relaxation and udder filling. The latter signs, particularly ligament relaxation, were the most reliable indicators of first stage labour which is the optimum time for clenbuterol injection. Using these criteria only nine out of 127 cows in the field trial were not in first stage labour at the time of injection; all of these were treated by a relatively inexperienced assistant cowman who may have misdiagnosed the ligament relaxation.

There were no adverse side effects attributable to the drug. The death of three of the four calves born to treated cows in the clinical trial was directly attributable to either fetal oversize or malpresentation. The fourth case was not easily explained, but it is unreasonable to attribute the death to the treatment since similar cases also occur in untreated animals. The drug was successful for postponing parturition and is potentially useful of farms. Clenbuterol may be useful for treating uterine prolapse and, at smaller dose rates, for postponing calving for a short period in dystocia cases while help is being organised or while the cow is moved to a more suitable location for obstetrical assistance. Clenbuterol has been successfully used for the latter purpose on the institute farms.

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Short Communications

Incidence of rotavirus, adenovirus and herpesvirus infection in pigeons

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APART from herpesvirus infection (pigeon herpesvirus 1, PHV1) (Cornwell and others 1967, Vindevogel and Duchatel 1978, 1979a), little is known about viral diseases of pigeons. In fact, the pigeon is resistant to several poultry pathogens such as infectious bronchitis virus (Vindevogel and others 1975a), infectious laryngotracheitis virus (Vindevogel and Duchatel 1979b) and infectious bursal disease virus (Vindevogel 1979), but is fairly susceptible to Newcastle disease virus (Vindevogel and others 1972).

McFerran and others (1976) diagnosed adenovirus infection in pigeons and other reports have shown that chickens and turkeys could carry rotaviruses (Bergeland and others 1977, Jones and others 1979, McNulty and others 1978, 1980). It was therefore decided to search for serological evidence of such viral infections in pigeons.

Blood samples were taken from 75 carrier pigeons presented at the avian clinic of the faculty of veterinary medicine of the University of Liège.

Rotavirus antigen was prepared from a bovine strain as previously described (Dagenais and others 1980).

Pigeon herpesvirus 1 antigen was prepared with the PHV1/B/Cu1 strain (Vindevogel and others 1975b) according to a previously described method (Vindevogel and others 1980).

Adenovirus antigen (CELO Phelps strain) was kindly provided by Dr Meulemans of the National Institute for Veterinary Research, Brussels.

The counter immunoelectro-osmophoresis (CIEOP) technique used was as previously described by Vindevogel and others (1980), according to the method of Middleton and others (1976).

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TABLE 1: Serological survey of virus infections in 75 pigeons

	Antigens		
	Rotavirus	Adenovirus	Herpesvirus
Number of serum samples positive	8	2	47
Percentage positive	10·7	2·7	62·7

From the results (Table 1), it seems very likely that pigeons can be infected by rotaviruses. McNulty and others (1979) have shown that mammalian and avian rotaviruses share common antigenic determinants, which can be demonstrated by CIEOP. This infection seems nevertheless to occur less frequently in avian than in mammalian species (Dagenais and others 1980).

McFerran and others (1976) found adenovirus infection associated with herpesvirus in pigeon hepatitis but McCracken and others (1976) failed to reproduce hepatitis in chickens with these viruses.

Recent work has shown that pigeon herpesvirus 1 remains usually confined near the site of inoculation, but viraemia and hepatitis may be observed in pigeons experimentally weakened by cyclophosphamide treatment (Vindevogel and Pastoret 1981). Our results show that herpesvirus infection is far more widespread than adenovirus infection in pigeons. Although it is well known that several serotypes of adenovirus exist, only one serotype of pigeon herpesvirus has been described in Europe (Vindevogel and Duchatel 1978). One neuropathogenic pigeon herpesvirus strain (pigeon herpes encephalomyelitis virus, PHEV) has been isolated in Iraq (Mohammed and others 1978, Tantawi and others 1979), but has not yet been antigenically compared to PHV1 isolates.

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Detection of a live fetus in cattle using Doppler-ultrasound

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THE farmer, the veterinary gynaecologist and the experimental teratologist have a common interest in determining not only whether a cow is pregnant but also whether the fetus is still alive. Techniques for the determination of pregnancy in cattle are now well-established and dependable, but confirmation of fetal viability has hitherto been regarded as more laborious and less reliable. Of the methods currently in use palpation per rectum was the first described in Britain (Fleming 1896). Changes in the amounts of progesterone in milk and in blood plasma have been used increasingly for pregnancy diagnosis over the last decade (Booth 1979), and an automated service is available nationally. Mitchell (1973) reported identification of the fetal circulation in pregnant cows by Doppler-ultrasound and Donaldson (1977) used an ultrasonic depth analyser to detect early pregnancy: in both cases ultrasonic probes were inserted per rectum.

Of those methods, only exploration per rectum and Doppler-ultrasound are capable of determining whether the fetus is alive. In the later stages of pregnancy the detection of fetal movement or cardiovascular activity by the rectal approach is largely fortuitous, particularly in large, multiparous cows in which the fetus is lying well below the brim of the pelvis. However, the closeness of the fetal calf to the floor of its dam's abdomen during the last five months of pregnancy makes it more accessible to an ultrasonic fetal pulse detector applied externally. Experience with one such instrument (Sonicaid V601) has shown that using a fairly simple standardised method fetal heart and, or, umbilical cord sounds can be detected reliably and fairly quickly from about 130 days' gestation. The following technique is now used at the Central Veterinary Laboratory, Weybridge.

With the cow standing and under minimal restraint, the hair is removed from the abdomen over an area extending from the umbilicus to the depression between the forequarters of the udder, and laterally from the midline to 15cm (6 inches) to the right of the right milk vein and forequarter. The external transducer of the fetal pulse detector, liberally lubricated with a water-soluble jelly, is applied first to the skin surface immediately cranial to the right forequarter. Absence of fetal sounds in this position necessitates wider scanning of the abdomen using a craniocaudal sweep from midline to right flank, but keeping to the depilated area. Once the fetus has been located the skin can be marked to facilitate checking on later occasions.

Table 1 records the findings in a series of 110 examinations carried out randomly on 12 Jersey and three Friesian cows

TABLE 1: Detection of fetal circulation in supposedly pregnant cows using Doppler-ultrasound

Pregnancy duration (days)	Number of examinations	Sound detected		No sound detected	
		(a) Subsequently calved	(b) Subsequently did not calve	(c) Subsequently calved	(d) Subsequently did not calve
80 — 120	13	3	0	8	2
121 — 140	17	12	0	3	2
141 — 180	32	21	0	5	6
181 — term	48	43	0	0	5
Total	110	79	0	16	15

TABLE 2: Validity (per cent) of Doppler-ultrasound examination in relation to gestational age of fetus

		Gestational age range (days)						
		80-120	121-140	141-180	180-term	140-term	120-term	80-term
Sensitivity	$\frac{a}{a+c}$ *	27	80	81	100	93	90	83
Specificity	$\frac{d}{d+b}$ *	100	100	100	100	100	100	100
Positive predictive value	$\frac{a}{a+b}$ *	100	100	100	100	100	100	100
Negative predictive value	$\frac{d}{d+c}$ *	20	40	55	100	100	62	48

* The data substituted in the equations are derived from the relevant columns in Table 1 (Rose and Barker 1979)