[25] H. THOMS, in *Classical Contributions to Obstetrics and Gynecology* (Charles C. Thomas, Springfield 1935).
[26] B. C. STEVENS, Soc. Sci. Med. *5*, 527 (1971).
[27] C. PROTHEROE, Br. J. Psychiat. *115*, 9 (1969).
[28] G. C. ROSENWALD and M. W. STONEHILL, Psychosom, Med. *34*, 129 (1972).
[29] K. DALTON, Proc. R. Soc. Med. *64*, 1249 (1971).
[30] W. A. BROWN and P. SHERESHEFSKY, Psychiatry *34*, 139 (1972).
[31] A. NIES, D. S. ROBINSON, C. L. RAVARIS and J. M. DAVIS, Psychosom. Med. *33*, 470 (1971).
[32] D. L. MURPHY and R. WEISS, Am. J. Psychiatr. *128*, 1351 (1972).
[33] J. BOCKAR, R. H. ROTH and G. HENINGER, Life Sci. *15*, 2109 (1974).
[34] D. L. MURPHY and R. J. WYATT, Nature, Lond. *238*, 225 (1972).
[35] R. J. WYATT, D. L. MURPHY, R. BELMAKER, S. COHEN, C. H. DONNELLY and W. POLLIN, Science *179*, 916 (1973).
[36] A. NIES, D. S. ROBINSON, L. S. HARRIS and K. R. LAMBORN, Adv. Biochem. Psychopharmac. *12*, 59 (1974).
[37] H. MELTZER and S. M. STAHL, Res. Commun. Chem. Path. Pharmac. *7*, 419 (1974).

posite direction found in the study by GILMORE et al.[14] were from samples drawn from 6 h before to 134 h after delivery, a short time period for which we have no comparable data.

The significance of plasma amine oxidase activity and its relationships to brain or sympathetic monoamine function is not known. Differences in enzymes related to the monoamine systems are of interest because of possible relevance to the behavioral changes associated with the post partum period in humans such as the puerperal psychoses which have been reported since Hippocrates[25]. There is a disagreement as to whether these psychoses represent distinct nosological entities or whether factors associated with the puerperal period precipitate the expression of episodes of schizophrenic or manic-depressive psychosis[26–30], both of which have been associated with changes in other monoamine enzyme activities[31–37].

Thyroid Hormone in Serum of Fetal Calf and Pregnant Cow During the Last Trimester of Pregnancy

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Summary. Considerably higher thyroxine and triiodothyronine concentrations in sera of bovine fetuses than in maternal samples were found during the last trimester of pregnancy.

It was shown that mammalian fetal thyroid is active in utero and that negative feedback control appears to be functional before parturition[4,5]. To know more about mother-fetus interrelation, we compared thyroid hormone content in sera of bovine fetuses and pregnant cows during the last third of pregnancy.

Material and methods. 23 pregnant Czech red-white cows in the 241–279th day of gestation were clinically and hematologically examined before experiment. They were submitted to high epidural anaesthesia with procain, the head of fetus was exteriorized, arteria carotis was cannulated and the fetus was exanguinated[6]. Samples of maternal blood were withdrawn during surgical procedure.

In maternal and fetal sera, thyroxine was determined by radioimmunological method[7] with some modifications of FÖLDES[8] and triiodothyronine was determined according to NAUMAN and NAUMAN[9]. Thyroxine antibody was produced and kindly supplied by Dr. FÖLDES[8], triiodothyronine antibody was the kind gift from Dr. NAUMAN[9].

Results and discussion. The results are summarized in the Table. Both thyroid hormones, thyroxine and triiodothyronine are in at least twice as high in concentration in fetal sera as in maternal ones. Student's t and paired tests are highly significant. We did not find any correlation between thyroid hormone values in fetuses and mothers, between thyroid hormone content in sera and body weight of fetuses. We also did not find anx tendency of thyroid hormone concentrations to change according to age of fetuses. In fetuses, unlike mothers, positive correlation between thyroxine and triiodothyronine was noted.

In the sheep fetus, high thyroxine secretion rate in comparison to maternal one was described[10,11]. Na-

Thyroxine (T_4) and triiodothyronine (T_3) concentrations in maternal and fetal sera. BW, body weight; n.s., non-significant

	Mothers		Fetuses		
	n	Means ± SE	n	Means ± SE	P
T_4 (nmol/l)	23	42.9 ± 3.3	23	109.4 ± 5.1	< 0.001
T_3 (nmol/l)	19	0.50 ± 0.05	19	1.22 ± 0.15	< 0.01
Correlation coefficients					
T_4 (mother:fetus)		+ 0.07767			n.s.
T_3 (mother:fetus)		+ 0.21016			n.s.
Fetal					
T_4:BW			23	+ 0.20033	n.s.
T_3:BW			19	+ 0.00243	n.s.
T_4:T_3			19	+ 0.45442	< 0.05
Maternal					
T_4:T_3	19	− 0.42385			n.s.

