The ineffectiveness of oleic acid treatment on liver plasma membrane basal adenylate cyclase activity is in good agreement with very recent results obtained in strictly comparable experimental conditions[8]; on the other hand, the stiffening of plasma membrane due to cholesterol incorporation exerts a stimulatory effect; which could be comparable to similar effects observed in tissue-culture cells by Sinensky and coworkers[21].

There results show that although, on the one hand, the effect of cis-vaccenic acid on the cyclase activity is at variance with previous observations on a different membrane system[5], on the other hand the hormonal sensitivity appears to be strictly dependent on the lipid environment whereas this is not the case for the less specific fluoride stimulation.

1 This investigation was partially supported by the Italian National Research Council.

2 H.K. Kimelberg, in: Dynamic Aspects of Cell Surface Organisation, p. 205. Ed. G. Poste and G.L. Nicolson. North Holland Publishing Co., Amsterdam 1977.
3 I. Dipple and M.D. Houslay, Biochem. J. *174*, 179 (1978).
4 P.M. Lad, M.S. Preston, A.F. Welton, T.B. Nielsen and M. Rodbell, Biochim. biophys. Acta *551*, 368 (1979).
5 J. Orly and M. Schramm, Proc. natl Acad. Sci. USA *72*, 3433 (1975).
6 R.P. Brivio-Haugland, S.L. Louis, K. Musch, N. Waldeck and M.A. Williams, Biochim. biophys. Acta *433*, 150 (1976).
7 M. Shinitzky and P. Henkart, Int. Rev. Cytol. *60*, 121 (1979).
8 O. Colard, A. Kertabon and C. Roy, Biochem. biophys. Res. Commun. *95*, 97 (1980).
9 T.K. Ray, Biochim. biophys. Acta *196*, 1 (1970).
10 E. Tria, S. Scapin, C. Cocco and P. Luly, Biochim. biophys. Acta *496*, 77 (1977).
11 B. Bloj, M.G. Galo, R.D. Morero and R.N. Farias, J. Nutr. *106*, 1827 (1976).
12 P. Luly and M. Shinitzky, Biochemistry *18*, 445 (1979).
13 P. Luly, O. Barnabei and E. Tria, Biochim. biophys. Acta *282*, 447 (1972).
14 S. Leoni, P. Luly, M.T. Mangiantini, S. Spagnuolo, A. Trentalance and R. Verna, Biochim. biophys. Acta *394*, 317 (1975).
15 P. Luly, P. Baldini, S. Incerpi and E. Tria, Biochim. biophys. Acta *555*, 366 (1979).
16 M. Shinitzky and Y. Barenholz, Biochim, biophys. Acta *515*, 367 (1978).
17 R.F. Chen and R.L. Bowman, Science *147*, 729 (1965).
18 O.H. Lowry, N.J. Rosebrough, A.L. Farr and R.J. Randall, J. biol. Chem. *193*, 265 (1951).
19 L.A. Chen, R.E. Dale, S. Roth and L. Brand, J. biol. Chem. *252*, 2163 (1977).
20 E. Hanski, G. Rimon and A. Levitzki, Biochemistry *18*, 846 (1979).
21 M. Sinensky, K.P. Minneman and P.B. Molinoff, J. biol. Chem. *254*, 9135 (1979).

Failure of cilia of reprogram following segmental ampullary reversal of the rabbit oviduct[1]

C.A. Eddy[2], D.R. Archer and C.J. Pauerstein

Department of Obstetrics and Gynecology, The University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, San Antonio (Texas 78284, USA), 23 April 1981

Summary. Cilia exhibited unidirectional and coordinated movement within microsurgically reversed segments of rabbit ampulla when examined up to 13 months after surgery. The direction of ciliary beating was opposite that of the remainder of the oviduct.

