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EPIDEMIOLOGICAL SURVEILLANCE OF INFLUENCE AND OTHER RESPIRATORY DISEASES IN MILITARY PERSONNEL

Annual Report

Gordon Meiklejohn, M.D.
Theodore C. Eickhoff, M.D.

31 May 1983
(For the period 1 October 1982 to 31 May 1983)

Supported by

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1. The H.I. antibody response of recruits who had received either whole virus vaccine or split vaccine was compared. Response to the whole vaccine was exceptionally good. Response to the ether-split vaccine was, if anything, slightly better.
2. The incidence of febrile URI remained extremely low despite outbreaks of H1N1 and H3N2 influenza A and of influenza B. At no time did the number of cases/1000/week exceed 3.8.
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Summary - Contd.

3. H3N2 cases of influenza were first detected during the week of January 31, 1983. The last case was detected during the week of April 11, 1983. A total of 10 cases were detected in which nine occurred in the permanent party and one in a student.

4. H1N1 influenza was first detected in the week of March 28. Ten cases occurred that week all of which were students. During the following week an additional three cases were detected in which two were in students and one in the permanent party.

5. Influenza B was first detected in the week of February 14th. All of five cases were in members of the permanent party, and the last case occurred during the week of April 18th.

6. It appeared that vaccine had been remarkably effective in providing protection and in reducing transmission. Despite the occurrence of cases of three types over many weeks there was only one week when influeza appeared to have an appreciable effect on overall respiratory disease rates in the student population.

7. Strains of H3N2 influenza A and influenza B were consistently isolated from patients with influenza, but, as in the past, virus isolation was successful in only about 60% of cases of H1N1 influenza. For these serologic diagnosis was essential in order to detect all cases.

8. Other viral diseases occurred only in very small numbers. Three cases of adenovirus diseases were detected. No cases of rubella or rubeola were recognized. Streptococcal cultures were positive in 13% of the patients.

9. Serum from 50 recruits which received the standard military vaccine were tested against the new A/Philippines/2/22 which has been accepted as the A/H3N2 component of the vaccine for the coming year. It was found that, while the titers and antibody response was slightly lower than against A/Bangkok, the postvaccination titers were 32 or higher in over 90% of the vaccinees. The whole question of how vaccines should be selected for incorporation into vaccines in future years was discussed.

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1. Introduction

The 1982-1983 season proved again to be a most unusual and interesting one. Three types of influenza virus, namely H3N2 and H1N1 strains of influenza A and influenza B were present on the Base during the period following the Christmas break. Little antigenic drift was observed from the strains contained in the vaccine. The receipt of a large number of serum pairs from Lackland Air Force Base from recruits who had received military vaccine were available and it was possible to observe the effect of the three different viruses on a totally immunized population. Febrile U.R.I. rates remained extremely low, and at no time was there any indication of an epidemic outbreak.

2. H.I. Antibody Response Following Vaccination

The results of H.I. tests with 78 serum pairs from individuals who had received whole virus vaccine are shown in Table 1. In this Table results of tests with two strains of H3N2 influenza, namely A/Bangkok/1/79 and A/Shanghai/30/80 are shown along with two strains of H1N1 influenza, namely A/Brazil/11/78 and A/England/333/80. A single influenza B strain was used namely B/Singapore/222/79, but sera were tested with both whole virus and with ether-split antigen. The additional H3N2 and H1N1 strains were included since they represented more recent isolates than those used in the vaccine formulation. A/Shanghai/30/80 represents a more recent variant of H3N2 and A/England/33/80 a more recent H1N1 isolate.

H3N2 Response

In tests with A/Bangkok/79 41% of the recruits were seronegative before vaccination and virtually none had titers above 1:16. There was a remarkable rise in antibody levels following vaccination with 92% of the individuals having titers of 32 or more. In tests with A/Shanghai/80 which, on the basis of tests with specific ferret antisera, was thought to show considerable variation from A/Bangkok, the results are almost identical. The A/Bangkok vaccine produced a titer of 32 or greater in 91% of the vaccinees against A/Shanghai/80.

H1N1 Response

Before vaccination the titers of 24% of the individuals were less than 8. Following vaccination this percentage was greatly reduced to 4% and 92% had titers of 32 or higher. In tests with the A/England/80 strain 36% had titers of less than 8 before vaccination, but, again, 92% had titers of 32 or more following vaccination.