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[4] G. B. HEGSTAD and L. J. WELLS, Anat. Rec. *118*, 389 (1954).
[5] M. NIKITOWITCH and E. KNOBIL, J. clin. Endocr. Metab. *15*, 837 (1955).
[6] F. TOMŠÍK and L. ČERNÝ, In vitro v ČSSR *2/3*, 46 (1973).
[7] S. J. SIEGEL, W. F. LINE, N. S. YANG, A. KWONG and C. FRANK, J. clin. Endocr. Metab. *37*, 526 (1973).
[8] O. FÖLDES, to be published. Institute of Experimental Endocrinology, Slovak Academy of Sciences, Bratislava.
[9] A. NAUMAN and J. NAUMAN, Polskie Archw. Med. wewn. *50*, 1295 (1973).
[10] P. W. NATHANIELSZ, R. S. COMLINE, M. SILVER and A. L. THOMAS, J. Endocr. *58*, 535 (1973).
[11] A. ERENBERG and D. A. FISCHER, in *Foetal and Neonatal Physiology* (Eds. R. S. COMLINE, K. W. CROSS, G. S. DAVES and P. W. NATHANIELSZ, Cambridge University Press, London 1973), p. 508.

thanielsz et al.[10] found also higher thyroxine content in sera of 3 fetal lambs in comparison to maternal values. Relatively high and stable values of thyroxine in sera of 7 bovine fetuses were also described[12], but they were not compared to values of mothers.

In our study considerably higher thyroid hormone values in fetal sera than in maternal samples were demonstrated. We have found that also triiodothyronine was present in fetal sera in relatively high concentration during the last trimester of pregnancy. These results suggest that thyroid gland has high activity in utero, and that maternal and fetal thyroid hormone pools are relatively independent of one another. Significant formation of triiodothyronine in bovine fetuses is supposed.

[12] P. W. NATHANIELSZ, R. S. COMLINE, M. SILVER and A. L. THOMAS, J. Endocr. *61*, 71 (1974).

PRO EXPERIMENTIS

The Underwater Electro-Olfactogram: a Tool for the Study of the Sense of Smell of Marine Fishes[1]

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Summary. Recording the olfactory receptor activity of marine fishes presents problems due to the shunting of the electrical signals by the highly conductive sea water, which results in significant signal loss. By recording the large signal-to-noise ratio D. C. potentials using the underwater electro-olfactogram (EOG), we were able to study olfactory receptor properties of freshwater and marine fishes in a comparable manner.

The underwater electro-olfactogram (EOG)[2], a slow (DC) potential change recorded in the water above the surface of the olfactory mucosa in response to chemical stimulation, has been used to study olfactory receptor responses of freshwater fishes[3,4]. A single report[5] exists concerning EOG responses from a marine species, the Atlantic hagfish (*Myxine glutinosa*, class Agnatha), to amino acids, recently shown to be effective attractants for some marine fishes[6] and potent chemical stimuli in freshwater teleosts[7–10]. The electrical responses from the excised olfactory organ of the hagfish are characterized by positive-going potential changes. We report here, negative EOG recordings from in vivo preparations of 2 classes of marine fishes: Chondrichthyes, the Atlantic stingray (*Dasyatis sabina*) and Osteichthyes, the sea catfish (*Arius felis*).

Recording the olfactory receptor activity of marine fishes presents problems due to the shunting of the electrical signals by the highly conductive sea water, which results in significant signal loss. Olfactory neural responses have been successfully recorded (AC) in freshwater teleosts[3,4,7,8] with metal filled glass capillary electrodes, tip plated with Pt-black[11], placed against the surface of the olfactory mucosa. We tried this method on marine fishes, but were unsuccessful due to the shunting of the receptor action potentials. By recording the larger signal-to-noise-ratio DC-potentials, we were able to study olfactory receptor properties of both freshwater and marine fishes in a comparable manner.

Freshly caught specimens from the Gulf of Mexico were immobilized (stingray: MS-222, tricaine-methane sulphonate; catfish: Flaxedil, gallamine triethiodide) and positioned in plexiglass containers with aerated sea water containing MS-222 perfusing the gills throughout the experiments. Stimuli were diluted to at least 50% (stingray) and 25% (catfish) of their applied concentrations as determinded by photodensitometry of dye solutions. The EOG was recorded with calomel electrodes via Ringer-agar filled capillary pipettes, amplified by a direct-coupled amplifier, and displayed on a pen recorder.

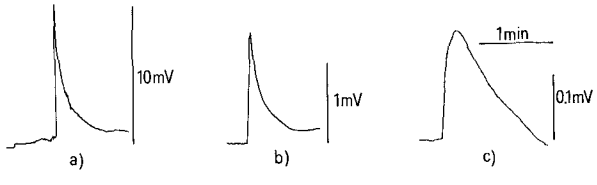

Fig. 1. EOG responses to 1.0 m*M* L-alanine. a) freshwater catfish; b) sea catfish; c) stingray. The small response magnitude of the sea catfish is due to shunting by the highly conductive sea water; that of the stingray is due to shunting and possibly an insufficient flow of sea water into its large olfactory capsule, which might also account for the long time course of the response. Rising edges of records have been retouched for clarity.

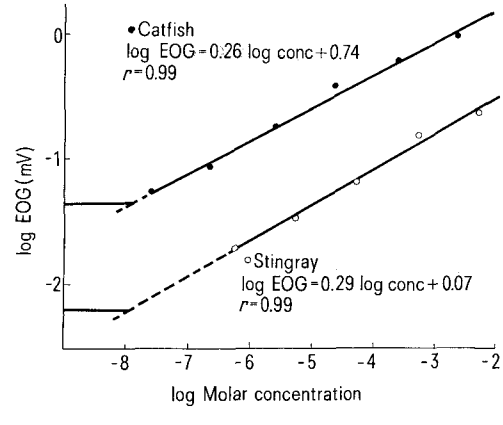

Fig. 2. Stingray (○) L-alanine, and sea catfish (●) L-cysteine, response-concentration curves in a log-log plot. Peak EOG responses are plotted as a function of the estimated concentrations delivered by the stimulator. Thresholds are determined by fitting a straight line to the response values and intersecting it with the control response, i.e. that obtained with the stimulus adjusted for zero concentration. The slight electrophysiological responses to the control stimulus are due primarily to chemical contamination[8,18].