Ciliated cells constitute over 50% of the cells lining the ampullary portion of the mammalian oviduct[3]. Ampullary cilia beat in the direction of the uterus and are thought to be a major determinant in effecting ovum transport through this portion of the female reproductive tract[4]. The technique of surgically reversing a segment of oviduct in order to assess the role of ciliary activity in ovum transport through the rabbit oviduct was first described over 50 years ago[5], but was not successfully achieved until the advent of tubal microsurgery[6]. Cilia within microsurgically reversed segments continue to beat normally, but in the ovarian direction, counter to that of cilia in the rest of the oviduct. Microsurgical segmental reversal performed at the level of the sparsely ciliated isthmus is consistent with normal fertility[6]. In contrast, reversal performed within the more densely ciliated ampulla effectively prevents pregnancy[7,8]. These data suggest that cilia are critical to ovum transport through the rabbit ampulla, but not through the isthmus. It has been suggested that cilia may reprogram several months following segmental reversal[9,10]. The present experiment was undertaken in order to determine if cilia within a reversed segment of rabbit ampulla are programmed to beat in a given direction indefinitely or if they become influenced by cilia in adjacent segments to beat in line with the entire oviduct following a protracted interval.

Materials and methods. 4 adult female New Zealand white rabbits, 2–3 kg, were selected at random and anesthetized with pentobarbital sodium (30 mg/kg). In 2 animals, a single oviduct underwent microsurgical double transection and reversal of a 1-cm segment of mid ampulla as previously described[6]. Briefly, this technique entails mobilizing a segment of oviduct connected to an intact vascularized pedicle of mesosalpinx. The segment is rotated 180° on its pedicle and a double tubal anastomosis is performed, using 6–8 interrupted sutures of 10-0 nylon passed through the serosa and myosalpinx, but avoiding the endosalpinx. The

Ratio of implantations to number of ovulations following unilateral segmental ampullary reversal and double transection without reversal

Animal No.	Operated side	Control side
	Segmental reversal	
1	0/3	2/4
2	0/5	2/3
	Double transection	
3	6/8	4/6
4	5/6	4/4

defect in the mesosalpinx is then repaired using several 10-0 nylon sutures. The remaining 2 animals underwent double transection surgery without reversing the orientation of the segment. These oviducts served as surgical controls. Unoperated contralateral oviducts in all 4 animals served as additional controls. 9–12 months after surgery, animals were bred to males of proven fertility and examined 2 weeks later at laparotomy. The numbers of corpora lutea and uterine implantations were recorded. Following delivery and return to estrus, animals were induced to ovulate with an i.v. injection of 100 IU hCG. 12–14 h later, a laparotomy was performed and the reproductive tract was exteriorized and examined. A normal complement of fresh ovulation points (3–8) was observed in the ovaries of all 4 animals. 3–6 individual rabbit ova in cumulus obtained from donor animals previously injected with 100 IU hCG and supravitally stained with methylene blue were placed on the fimbria of operated oviducts and their in vivo transport within the ampulla examined with an operating microscope (Zeiss OPMI 6). The oviducts were then excised, placed in oxygenated Krebs solution at 37 °C, cut open and pinned flat, endosalpinx up. 3–6 additional stained ova in cumulus were placed at various locations along the ampulla and their transport similarly examined in vitro.

Results and discussion. Microsurgical reversal of a 1-cm segment of mid ampulla prevented pregnancy. No implantations occurred in those uterine horns associated with oviducts that had undergone segmental reversal, whereas normal pregnancy occurred in all others, including those whose oviducts had undergone double transection without reversal (table). Ova in cumulus placed on the fimbrial surface of oviducts that had undergone ampullary segmental reversal were transported in normal fashion through the ampulla until reaching the interface between normal ampulla and the reversed segment. At this point, net forward movement ceased. Ova failed to enter and pass beyond the reversed segment despite observation times in excess of several hours. When mechanically displaced into the reversed segment, ova were transported toward the ovary, but again became arrested when they reached the anastomosis between normal tube and the reversed segment. In contrast, transampullary movement of ova was normal in double transected controls. Ova were transported across both anastomosis sites to the ampullary isthmic junction. In vitro ovum transport results were the same and confirmed that cilia within reversed segments of ampulla continued to beat in a coordinated manner in the ovarian direction, counter to that in the rest of the oviduct, and thereby effectively impeded transport of ova across the reversed segment and into the uterus.