Influenza B Response

When whole virus was used in the H.I. tests it appeared that 53% of the recruits had titers of less than 8 before vaccination. A rather satisfactory antibody response was nevertheless obtained and 86% had titers of 32 or more following vaccination. A quite different picture was obtained when the B/Singapore/79 antigen was used. With this antigen only 21% had titers of less than 8 before vaccination, and 100% had titers of 32 or more following

vaccination and 96% had titers of 64 or more. This difference in sensitivity of the two types of antigens in tests with this virus has been a consistent finding, and it is obvious that tests with the whole virus, even after continuous egg passage, are far less sensitive in picking up antibodies than the ether-split preparation. Some difficulty has been obtained in reproducing results in tests with ether-split antigen.

Comment

The response to the three vaccine components was highly satisfactory and indicates that three weeks after administration of vaccine almost all individuals had titers in the "protective range". It is of some interest that the alternate H3N2 virus, A/Shanghai/80, which had been considered as a new vaccine candidate because of evidence of antigenic drift, behaved very much like A/Bangkok in this population. The same is true of the H1N1 strain A/England/80, which had also been discussed as a possible substitute for A/Brazil in the vaccine. The data here suggests that it is immaterial whether the early or later strain was used. This is in line with earlier observations that in suitably primed persons who have undoubtedly been infected one or more times, have a broad response when vaccinated with a vaccine of adequate potency.

Comparison of Antibody Response and Reactions to Whole Virus and Ether-Split Vaccines

In collaboration with Col. Gremillion, Chief of Infectious Diseases at Lackland Air Force Base, serum pairs were obtained before and after vaccination from large groups of individuals who had received either whole virus or ether-split virus preparations. Both were standard vaccines which were assumed to have 15µg each of A/Bangkok/79, A/Brazil/78 and B/Singapore/79. Dr. Gremillion was interested in (1) determining whether in this age group there was any difference in antibody response and (2) whether there was a difference in the systemic or local reactions following vaccination.

Antibody response of the individuals who received whole virus vaccine is shown in Table 1 and those who received split-virus vaccine in Table 2. Results are almost identical with the two preparations in this population. Data on the systemic reactions following vaccination are not yet available.

3. Surveillance

From early November of 1982 until the end of May of 1983 students or permanent party who reported at the Base dispensary with febrile (over 99°F.) respiratory infections were directed to the surveillance office on a voluntary basis. Throat washings were collected for a virus isolation attempt along with acute phase serum specimens. Convalescent sera were collected three weeks later. All serum pairs were tested by complement fixation tests for influenza A (A/Brazil) and B (B/Singapore) and adenovirus and by hemagluttination inhibition tests with appropriate antigens. Diagnosis of influenza was based on one or more of the following: 1) isolation of virus, 2) demonstration of a four-fold or greater rise in titer in complement fixation and/or hemagluttination inhibition tests. Rates were calculated only for the student population which is homogeneous with respect to age (17-23), residence on the Base and

immunization history. The permanent party, which is approximately equal in number, is heterogeneous with respect to age, place of residence, and immunization history and it was considered impossible to construct a meaningful denominator on which to base an incidence rate. The immunization records of each individual were obtained and examined in order to ascertain the completion of influenza and adenovirus immunization and the date of vaccination.

During the early part of the season there was some difficulty in obtaining specimens from all individuals who reported to the dispensary with febrile URI. The situation steadily improved as the winter progressed and by the middle of April specimens were being obtained on over 90% of those who reported to the dispensary with this type of illness.

4. Overall Febrile URI Rates

Table 3 presents the febrile URI rates for the weeks from November 1, 1982 to May 15, 1983. Fever was defined as a temperature of 99°F. or higher. The rates were the lowest encountered in the past 30 years. In most weeks they have failed to reach even 2/1000/week and at the highest during a small flurry of H1N1 influenza the rate was only 3.8 and then fell off very sharply. The number of cases of influenza A of either type, influenza B, adenovirus, streptococcal pharyngitis are also shown. There was no particular clustering of patients of any of these diseases.

