Recording foetal breathing in man

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Foetal lambs in utero make foetal breathing movements (FBM) which coincide with periods of rapid eye movement sleep (Dawes, 1974). This association and their suppression by phenobarbitone (Boddy, Dawes, Fischer, Pinter & Robinson, 1976), suggests that FBM are an indicator of arousal in the foetus. We are investigating FBM in man as a possible *in vivo* test system for measuring the central nervous depressant effects on the foetus of drugs, particularly the analgesics given to women in labour.

FBM have been recorded in man using A scan ultrasound (Boddy & Robinson, 1971). Movements of the foetal chest wall are detected by an ultrasonic beam. However, a variety of artefacts may be caused by other movements of the foetal chest relative to the ultrasonic beam (Farmer, Thomas & Blackwell, 1975). We have recorded FBM more directly, visualizing the foetus by real time ultrasound. The real time ultrasonic scanner (ADR, Arizona) has 64 separate transducers so arranged that each contributes a line of B scan to the image display, producing a moving picture of the foetus in cross section. The transducer array is moved across the maternal abdomen until the foetal chest and upper abdomen are visualized in sagittal section lateral to the spine and traversing the heart. FBM can be recognized as characteristic tipping movements as the anterior chest wall moves inwards while the anterior abdominal wall moves outwards. The image is recorded on video tape. No attempt has been made to register FBM electronically since it is only by direct observation that the other movements of the chest wall can be distinguished. These other movements include transmitted pulses from the maternal aorta, maternal respiration, foetal body movement (FM) and maternal movements. Records of FM and FBM are made by an observer using a manual tachometer.

Six women with uncomplicated first pregnancies were studied on 2 occasions between the 36th and 38th week of gestation. Recordings were made for 30 min between 8 and 9 a.m. following a 25 g glucose drink. The percentage of time during which the foetus made FBM and FM is shown in Table 1. No FBM could be distinguished during whole body movements. There was a tendency for individual foetuses to behave similarly on the two occasions. The average mean frequency of FBM was 52 ± 4/min (mean ± s.e. mean) with a range of 32 to 72/minute.

Table 1 Occurrence of foetal breathing and foetal movements in six human foetuses studied on two occasions

	FBM:% time occurring		*FM:% time occurring*	
Patient	*1st time*	*2nd time*	*1st time*	*2nd time*
1	90	93	3	3
2	62	72	21	16
3	51	48	6	2
4	13	66	11	17
5	82	57	20	6
6	25	15	18	24
Mean ±s.e. mean	54 ± 13	59 ± 11	13 ± 3	11 ± 4

Supported by the Wellcome Trust and the Cilag-Chemie Foundation.

References

BODDY, K. & ROBINSON, J.S. (1971). External method for detection of fetal breathing in utero. *Lancet*, **2**, 1231.

BODDY, K., DAWES, G.S., FISCHER, R.L., PINTER, S. & ROBINSON, J.S. (1976). The effects of pentobarbitone and pethidine on fetal breathing movements in sheep. *Br. J. Pharmac.*, **57**, 311–317.

DAWES, G.S. (1974). Breathing before birth in animals and man. *New Eng. J. Med.*, **290**, 557–559.

FARMER, D.J., THOMAS, G. & BLACKWELL, R.J. (1975). Errors and artefacts encountered in the monitoring of fetal respiratory movements using ultrasound. *Ultrasound in Med. & Biol.*, **2**, 31–36.