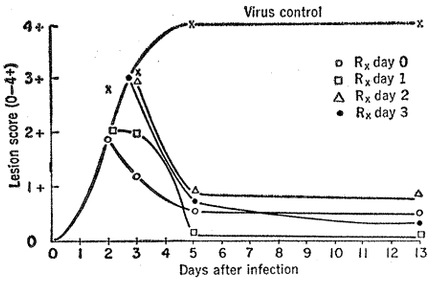

Fig. 3. Response of herpetic keratoconjunctivitis to intravenous polyinosinic:polycytidilic acid; R_x is treatment.

peated administration shortly after onset of virus-induced murine leukemia retarded progression of the disease but was not curative (*16*). Intraocular injection of endotoxin to induce interferon was protective prophylactically (*17*, *18*) and may have resulted in a minimal therapeutic effect, although other effects of endotoxin may have also been involved (*18*). In this study, as well, it is possible that herpes infection resulted in low-level production of interferon (*11*). It had previously been proposed that application of amounts of interferon greater than those that were available at that time would lead to effective therapy (*1–3*, *5*, *19*). The levels and duration of circulating interferon observed in the present study are unusually high (*14*).

Extension of our therapeutic findings to other virus infections is necessary to establish conclusively the therapeutic role of interferon. Such demonstrations seem plausible because herpes simplex virus is only moderately sensitive to the antiviral action of interferon in rabbit cells (*20*). Since there are many viruses that are more sensitive to the antiviral effect of interferon, it seems possible that effective therapy of these infections will be demonstrated.

The therapeutic effect of interferon inducers in established herpetic infection of the rabbit eye raises the possibility of similar application to herpetic infections of the human eye. In inducing viral resistance in human fibroblasts, PI:C is highly active (*21*, *22*). This animal model has been successfully employed in the development of iododeoxyuridine therapy of superficial herpetic infections of the human eye (*23*). Although iododeoxyuridine is an excellent therapeutic agent, it has certain limitations because of its inactivity in nonsurface infections of herpes simplex virus and the existence of drug-resistant strains of virus. Furthermore, it has a narrow antiviral range. Therefore, it seems reasonable to expect that inducers of the interferon system may find application in human eye infections.

Evidence that the therapeutic effectiveness of PI:C is largely attributable to induction of the interferon mechanism comes from the previous (*11*) and present demonstration of high levels of circulating interferon in rabbits receiving this inducer, and the demonstration of strong activation of the interferon mechanism in four different rabbit tissue cultures (kidney, spleen, thymus, and embryo) treated with PI:C (*24*).

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Airborne Pheromones

Whitten, Bronson, and Greenstein (*1*) described an estrus-inducing pheromone of male mice which is transported by the movement of air currents. Medieval Europeans believed that female birds responded to similar airborne stimuli. The 12th-century *Bestiary*, translated by T. H. White (*2*) has this to say of Perdix, the partridge:

"Desire torments the females so much that even if a wind blows toward them from the males they become pregnant by the smell."

This belief can be traced to the writings of Aristole (*3*) who described unfertilized eggs as *hypenemia* or zephyria.

"They are mistaken who say that hypenemia (barren eggs) are the remains of former acts of sexual intercourse; for young birds, as fowls and geese have been frequently observed to lay such eggs without any sexual intercourse.—The hypenemia are by some persons called zephyria, because they say that birds receive these winds in the spring."

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16 September 1968

Obsidian Dating Revisited

In their recent article, Meighan *et al.* (*1*) have reported on the use of obsidian dating as applied to West Mexican archeology. In their report, they use a linear rate of hydration (years/micron). In a footnote they comment that we do not agree with this linear hydration rate on theoretical grounds. We wish to point out that our disagreement is based not on theoretical grounds, but on experimental determination of hydration rate (*2*) as well as on an empirical approach similar to that used by Meighan *et al.*

Other archeologists working in various parts of the world (*3*) have also found that the obsidian hydration follows the relation (thickness)^2 = k time (microns^2/yr).