5. Occurrence of Influenza

The 1982-83 season was unique in that three types of influenza were present during the month following the Christmas break, influenza A of H3N2 and H1N1 types and influenza B, all in miniscule numbers. The time of occurrence of these cases is shown in Figure 1 which also indicates whether the cases occurred in students or permanent party personnel. Also shown is the overall febrile respiratory disease rate (99°F. or higher).

Five cases of influenza B were detected, all in the permanent party. These are scattered over a period of 11 weeks from the 14th of February until the 25th of April. Three occurred as single cases per week and the other two during a single week.

Ten cases of H3N2 influenza were detected. The first of these occurred during the week of January 31st and the last during the week of April 11th. There was only one week in which there was more than one case, namely the week of February 28th when there were four cases in the permanent party and one in a student. It is of some interest that the first case in the military was not detected until some three weeks after the occurrence of a civilian case in the Denver area.

H1N1 influenza occurred in a quite different pattern. No cases were detected until March 28th when ten cases were detected all in students. This was the only week during which it appeared that influenza might have an impact on the overall febrile respiratory disease rate which rose from less than 2/1000/week to 3.8/1000/week. Three additional cases occurred during the following week, two of which were in the permanent party.

A curious distribution of patients between students and permanent party is illustrated in Table 5. In the student population there were 11 cases of H1N1 influenza, one case of H3N2 influenza and none of influenza B. While there was only a single case of H3N2 influenza in a student, there were nine cases in the permanent party. Permanent party had a single case of H1N1 influenza and contributed all five cases of the influenza B. The pattern observed of H1N1 cases is easily explained on the basis of age. What is not clear is why cases of the other two types occurred mainly in the permanent party. With two exceptions the immunizations records of these patients indicated they had received vaccine in the preceeding three months. Possibly the permanent party were more likely to be exposed to a heavy challenge due to the fact that they reside in a civilian community, where a considerable number of H3N2 influenza were occurring during the same period.

6. Influenza in the Civilian Community

The Viral Diagnostic Laboratory of the University Hospital under the direction of Dr. Myron Levin under the Pediatric Infectious Disease Section receives large numbers of specimens for viral diagnosis from the Denver area and from other parts of the state. Strains are isolated in the diagnostic unit and if they appear to be influenza, virus strains are typed in our laboratory. During the period from 1/11/83 to 5/12/83 forty virus strains were isolated which were subsequently confirmed as strains of influenza virus. Of these 35 were confirmed to be H3N2 strains and five confirmed as B strains. No H1N1 strains were isolated.

In the civilian community H3N2 influenza was in the community over the period of 11 January until late April in a smoldering endemic form. Influenza B also was occurring at the same period, at a lower level. It is surprising that no H1N1 strains have been isolated up to the time of the preparation of this report.

There were four civilian cases which had unusual and interesting clinical features. These were the following:

1) A patient with influenza B who had extraordinarily high enzymes indicating muscle damage with marked hemoglobinemia and hemoglobinuria.

2) A woman in her 7th month of pregnancy who developed influenza with very high fever and started to go into labor. Amniocentesis was done and influenza virus was isolated from the amniotic fluid. Labor was stopped and the patient went on to term delivering a healthy baby two months later. Serologic studies on cord and infant blood are not yet complete.

3) A patient with Down's syndrome who developed influenza A H3N2 complicated by a viral pneumonia which was confirmed by lung biopsy on day ten. The patient subsequently died and postmortem tissue failed to reveal virus. The patient's serologic pattern was unusual in that no C.F. antibody developed, but there was a striking rise in H.I. antibody titers of less than 8 to 1024 A/Bangkok/79.

4) A patient who presented with parotitis and low grade fever from whom influenza B was isolated. Efforts are being made to determine whether there was a concurrent mumps infection.

7. Comments on Vaccine Effectiveness

In the absence of any control group it is obviously impossible to prove that the low incidence of any of the three types of influenza to the effectiveness of vaccination. It is noteworthy that antibody levels to all three types were uniformly high following vaccination and that there were very few individuals whose titers were 8 or less than 8, a level at which they would be highly susceptible. Nonetheless, this population was challenged by all three viruses on a number of occasions by influenza patients on the Base, and there was no evidence of extensive spread in either the student or the permanent party personnel. The students were uniformly vaccinated as were most of the permanent party. It is a bit puzzling why more cases of influenza H3N2 and B occurred in the permanent party than in students. This experience has been noted during the past three years and remains unexplained.

