

Warts among workers in poultry slaughterhouses

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MERGLER D, VEZINA N, BEAUVAIS A. Warts among workers in poultry slaughterhouses. *Scand j work environ health* 8 (1982): suppl 1, 180-184. The objective of the study was to identify the prevalence of warts in poultry slaughterhouses. A questionnaire was administered to 1,194 workers, of whom 569 completed it. The prevalence of warts (*Papilloma virus*) was found to be 28.5 % in slaughterhouses. In the general population it is 7-10 %, reaching a peak in individuals around the age of 14 a. In the poultry slaughterhouses, the prevalence was highest (38.7 %) in the age category 25-29 a, and among those who had been working 4 to 6 a (40.8 %). The factors present in the work environment that showed a significant correlation ($\alpha \leq 0.05$) with the presence of warts were the following: steel-mesh gloves that were too large for the wearer, work with a saw, handling of cold objects, and high humidity levels. It was concluded that mild abrasion of the skin (too-large gloves) and high humidity facilitate cutaneous infection by the virus, whereas the handling of cold objects and work with a saw provoke local vasoconstriction which could hinder the immune reaction.

Key terms: *Papilloma virus*.

Warts are benign epithelial tumors of the skin which develop after infection by the *Papilloma virus*. They are located principally on the hands, but can also be found elsewhere on the body. The virus introduces itself into epidermal layers of skin (6, 13, 19, 27) traumatized either by mild abrasion or by pressure on the skin (26), and, depending upon the cutaneous micro-environment, the tumor develops after an average latency period of four to six months (11, 26, 29). It seems that viral contact with the subepidermal layer interferes with the development of the tumor (14, 34). Untreated warts have an average life span of 2 to 3 a; the factors leading to the regression of a tumor, though not clearly demonstrated, seem to relate to the cellular immune reaction (11) and the

degree of cutaneous vascularization (32). Warts are contagious; the virus can be transmitted by autoinoculation (5, 7, 22, 24, 33) or from one person to another through direct contact or via a suitable medium (12, 21, 23, 25). The virus seems to be species-specific (8, 13, 16, 26, 27).

The prevalence of warts in the population is generally considered to be 7 to 10 % (9, 10, 20). Their prevalence, however, increases greatly among people whose profession involves meat handling. Litt (18) reported warts on the hands of each of the 31 meatcutters who had consulted him for dermatological problems. Rowson et al (27), in 1967, reported a study relating profession to dermatological problems. They found that the prevalence of warts was significantly higher among veterinarians and butchers. In a study done by De Peuter et al (10) the prevalence of warts among 536 workers of two meatcutting industries was 23.8 %. Samitz (28), in 1947, found few dermatological problems in the poultry industry. However, more recently a high frequency of warts was reported by Gonçalves (15) and Taylor (30) among poultry slaughterhouse workers (45.8 and 38.2 %, respectively).

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Certain authors (8, 30) have suggested that the virus is brought into the worksite by an individual, and its subsequent propagation is facilitated by the existing work conditions in these industries. Different researchers put forward hypotheses relating the high frequency of warts to such factors as meat handling (1), repeated cutaneous microtrauma, humid hands, and constant contact with animal fluids (8, 10).

Objectives

The objectives of the present study were to determine the prevalence of warts among workers in Quebec poultry slaughterhouses and to determine some of the specific factors present in the work environment that would lead to the propagation and development of the virus.

Subjects and methods

The study was undertaken at the request of unionized workers of eight poultry slaughterhouses. In order to identify the health problems, and to determine the possible relationships between health problems and specific factors in the workplace, a limited-choice questionnaire was used. The questionnaire, comprising 216 questions, contained the following sections: (i) personal and occupational history (9 questions); (ii) description of the type of work (5 questions) (this part was changed for each slaughterhouse); (iii) use of instruments and individual protective equipment, as well as their state of repair (27 questions); (iv) worksite environmental conditions and work organization (39 questions); (v) health problems (83 questions); (vi) use of medication and tobacco (8 questions); (vii) health problems specific to women workers (45 questions) (this last part was likewise distributed to the wives of the male workers; the housewives could then constitute a reference group for these specific problems).

The questionnaire was distributed by the union delegates to the slaughterhouse workers. Five hundred and sixty-nine of the 1,194 workers (47.6 %) completed the questionnaire. The sample was validated with respect to the total population of the slaughterhouses, from lists furnished by the unions, for the variables age, sex and

years of employment. No significant difference was found for these variables at the level of $\alpha \leq 0.05$.

