Research Note

Survival of Herpes Simplex Virus Type 1 on Some Common Foods Routinely Touched before Consumption

D. BARDELL*
Department of Biology, Kean College of New Jersey, Union, New Jersey 07083, USA

(Received 12 November 1992/Accepted 22 January 1997)

ABSTRACT

Droplets of saliva containing herpes simplex virus type 1 were placed on the skin of tomatoes and the upper surface of lettuce leaves. There was no loss of virus infectivity titer at refrigerator temperature (2°C) at any time examined up to 1 h, the longest period tested. At room temperature (22 to 24°C) there was a 2-log drop in titer between 30 and 60 min, but some infectious virus was still present at 1 h. The virus-containing saliva remained in a liquid state at 2°C. At 22 to 24°C the droplets became dry at approximately 50 min. Implications of the findings are discussed.

Key words: herpesvirus, saliva, lettuce, tomatoes

Data from 71 investigations into outbreaks of food-borne viral diseases show poor personal hygiene to have been the cause, or a contributing factor, in 92% of the outbreaks (4). Most studies of virus contamination of food have concerned enteric viruses, reflecting the fact that many food-borne infections affect the intestinal tract. However, on the basis of observations of unhygienic actions by some food handlers in public eating places, viruses infecting the mouth and respiratory tract should not be disregarded with respect to viral contamination of food (2).

Herpesviruses are widely disseminated in nature, and most animal species have yielded at least one herpesvirus upon examination (5). Human beings are the only known reservoir of the herpes simplex viruses, and these viruses are common in the population at large. Herpes simplex virus type 1 (HSV-1) is the agent of several illnesses ranging from vesicular lesions of the skin to diseases of the central nervous system (7). It most frequently causes infections in and around the mouth. HSV-1 is transmitted in bodily secretions, including saliva (3, 7). Healthy carriers of the virus are not uncommon and, like persons with manifest symptoms of disease, can shed the virus.

The use of disposable gloves by food handlers has become common in recent years as a precautionary measure against the transfer of microorganisms from the handler to food eaten by other persons. Be that as it may, it is not unusual to see food handlers put their hands to their mouth and nose and then continue working without changing their gloves (2). Since the mouth and nose are the habitats of many microorganisms, such practices prompted a study into the survival of HSV-1 on latex disposable gloves. After deposition on gloves, virus was recovered at various times up to 1 h, the longest period tested. Furthermore, infectious virus was readily transferred by touch to food, even after being on the glove for 1 h, at which time the virus-containing saliva had become dry (2).

In view of the foregoing, the work reported herein was designed to determine the survival of HSV-1 in an infectious state on lettuce and tomatoes, two popular ingredients of sandwiches that are ordinarily touched by employees of establishments preparing food to be eaten by members of the public.

MATeRIALS ANd METHODS

Virus and cell cultures

HSV-1 (strain F) and an established line of human epithelioid cells (HEp-2) were purchased from the American Type Culture Collection, Rockville, MD. The methods of growing the cells, propagating the virus for experimental use, and titration of virus infectivity have been reported (2).

Determination of HSV-1 survival on lettuce and tomatoes

For placement on lettuce and tomatoes, HSV-1 was suspended in unstimulated saliva from a healthy adult person. Freshly collected saliva was used in all experiments. The method of preparing the suspension of virus in saliva has been reported (2).

To determine the survival of HSV-1, a 0.01-ml droplet of virus suspension was placed on the skin of each of 5 ripe and firm tomatoes at refrigerator temperature (2°C) and on 5 tomatoes at room temperature (22 to 24°C) for various periods up to 1 h. Each droplet covered an area approximately 0.5 cm in diameter. To recover HSV-1 for infectivity titration, the area of the tomato skin...
to which virus had been applied was overlaid with 0.1 ml of tissue culture growth medium, which was left in place for 2 min with gentle agitation. The medium was then aspirated, and the virus contained therein titrated. The same procedure was followed with lettuce; in this case the droplets were placed on the upper surface of leaves. The lettuce and tomatoes were purchased locally. Before use they were washed with tap water and gently blotted dry with paper toweling. Thus they were treated in a manner they normally use; they were washed with tap water and gently blotted dry with paper toweling. Therefore, it was deemed appropriate for the present investigation of a virus infecting the mouth to study survival of HSV-1 on lettuce and tomatoes, since they are popular ingredients of both sandwiches and salads.

Previous work showed that HSV-1 was readily transferred by touch to foodstuffs by a person wearing disposable latex gloves of a kind worn by food handlers (2). The work reported herein demonstrates that there was a marked decline in titer of HSV-1 transferred to lettuce and tomatoes held at room temperature, but some virus was still present at 1 h after deposition on the foodstuffs. However, there was no loss of infectious HSV-1 at refrigerator temperature, the state in which lettuce and tomatoes are usually kept in public eating places before being served to consumers.

The data in Tables 1 and 2 show there was no anti-HSV-1 activity in the saliva or associated with the surface of lettuce leaves and tomatoes, as the results for the control, virus on glass, were like those for virus on foodstuffs.

The drop in HSV-1 infectivity titer at room temperature is probably caused by drying of the virus-containing saliva on the surface of the foodstuffs. Investigations into survival of HSV-1 on some commonly touched objects in public buildings and on food-handlers' gloves demonstrated that drying of the milieu in which the virus is suspended caused a sharp drop in titer of HSV-1 (1, 2).

To inhibit growth of contaminating bacteria and microfungi or production of toxins by those organisms, food is generally kept at refrigerator temperature. With respect to virus contamination of food, the results of the present investigation show, at least for HSV-1, that it would be better to keep food at room temperature.

In conclusion, this investigation, like a previous study (2), indicates a need to study viruses other than those infecting the enteric tract with respect to viral contamination of food by unhygienic actions of food handlers. Furthermore, an outbreak of infectious hepatitis traced to contaminated lettuce draws attention to the paucity of information regarding survival and transmission of viruses on fresh fruits and vegetables (6).

**ACKNOWLEDGMENT**

This investigation was supported by a Faculty Research Grant funded by the New Jersey Department of Higher Education.
REFERENCES