This is the fifth consecutive year in which the same pattern has been observed, namely of repeated introductions of virus onto the Base without any sign of epidemic spread in this well vaccinated population. It is reasonable to assume that in large measure the failure of the virus to spread resulted from the fact that individuals exposed to the infected patients were, in almost all instances, immune and that there was only rarely transmission of disease to the few susceptibles who remained in this population. When one notes the pre-vaccination antibody titers against these viruses and observes relatively high proportions of individuals who had titers of less than 8 (Table 1), one must assume that there would have been considerably more influenza had vaccine not been given.

8. Laboratory Diagnosis of Influenza

The results of virus isolation attempts and of serologic tests are shown in Table 4 for H3N2 and influenza B cases, and in Table 5 for H1N1. The number of cases in each instance was too small to justify any comparison of the sensitivity of the different methods. It is of interest to note that viruses were isolated from all nine of the H3N2 influenza cases and from all five of the influenza B cases. Occasional failures were found with both H.I. and C.F. tests, but this number was very small. With H1N1 cases as in former years some difficulty was encountered in isolating viruses from throat washings, and the total score was 8 positive out of 13 or slightly more than 60%. This same figure has held for the last three years during the H1N1 epidemic. H.I. tests were remarkably sensitive in detecting cases and it is noteworthy that all cases have extremely low acute phase H.I. antibody titers. This presence of individuals with titers in this low range was rather remarkable since there was so few people with titers remaining in this low range following vaccination. This suggests there is a high range of illness in patients with titers of less than 8 or 8. The H.I. titers in the acute phase sera of patients with H3N2 infections were considerably higher, but still fell in a very low range when one recalls the markedly elevated titers of individuals following vaccination.

9. Strain Typing

The traditional methods for identifying influenza isolates is to test the tissue culture fluid for hemadsorption with guinea pig red blood cells or test for hemagglutinating titers with chicken Rbc. This procedure works well for influenza B or H3N2 strains of influenza A, but has been unsatisfactory for H1N1 strains. For this reason we have compared results of testing for hemagglutination with both chicken and guinea pig red blood cells. There was a 1% cell suspension of the latter rather than the 1/2% in order to lessen the time required for reading of the tests. Results are presented in Table 6.

In this Table the cumulative percentage of tissue culture isolates which hemagglutinated at a given titer is shown with guinea pig Rbc. 100% of the H1N1 isolates had titers of at least 1:8, and many went beyond that point. On the other hand, only one-half agglutinated chicken cells at titers of 1/2.

In contrast to the results of the H1N1 strains results of both H3N2 and influenza B were not markedly different for number of strains of H3N2.

10. Discussion of Selection of Vaccine Strains

The past season has been marked again by confusion and controversy over the composition of vaccine for the coming year. It might be well to place on the record a summary of this situation as it appears from our laboratory. The questions centered around two issues, namely whether a new far Eastern strain A/Philippine/2/82 should be substituted for A/Bangkok/1/79 and whether existing supplies of vaccine should be used up.

A number of strains isolated in the far East in the last two to three years have shown continuing antigenic drift away from A/Bangkok/79. The strain A/Philippine/82 was isolated by Col. George Lathrop in the EPI Laboratory at Brooks Air Force Base in Texas and forwarded to Dr. Kendal at CDC along with serum pairs from 70 Air Force recruits at Lackland Air Force Base. This strain was, in accordance with CDC procedure, inoculated into ferrets and appeared in cross-agglutination inhibition tests to differ markedly from A/Bangkok/1/79 and other earlier H3N2 strains. Also when the sera from Air Force recruits were tested it appeared that almost all (96%) had titers of less than 1:8 before vaccination and that the antibody response to A/Bangkok vaccine was poor.

However, these tests were done with a 9th egg passage of the virus and it was obvious that they were due mainly to its low avidity. After the virus was recombined with PR8 in Dr. Kilbourne's laboratory (X-79 strain) and the sera from Lackland Air Force Base were tested in Denver with the X-79 strain, it was obvious that the A/Bangkok vaccine produced a highly satisfactory response (Table 7). While the percentage of pre-vaccination sera which had titers of less than 1:8 was obviously lower in tests with A/Philippine than with A/Bangkok, in post-vaccination sera there was little difference in the percentage of individuals who had titers of 32 or more, suggesting in the human, in contrast to the ferret, a broad response had been attained and that the A/Bangkok vaccine produced a highly satisfactory response.

