als jene des Aktivitätsendes (SD = 51 Min.). Die tägliche Gesamtaktivitätsmenge betrug im Mittel 10,3 Std. (SD = 87 Min.). Die Verteilung der Aktivität entspricht dem Bigeminus-Typ, mit einem Hauptmaximum in den frühen Morgenstunden und einem Nebenmaximum vor der Abenddämmerung. Einige auf die Dunkelzeit entfallende längere Aktivitätsschübe bedingen ein weiteres kleines Maximum um Mitternacht. Die übrigen, nur sehr kurzen nächtlichen Schübe resultieren aus gelegentlichem Wechsel von Schlafplatz und Schlafhaltung.

Das Aktivitätsmuster dieses Steinbocks unterscheidet sich damit wesentlich von jenem adulter Rothirsche, die sich zur gleichen Zeit in seiner unmittelbaren Nachbarschaft aufhielten. Sie waren weitgehend nachaktiv[3].

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