It appears that in the rabbit, so long as the structural integrity of the cells within a reversed segment of ampulla is maintained, the originally programmed direction and coordination of ciliary beating is maintained and is not altered or reprogrammed by adjacent ciliated cells in normal segments of ampulla.

1 This research was supported in part by a grant (HD 09339-06) from the National Institutes of Health and the Bioassay and Smooth Muscle Core Laboratories (NIH grant P30 HD10202).
2 To whom requests for reprints should be sent.
3 H. Kanagawa, E.S.E. Hafez, W.C. Pitchford, C.A. Baechler and M.I. Barnhart, Anat. Rec. *174*, 205 (1972).
4 S.A. Halbert, P.Y. Tam and R.J. Blandau, Science *191*, 1052 (1976).
5 Y.P. Kuo and R.K.S. Lim, Chinese J. Physiol. *2*, 389 (1928).
6 C.A. Eddy, J.J. Hoffman and C.J. Pauerstein, Experientia *32*, 1194 (1976).
7 C.A. Eddy, J.J. Flores, D.R. Archer and C.J. Pauerstein, Am. J. Obstet. Gynec. *132*, 814 (1978).
8 P. McComb, S.A. Halbert and V. Gomel, Fert. Steril. *34*, 386 (1980).
9 P. McComb and V. Gomel, Fert. Steril. *31*, 83 (1979).
10 R.M.L. Winston, Clin. Obstet. Gynec. *5*, 607 (1978).

Abdominal vagotomy attenuates drinking induced by intravenous infusion of various osmotic loads in the rat

J.R. Martin and D. Novin

Institute for Behavioral Science, Swiss Federal Institute of Technology, Turnerstrasse 1, CH-8092 Zürich (Switzerland), and Department of Psychology and the Brain Research Institute, University of California, Los Angeles (CA 90024, USA), 16 June 1981

Summary. Male rats were subjected to sham surgery or total abdominal vagotomy and then subsequently received a chronic i.v. cannula. Vagotomy attenuated the dipsogenic effects of infusions of hypertonic saline and sucrose that were observed in the control rats.

A controversy exists about whether central osmoreceptors or sodium receptors mediate the behavioral effects of bodily water imbalances[1,2]. With respect to receptors located in the viscera, recent electrophysiological research has provided evidence that hepatic sodium- and osmo-sensitive cells both activate neurons in the ventrobasal thalamus of rats[3]. It has been suggested that these visceral receptors project to the brain via afferent vagal fibers[4]. It is consistent with this view that behavioral investigations have demonstrated that abdominal vagotomy attenuates the dipsogenic effect of the i.p. injection of hypertonic saline[5,6]. The present experiment was done to determine whether this vagally-mediated visceral drinking system is sensitive to nonionic perturbations of plasma osmolality, as well as to changes in the sodium ion concentration.

Methods. The subjects were 13 male Long-Evans pigmented rats obtained from Simonsen Laboratories (Gilroy, CA). Throughout the experiment these rats received Purina Lab chow and tap water ad libitum, except during the drinking tests when food was absent.

Prior to denervation or control surgery, all rats were fasted for about 12 h. The subjects were anesthetized with pentobarbital sodium (50 mg/kg b.wt) and then underwent either bilateral subdiaphragmatic vagotomy including transection of the hepatic branch of the vagus or a sham surgery procedure. The details of these surgical procedures are provided elsewhere[7]. During the subsequent 6-12-week recovery period, these rats received palatable foods as a supplement to their regular diet to facilitate the maintenance of normal body weight gain.

Following recovery from the trauma of the 1st surgical intervention, each rat underwent surgery, receiving a Silastic cannula in the hepatic-portal vein. The details of this cannulation method are described elsewhere[7]. During