The Civilian Advisory Group, on the basis of the data reported by CDC and lacking the data provided to the Armed Services, concluded that the A/Bangkok vaccine would be relatively ineffective against A/Philippine virus in the event of an epidemic and recommended that the A/Philippine should be the H3N2 vaccine strain for the coming year. The Influenza Committee advisory to the AFEB had definite reservations about whether a change was necessary, but could see no harm in making the change, as long as the virus did well in vaccine production, and concurred in the decision to substitute A/Philippine strain for A/Bangkok in the interest of having uniformity between military and civilian preparations. The Committee recommended, however, that if the Armed Services had remaining stocks of vaccine containing A/Bangkok that they should be used up before the A/Philippine vaccine was used.

This produced conflict with the Civilian Committee recommendation. Dr. Kendal took the position that, even though the A/Philippine response to the A/Bangkok appeared to be quite good, it was probably not as good as it would be with an homogolous A/Philippine vaccine and, therefore, was a second-line product. He argued that if one was to use influenza vaccine, one should use only the best and that it would be unethical to use a product which one believed to be inferior to the prospective vaccine for the 1983-84 season.

On strictly scientific grounds I believe that any seasoned influenza worker would view the situation in the following way. We know that ferret antisera are extraordinarily strain specific and exaggerate the differences between strains. We also appreciate the difficulty of interpreting data with recently isolated strains with low avidity. The truly relevant data are those derived from studies of vaccinated human beings in the age ranges which one is seeking to protect. With virus rendered more avid by passage and/or recombination it is obvious that individuals in the age group from 18-22 show, in contrast to the ferret, a broad response following the administration of A/Bangkok vaccine and achieve antibody levels which should provide a high degree of protection.

One can argue that response might be even higher with an A/Philippine vaccine, but our experience has been that vaccines prepared from earlier strains have provided almost total protection of the student population against H3N2 strains which show similar degrees of variance from the vaccine strain. Two considerations must be balanced. On the one hand, there would be considerable saving of money if the residual vaccine is used. On the other hand, the political consequences of using a vaccine currently labeled as inferior by the CDC and Air Force might be formidable in the event that a virus comes along which caused a relatively high incidence of disease. The Armed Services in that event would certainly be criticized for making an error in its decision. In essence it becomes an argument of a non-scientific nature. The scientific evidence supports the use of the old vaccine until it had been exhausted, while political considerations may make it appear desirable to discard the large amount of presumably effective vaccine in order to avoid possible repercussions. The obvious next step is to test the new A/Philippine vaccine as soon as it becomes available in parallel with the A/Bangkok vaccine in order to compare the two vaccines in the relevant population, namely military recruits. Arrangements to do this at some recruit base are in progress.

11. Projected Laboratory Studies

Laboratory studies other than those connected with the surveillance program have been deferred for the most part because the late start of the program resulting from delay in funding and the fact that the curious mixture of viruses during the winter months occupied most of the laboratories efforts and made it virtually impossible to conduct additional studies. During the coming months when the surveillance load is lighter several projects are planned. These include:

1) Further studies of antigenic drift. In our 1977 report we noted the results of studies of H.I. antibody levels in H3N2 influenza with a series of H3N2 strains going back from the most recent to the original A/Hong Kong/68 strain. We would like to now repeat these five years later after the H3N2 viruses have been around for 15 years with the thought that some light might be shed on the fact that a small proportion of individuals still appear to respond poorly to vaccination.

2) Search for evidence of R.S. virus infection. We have always had a large majority of our cases fall into a category of undetermined etiology. At no time have we investigated the possibility that R.S. virus was causing febrile respiratory diseases in this population. We plan in collaboration with Dr. Myron Levin of the Department of Pediatrics to test serum pairs from this year and possibly of 2 or 3 earlier years for R.S. antibody rises using the elisa technique.

