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A STATISTICAL STUDY ON FARM AND VILLAGE LEVEL ON THE POSSIBLE RELATIONS BETWEEN HUMAN LEUKAEMIA AND BOVINE LEUKOSIS

By

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KVARNFORS, E., B. HENRICSON and G. HUGOSON: *A statistical study on farm and village level on the possible relations between human leukaemia and bovine leukosis.* Acta vet. scand. 1975, 16, 163—169. — In order to further elucidate a possible relationship between bovine leukosis and human leukaemia a comparative statistical study on herd and village level was performed for an 11 year period in a Swedish county where bovine leukosis incidence as well as human leukaemia mortality were above the national mean.

The addresses of the human leukaemia cases and bovine leukosis cases were traced. As control material were used farms and villages situated within 5 ± 0.1 km from each human case address.

The difference between the addresses of human leukaemia cases and the control addresses with respect to the occurrence of bovine leukosis was not found to be statistically significant.

There was no statistically significant difference in frequency between human cases with professions associated and not associated with farming with respect to the occurrence of bovine leukosis on the same addresses.

A comparison between the frequency of addresses for human leukaemia and controls with respect to the occurrence of cattle on the addresses did not give statistically significant higher values for those human leukaemia addresses having housed cattle.

A study of the time elapse between each human case and the bovine case(s) on the same address did not indicate a regular appearance earlier or later of the bovine case.

The possibilities to evaluate with reliability a material of this kind are discussed.

bovine leukosis; human leukaemia.

During the latest decades the question of the transfer of leukaemia viruses between different animal species has gradually been emphasized. In addition several comparative inci-

dental studies between bovine leukosis and human leukaemia as well as studies elucidating a hypothetical influence of cattle breeding on the leukaemia incidence in man have been published. A literature review has been published by *Beier et al.* (1971), and a few papers dealing with the subject have been published later on (*Henriksen & Brix Jensen* 1971, *Milham* 1971). It can be concluded that no evidence for a correlation between bovine leukosis and human leukaemia has been demonstrated.

Investigations in Sweden have shown that in the sixties in three of the seven counties, where the bovine leukosis incidence was above the national mean, the human leukaemia mortality also was significantly above the national mean (*Ringertz* 1967). In a study on community level in one of the three counties, the Kalmar county, no correlation was found, however, between the frequency of bovine leukosis and human leukaemia (*Henricson & Ringertz* 1968). In order to further elucidate the relations between bovine leukosis and human leukaemia a comparative statistical study on herd and village level was performed in the Kalmar county and this study is presented in the following.

MATERIAL AND METHODS

Bovine leukosis

Bovine leukosis has been registered in veterinarian reports at Swedish slaughter-houses under a special heading since 1941 and in the Central Bovine Leukosis Registry since 1966. Through the reports and the registry the owners of and addresses for herds having delivered leukotic cattle for slaughter were traced during the period 1960—1970 for the Kalmar county. The addresses for the herds were pinpointed at a map.

Human leukaemia

The addresses and the professions for all cases of human leukaemia having been diagnosed in the Kalmar county and notified to the Swedish Cancer Registry* during the period 1960—1968 were traced. The cases having rural addresses were also pinpointed at the map.

* The material was kindly provided by the head of the Cancer Registry, prof. N. Ringertz.

Control material

All farms and villages found to be situated within a distance of 5 ± 0.1 km from each pinpointed case of human leukaemia were noted and used as control material (see Fig. 1).

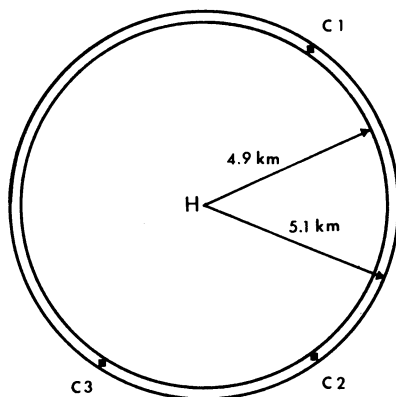


Figure 1. An example of a situation for control addresses (C1, C2, C3) in relation to the address of a human leukaemia case (H).

Investigation on cattle occurrence

Through the slaughter-house registry and statistics the delivery of cattle for slaughter from 1960 to 1970 was investigated for all control addresses and all pinpointed addresses representing human leukaemia cases.

Investigation on the occurrence of residents

At the population registry of the Kalmar county information was obtained on the occurrence of residents during the sixties on the control addresses.

RESULTS

The bovine leukosis cases as well as the human leukaemia cases were distributed throughout the whole county without obvious clustering.

The number of rural addresses for human cases was 52 including one address with two cases. Cattle were found to have been delivered for slaughter from 47 of these addresses and bovine leukosis was reported from 29 addresses. Of 293 control

addresses 210 were found to have delivered cattle for slaughter. One-hundred-and-one of these had been reported for bovine leukosis cases. Two-hundred-and-sixty-four of the control addresses had had residents. None of these addresses was found to have had cases of human leukaemia. Although a somewhat higher figure for the frequency of bovine leukosis cases on human leukaemia addresses, the difference between the addresses of human leukaemia cases and controls with respect to the occurrence of bovine leukosis was not found to be statistically significant (29/47—101/210; $\chi^2 = 2.33$; $f = 1$).