It is true that hydration is apparently very rapid in the Mexican region under discussion by Meighan and colleagues, and an examination of their Morret site data given in their Table 1 yields a hydration rate of 20 μ^2 per 1000 years. Applying this rate to the data that they give in their Table 2 yields a time span for Morret of approximately 680 to 3850 years B.P. (before the present). This span includes the radiocarbon date of A.D. 1300 (650 years B.P.) which Meighan *et al.* reject as being made on material intrusive into the site. The thickest hydration would give an age of approximately 3800 B.P. We do not know if this is reasonable for Morret, but the existence of cultures as old as this in this area is indicated by one radiocarbon date of 4000 years B.P. at the Tizapan el Alto, Jalisco site, which Meighan *et al.*, however, reject without explanation in favor of three younger dates.

The rate of 20 μ^2 per 1000 years for Morret may not be exact, but does not look unreasonable from the evidence given by Meighan *et al.* A similar nonlinear hydration rate may apply to other sites in the area.

Meighan *et al.* do not present any evidence that makes necessary the use of a linear hydration rate. The conclusions that they draw from their data would be drastically changed by the use of a μ^2/year rate.

The use of a linear rate instead of a nonlinear hydration rate may be justified as an approximation when the time span under consideration is short. However, its use in longer time spans can lead to erroneous conclusions, as we believe that it has in the case of Meighan *et al.*

The concept of possible re-use of artifacts, demonstrated to have occurred in other areas, is not discussed. The reoccupation of an older site surface by a more recent group and resultant mixture of artifacts is not eliminated by the evidence in the article, although the points with the thickest hydration layers resemble point types reported from other North American sites dated 4000 or more years ago (*4*).

One of the most fruitful aspects of the obsidian dating method is its ability to detect reoccupation of a site or the mixture of artifacts of different ages in a seemingly homogeneous complex. By rejecting the data that do not fit their hypothesis, Meighan *et al.* both violate the principles of scientific investigation, which require a hypothesis to take into account *all* the data available, and overlook potentially significant interpretations of the archeology.

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18 September 1968

The question of hydration rate is an important one and we are happy to comment further on it. The principal point of the criticism is that the Friedman formula for obsidian hydration has now been so firmly established by empirical evidence that use of any other rate formula will lead to erroneous results. Our disagreement is that we believe the Friedman formula is not so securely established and that it is necessary in each new area to investigate the nature of the hydration rate as well as the elapsed time for formation of the hydration band. The archeological references (*1*) given to show verification of the Friedman rate have no necessary application to our West Mexico data. The summary article on Japan (*2*), for example, has only six points in time for which there are both radiocarbon dates and obsidian hydration readings, over a time span of 17,000 years. The West Mexican rate was established on the basis of 35 radiocarbon dates spanning less than 3000 years.

In addition, there is at least one other kind of hydration rate published (*3*), based on a large sample of evidence from California. This rate differs from both the Friedman formula and the rate we used in West Mexico. Archeologists are by no means unanimous in accepting any specific rate formula.

We developed a hydration rate to fit the archeological evidence. Friedman and Evans have gone the reverse direction and suggest a reinterpretation of West Mexican archeology to make it fit the Friedman hydration rate. Below are some comments on their reinterpretation of the archeological data.

1) It is not true that the rate of 20 μ^2 per 1000 years is an acceptable alternative to the rate we proposed. Acceptance of such a rate indicates that the Morret site was occupied for 3170 years instead of the 1320 years we indicated. Both the evidence of the 16 radiocarbon dates and the artifact content of the site support our interpretation. An answer that makes the site 1500 years older than it actually is cannot be considered a reasonable answer by archeologists and it is precisely this kind of result that led to rejection of the Friedman formula.

2) We are criticized for not using all the data, with specific mention of two omitted radiocarbon dates. Evidence on the 4000-year date from Tizapan is given in the site report (*4*). This date says nothing at all about the age of the Morret site which is 200 km distant. The rejected Morret date of A.D. 1300 is accompanied by another radiocarbon date, from the same pit and level, of A.D. 250 (*5*). The archeological evidence is in agreement with the latter date.

3) The concept of re-use of artifacts is not relevant to our sample because most of the obsidian specimens we used are chipping waste—discarded flakes resulting from artifact manufacture. Only 6 of 119 obsidian readings on the Morret site are on finished artifacts; only 27 of the total items have been used as tools, even casually.

4) Reference to the "points with the thickest hydration layers" being of forms that may occur 4000 years ago somewhere else in North America is irrelevant; the Mexican examples we used are unquestionably from the early centuries A.D.

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References and Notes

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