71-0784. Davison, K. L. (Metabolism and Radiation Res. Lab., Animal Husbandry Res. Div., Agricultural Res. Ser., U.S. Dept. of Agriculture, Fargo, N. D. 58102). Growth, hemoglobin, body composition and vitamin A of sheep fed dieldrin. *J. Animal Sci. 31(3): 567-75; 1970.* (11 references)

The effects of prolonged feeding of dieldrin on growth, body composition, plasma and liver vitamin A and hemoglobin in sheep is reported. Dieldrin was dissolved in acetone solution and mixed with a diet supplement containing oats, barley, corn, soybean meal, mineralized salt and dicalcium phosphate. Four-hundred g of pelleted alfalfa hay and 100 g of the dieldrin-treated supplement were fed twice daily to 135 crossbred wethers weighing 30 to 40 kg. Two replicates were run using 60 to 75 sheep, respectively. Dieldrin concentrations of 0, 1, 2 and 4 mg/kg were used in the first replicate but ten of 12 sheep dosed with 4 mg/kg died within a month. A second replicate was carried out using dieldrin concentrations of 0, 0.5, 1 and 2 mg/kg. Two sheep from each treatment were slaughetered at 0, 4, 8, 16 and 32 weeks. Tissue samples and gastrointestinal contents were removed when the animals were slaughtered. The carcass remains and intestines from the second replicate were ground, blended in a Waring Blender and freeze-dried with a Virtis freeze-drier. An adiabatic Parr oxygen bomb calorimeter was used to determine the heats of combustion of feed and carcass samples. The Kjeldahl method was used for the determination of nitrogen which was converted into protein values by multiplying by 6.25. Hemoglobin in the jugular blood was analyzed monthly using the cyanmethemoglobin method (Evelyn and Malloy, 1938). The microcapillary method and the Kimble (1933) method were used to analyze hematocrit and vitamin A, respectively. The method of Davies (1933) was used to analyze vitamin A in the liver tissue samples at slaughter. Plasma vitamin A was determined monthly while liver vitamin A and the carcass fat and protein content were determined when the animals were killed. Growth, body fat and plasma vitamin A were not affected by dieldrin concentrations lower than 2 mg/kg but at the 2-mg/kg level, the action of dieldrin reduced the rate of gain and accumulation of body fat and also reduced the vitamin A levels in the plasma. Dieldrin did not affect hemoglobin, hematocrit and liver vitamin A.

71-0785. Ratcliffe, D. A. (The Nature Conservancy, Monks Woods Experimental Station, Abbots Ripton, Huntingdon, England). Changes attributable to pesticides in egg breakage frequency and eggshell thickness in some British birds. *J. Appl. Ecol. 7(1): 67-115; 1970.* (86 references)

This paper is a general review of the subject, dealing with the following topics: the recent frequency of egg breakage, the nature of egg breakage, parental destruction as the proximate cause of egg breakage, other possible causes of egg breakage, decrease in eggshell weight (peregrine, sparrowhawk, golden eagle and other species), the causes of the eggshell effect, the connection with environmental pollution, the decrease in eggshell weight, egg breaking, breeding failure and population change and the significance of egg breaking in a 'natural' situation. Egg breakage in the nests of British peregrines (P), sparrowhawks (S) and golden eagles (G) has increased with unprecedented frequency. Most breakage is attributed to parent birds, usually by the eating of both shell and contents. A proximate cause seems to have been a wide and substantial decline in weight (largely thickness) of the shell. For P and S, the change began in 1946-1947, climaxing in 1948-1950 and persisting to the present. For G, the beginning was probably no later than 1951. Other species have shown the phenomenon: kestrel (from 1946), merlin (from 1951), hobby (from 1952), shag (from 1951), rook (from 1958) and carrion crow (from 1958). No significant change has been found in eggshells of common buzzard, raven, guillemot, razorbill, kittiwake, blackheaded gull, golden plover or greenshank. One known environmental change parallels in time and geographical pattern the eggshell change and has a likely connection physiologically: the contamination (after 1945) of the ecosystem by synthetic organic chemicals used as pesticides and in industry. Organochlorine substances build up notably in tissues of wild raptors. Experiments have shown that organochlorines alter calcium metabolism in birds. The introduction of DDT and *gamma*-BHC (1946-1948) was contemporaneous with the onset of eggshell change. Dieldrin-type compounds since 1955 added to organochlorine contamination probably have enhanced the eggshell change. PCBs (polychlorinated biphenyls) may have contributed. In Great Britain, there is a correlation between geographical variation in level of contamination, degree of change in eggshell weight and egg breakage frequency for P, S and G. Organochlorines set off a chain of events in some raptors: decrease in shell thickness leading to more frequent egg damage and to more frequent parental destruction of damaged eggs. There may have been harmful effects on breeding behavior and thus a decline in breeding success which may have helped prevent recovery from population "crashes" from adult mortality of P and S after 1955. Interspecific differences in eggshell change may derive from differences in degree of exposure to residues, differences in uptake and biochemical reaction to a particular residue level. Parental egg-breaking may be a response to adverse conditions manifested between ovulation and hatching. Eggshell change due to chemical contamination serves as an adverse factor in place of a 'natural' adverse factor, but the outcome is more detrimental to the species if reduced breeding success is maintained.

71-0786. Fowler, J. S. L. (Dept. of Veterinary Pharmacology, Royal (Dick) School of Veterinary Studies, U. of Edinburgh, Edinburgh, Scotland). Chlorinated hydrocarbon toxicity in the fowl and the duck. *J. Comp. Pathol. 80(3): 465-71; 1970.* (17 references)

The effects of carbon tetrachloride (CCl_4) and hexachloroethane (HCE) on aspartate amino transferase (GOT), iditol dehydrogenase (SD), glutamate dehydrogenase (GD) and ornithine carbamyl transferase (OCT) activity and bromsulfthalein (BSP) clearance in various tissue extracts were studied in cockerels and ducks. The cockerels were the White Leghorn breed, 1.4 to 1.6 kg in weight; the ducks were the Khaki Campbell breed, 1.6 to 1.9 kg in weight. CCl_4 was given to both cockerels and ducks in doses of 6 ml; cockerels received HCE in doses of 4 g in olive oil; in both cases, the route was oral. Olive oil was the control substance. CCl_4 had no adverse effect on ducks but produced light narcosis, anorexia and