Standard tests were used to determine the relationships between the variables [chi-square test, tau test ($\alpha \leq 0.05$)]; when an interrelationship occurred between variables related to a particular health problem, each of them was, in turn, controlled in order to determine their relative importance.

Results

The prevalence of warts was found to be 28.5 %. Of the total sample 5.9 % had suffered from this skin disease before working in a slaughterhouse. Those who were currently afflicted did not have a significantly different frequency of warts prior to working in the slaughterhouse (7.6 %) from those who were currently unafflicted (3.9 %).

Fig 1 shows the distribution of warts by age; the frequency increased to a peak (38.7 %) in the age category 25—29 a and decreased thereafter. Fig 2 illustrates the distribution with respect of years of employment in a slaughterhouse. The percentage peaked at 4—6 a (40.8 %) and decreased thereafter. It should be noted that the overall distribution of age and years of employment attained maximum values at 20—24 a and 1—3 a, respectively, and then declined rapidly. The turnover of personnel in the slaughterhouses was high.

For the presence of warts, a significant correlation was found with humidity, use of a saw, the wearing of too-large steel-mesh gloves, and the handling of cold objects. These factors are listed in table 1.

Discussion

It seems clear that certain conditions present in the poultry slaughterhouse environment favor the propagation and/or the development of the *Papilloma* virus. Evidence was provided by the age distribution of the workers with warts as compared to that of the general population, as well as the relationship between the prevalence of warts and years of employment. The distribution of warts with respect to age differed from that found in the general population where the frequency increases

to a maximum around 14 a of age (2, 3, 9, 26) and then decreases rapidly; in the slaughterhouses the highest frequencies of

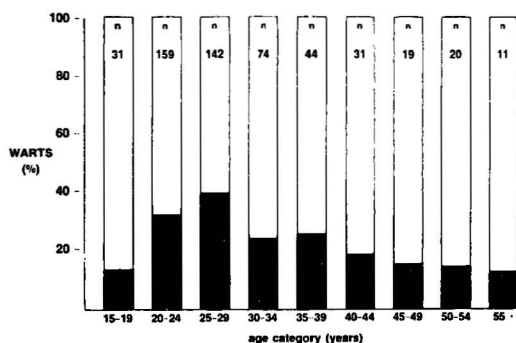


Fig 1. Prevalence of warts versus age [The hypothesis of independence between the presence of warts and age was rejected with a probability of $\alpha \leq 0.02$ ($\chi^2 = 19.34$)].

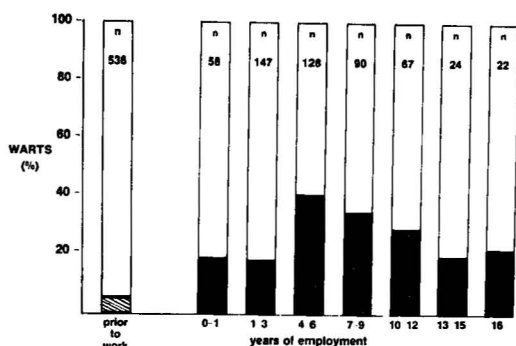


Fig 2. Prevalence of warts versus years of employment [The hypothesis of independence between the presence of warts and years of employment was rejected with a probability of $\alpha \leq 0.001$ ($\chi^2 = 22.60$)].

31.4 % and 38.7 % were found for those who were in the age categories of 20—24 a and 25—29 a, respectively. It then decreased with age to 15 % for the age group 50—54 a, and to 13.3 % for those above 55. This occurrence is also in contrast to the general population where warts are extremely rare among persons 50 a of age or more (9). The form of the distribution curve of fig. 1, showing a decrease with age, independent of years of employment, is interesting. Two factors may be responsible. First those who frequently suffer from warts and are obliged to have them continually removed tend to leave this workplace and search work elsewhere. Second ageing may be associated with acquired immunity or skin changes; this phenomenon would account for the decrease observed in the general population also.