A profession associated with farming had been noted for 16 of the 53 cases of human leukaemia. Fifteen of these were found on cattle addresses and 10 on bovine leukosis addresses as well. For 22 additional cases a profession had been noted, which could definitely not be associated with farming. Nineteen of these were found on cattle addresses and eight on bovine leukosis addresses as well. The difference in frequency between professions associated and not associated with farming with respect to the occurrence of bovine leukosis was not statistically significant (10/15—8/19; $\chi^2 = 1.16$; $f = 1$).

A comparison between the frequency of addresses for human leukaemia and controls with respect to the occurrence of cattle on the addresses does not give statistically significant higher values for those human leukaemia addresses having housed cattle (47/52—210/264; $\chi^2 = 2.69$; $f = 1$).

On the 29 addresses having had both bovine leukosis and human leukaemia there were 30 human cases and 60 bovine cases. A study of the time elapse between each human case and the bovine case(s) on the same address (Fig. 2) does not indicate a regular appearance earlier or later of the bovine case.

DISCUSSION

In the present study no significant relationship has been shown between human leukaemia and bovine leukosis. It should be stressed, however, the difficulties in evaluating a material of this kind in such a way that questions can be completely answered. Many uncertain factors are involved, such as irrelevant variations in small materials.

Information collected from the Cancer Registry can be misleading. The registered profession and places of living of human



Figure 2. The time distribution of 60 bovine leukosis cases in relation to 30 human leukaemia cases on the same addresses.

H = The year of human case

□ = Bovine case plotted twice due to two human cases at the same address

▨ = Remaining bovine cases

cases can refer to a rather short time before death. This might be important in case the time between exposure to possible leukemogenic factors and disease elapses over years. Exposure to a possible bovine leukosis virus of humans having non-rural professions and/or addresses can have taken place in such ways that it does not come out from information in the Registry. By means of personal interviews with relatives to the human cases the above mentioned problems could have been solved. Such a procedure was judged to be inappropriate with reference to the delicate correlations studied.

The identification of bovine leukosis cases on farm addresses is fully reliable. The cases are caught at the slaughter-house, and in Sweden all animals are identified by herd of origin at slaughter. The merit of this is somewhat reduced, however, due to the cattle purchases between herds. This was documented in a previous study (Hugoson 1969).

The above mentioned possibility of a rather long time between exposure to a leukemogenic agent and the manifestation of disease could influence the accuracy of analysis also in another way. Suppose bovine leukosis initiates incubation time in humans

and suppose also that such an incubation time is 4—5 years. Then human leukaemia cases in connection with a farm should always be looked for 4—5 years after the bovine cases. A reversed dependence between the diseases in man and cattle would ask for a reversed arrangement of the material. Even though the material is not refined on this point, the results presented in Fig. 2 indicate either that there is no single-sided "incubation time dependence" between human leukaemia and bovine leukosis or that both are dependent on each other with the same incubation time.

Studies of the possible relationship between the two diseases concerned will probably continue by both statistical and other methods. Contribution to the motivation for such studies might be gained by some impression of a systematic relationship in the figures now presented.

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SAMMANFATTNING

Jämförande undersökning på by- och gårdsnivå av möjligheten av ett samband mellan human leukemi och bovin leukos.

För att ytterligare belysa ett eventuellt samband mellan bovin leukos och human leukemi gjordes en jämförande statistisk undersökning omfattande en 11-årsperiod på gårds- och bynivå i ett svenskt

län, där frekvensen bovin leukos såväl som frekvensen dödsfall i human leukemi låg över medeltalet för hela landet.

Humanleukemifallens och de bovina leukosfallens adresser spårades. Som kontrollmaterial användes gårdar och byar belägna inom ett avstånd av $5 \pm 0,1$ km från varje humanfallsadress.

Det kunde inte påvisas någon statistiskt signifikant skillnad mellan humanfallsadresser och kontrolladresser med hänsyn till förekomsten av bovin leukos.

Det var ej heller någon statistiskt signifikant skillnad i frekvensen mellan humanfall med och utan yrkesanknytning till jordbruk med hänsyn till förekomsten av bovin leukos på samma adresser.

En jämförelse mellan frekvensen humanfalls- och kontrolladresser med hänsyn till förekomsten av nötkreatur på adresserna gav ej statistiskt signifikant högre värden för de humanfallsadresser där förekomst av nötkreatur noterats.

En studie över tidsintervallet mellan varje humanfall och de(t) bovina leukosfallen(fallet) på samma adress tydde inte på ett regelbundet uppträdande av nötkreatursfall tidigare eller senare än humanfallet.

Möjligheterna att tillförlitligt utvärdera ett material av det här presenterade slaget diskuteras.

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