The prevalence of slaughterhouse workers suffering from warts prior to working in a slaughterhouse (5.9 %) was slightly inferior to that reported for of the general population (9, 10, 20). As for the distribution of warts with respect to years of employment (fig 2), the prevalence, lower (18.5 %) in the first 3 a, increased to 40.6 % for those with 4—6 a of employment; it then decreased gradually to around 21 % for those who had worked for 13 a or more in a poultry slaughterhouse. The latency is probably associated with the time required for the creation of an adequate cutaneous microenvironment, necessary for the infection and development of the virus in addition to the latency period of the virus itself (4 to 6 months)

Table 1. Prevalence of warts for different work conditions.

Work condition	Workers (N)	Warts		χ^2	α
		N	%		
Humidity					
Very dry, dry, comfortable	90	12	13.3	11.37	0.001
Very humid, humid	433	137	31.6		
Saw					
Uses a saw	59	26	44.1	6.56	0.01
Does not use a saw	409	110	26.9		
Size of steel-mesh gloves					
Too large	62	28	45.2	10.22	0.001
Right size	103	21	20.4		
Handling					
Cold objects	145	43	29.6	4.62	0.05
Warm objects	187	36	19.2		

(11, 26, 29). Certain authors (13, 31) have suggested that individuals with a deficient immune system (either inherent or provoked by immunosuppressors) develop warts. These individuals, as well as those exposed to extreme conditions favorable to the development of the virus, would account for the prevalence of 18.5 % in the first few years of employment in an environment where the total number of viruses must be particularly high.

For warts to form, two conditions are necessary, the first being the possibility of infecting the epidermal layers of the skin and the second an adequate cutaneous environment which either permits the virus to develop or does not hinder its development. Four factors present in the slaughterhouses were related to a significantly high frequency of warts (table 1), ie, steel-mesh gloves that were too large, a high humidity level, work with a saw, and the handling of cold objects.

A facilitation of viral entry into the skin probably accounts for the high prevalence of warts among those who wear ill-fitting steel-mesh gloves. The constant rubbing of steel-mesh gloves that are too large for the hand produces mild skin abrasions that permit the virus to infect the epidermal layer.

A high humidity level seems to be an important factor of the cutaneous micro-environment required for the development of warts. Certain authors suggest that humid skin favors their proliferation. Lewis (17) noted that a large proportion of the hundreds of patients whom he had treated for warts on the feet (plantar warts) reported that their feet were always humid, and Clarke (26) underlined the rapid development of warts on genitalia, a region where the skin is humid. Other studies (4, 12, 13, 25) have shown a high prevalence of warts among those exposed to a humid environment, particularly public baths and swimming pools.

An adequate cutaneous vascular supply is necessary to combat the growth of warts. The manipulation of cold objects and the use of a saw are two factors that would provoke local vasoconstriction and limit the cutaneous blood supply. The saw is used to cut the chicken into parts; the worker holds the fowl, which has been previously chilled to 4°C, and pushes it

through the cutting blades of the saw. He or she is thus subject to cold, pressure on the hands, and the vibrations of the saw, three causative factors of local vasoconstriction. The high humidity level could likewise accentuate the effects of cold.

A popular notion among slaughterhouse workers is that the warts come from the fowl. Warts, however, are species specific; the role of the fowl would more likely constitute a transport medium, carrying the virus from one person to the other along the assembly line. Marples (19) suggested that fragments of the corneal layer containing a large quantity of the virus continually leave the surface and constitute an excellent vehicle for the viral particles. An interesting example of the importance of a transport medium in a work environment was reported by McLaughlin & Sydney (21) in 1937. Nine of all workers in contact with bone glue developed warts in a short period of time; 10 other workers who were not in contact with the glue did not have warts. All those who had warts were removed from the workplace and new glue was made up. No new warts were found. The author suggested that the virus was introduced into the workplace by one of the workers and the glue became contaminated and then transported the virus to all those who touched the glue. The abrasive action of the glue on the skin probably created an excellent milieu for the virus to infect. It is possible that the fowl in the slaughterhouse plays a similar role.

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ANNOUNCEMENT

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Under the auspices of the Permanent Commission and International Association on Occupational Health, the Second International Symposium on Epidemiology in Occupational Health will be held at the McGill University, Montreal, Canada, on 23—25 August 1982. The Symposium is mainly for active research workers in the field of occupational health. Papers are in-

vited on any application of epidemiology in occupational health. The closing date for abstracts is 15 April 1982. Those interested in attending should contact the Epidemiology Secretariat, 772 Sherbrooke West, Montreal Quebec, Canada H3A 1G1, in order to obtain the second announcement containing abstract forms, detailed information, etc.