3) In accordance with recent recommendations of the Committee on Influenza Advisors on the AFEB we plan as soon as vaccine containing the A/Philippine strain vaccine is available to compare the effects of present formula and new formula vaccine in antibody response to A/Philippine/82. Col. Gremillion at Lackland Air Force Base has informed us that it should be possible to obtain groups of at least 50 serum pairs from individuals who have received each of these two vaccines. They will be run in H.I. tests against A/Bangkok/79 and A/Philippine/2/82 using at least two strains of the latter, one the E9 CDC cloned strain and the other the X79 strain (the Kilbourne recombinant). The intent here is to find out how antibody response for A/Philippine compares following administration of these two vaccines. This information is important if one is to make an intelligent decision on whether or not to use or discard the relatively large amount of A/Bangkok vaccine which remains in the hands of the Armed Services.

12. Collaborating Activities

Air Force. Lt. Col. Gremillion at Wilford Hall, U.S.A.F. Medical Center in San Antonio, where he is Chief of Infectious Diseases, has been most helpful during the last three years in providing serum specimens from newly vaccinated recruits. Serologic work on these sera has been done at our laboratory. During the past season Dr. Gremillion has conducted a study comparing systemic and local reactions to whole and split-virus vaccines. Our laboratory has tested the sera from some 80 persons in each of these groups in order to determine the comparability of antibody response. As noted earlier, results are virtually

identical to the two groups. Dr. Gremillion is in the process of analyzing the reaction data and hopefully these data will be useful in determining whether reaction rates due to whole virus vaccine are significantly different than those with split-virus vaccine. The principal investigator was able to visit the immunization program at Wilford Hall while at Lackland Air Force Base in December of 1982 and review the immunization procedures. They are most impressive and explained a remarkable consistency with which recruits arriving at Lowry Air Force Base have received their routine immunizations.

Walter Reed Army Institute for Research. Reports on new or relevant developments have been forwarded promptly to the AFEB via Col. Bancroft at Walter Reed Army Institute for Research. Dr. Charles Hoke who was formerly stationed there was visited in Bangkok in September of 1983 where he is working on arborviruses including dengue rather than influenza. It was, however, possible to have a discussion with him regarding what could be made of the remarkable collection of serums from children aged 1 to 5 which had been gathered in Bangkok over recent years.

Attendance at the AFEB Meeting. The principal investigator was invited to attend the meetings of the Armed Forces Epidemiological Board on March 10th and 11th, 1983. The question of the vaccine composition for 1983-84 season was discussed and an opportunity was then provided for presentation which summarized the results of the University of Colorado research program at Lowry Air Force Base during the past 30 years. The remarkable progress which has been made was demonstrated. Overall febrile respiratory disease rates which formerly reached as high as 50/1000/week have remained well below 5/1000/week in the past four seasons. The need for continuing studies of this tricky virus was stressed.

Influenza Research Center at Baylor University in Houston. In December of 1982 the principal investigator visited the laboratories and conversed with staff at the Influenza Research Center. Data from the Air Force studies were presented and discussed and the current activities of the Baylor group were also reviewed. This proved to be a highly profitable interchange and contacts will be maintained in the future.

Center for Disease Control. There has been frequent contact with Dr. Gary Noble and Alan Kendal at CDC during the influenza season. They have been kept current on our recent activities and a number of virus strains have been provided to them as they are isolated.

13. Discussion

For the fifth straight year febrile URI rates remained at unprecedently low levels. This occurred despite the presence on the Base of all three types of influenza namely, H3N2 and H1N1 influenza A and influenza B. Based on the pre-vaccination antibody levels of this population, one must assume that the introduction of these viruses would have resulted in sharp outbreaks with substantial numbers of cases if vaccine had not been given. This is clearly shown in the case of the H1N1 cases, all of which occurred in individuals with extremely low antibody levels. Attack rates appeared to have been relatively high in this small segment of the population and one must assume that if a

quarter of the population had titers of 1:8 the number of cases would have been many fold higher than that observed. The cases did not occur in any single spot and were actually scattered throughout the Base of one or two cases at the most in each squadron. The lack of a control group makes it impossible to estimate vaccine effectiveness, but it is noteworthy that in this setting where there was repeated challenge by all three viruses the overall total number of cases detected was only 27 in a population of approximately 5,000, a rate of approximately 0.05%. During this and during the past four years the influenza problem appears to have been under good control, but one can predict with assurance that this virus holds surprises in the future.

The virtual absence of adenovirus disease and the absence of rubella and rubeola constitute a blind test to the effectiveness of these vaccines and to the execution of the program at Lackland Air Force Base.

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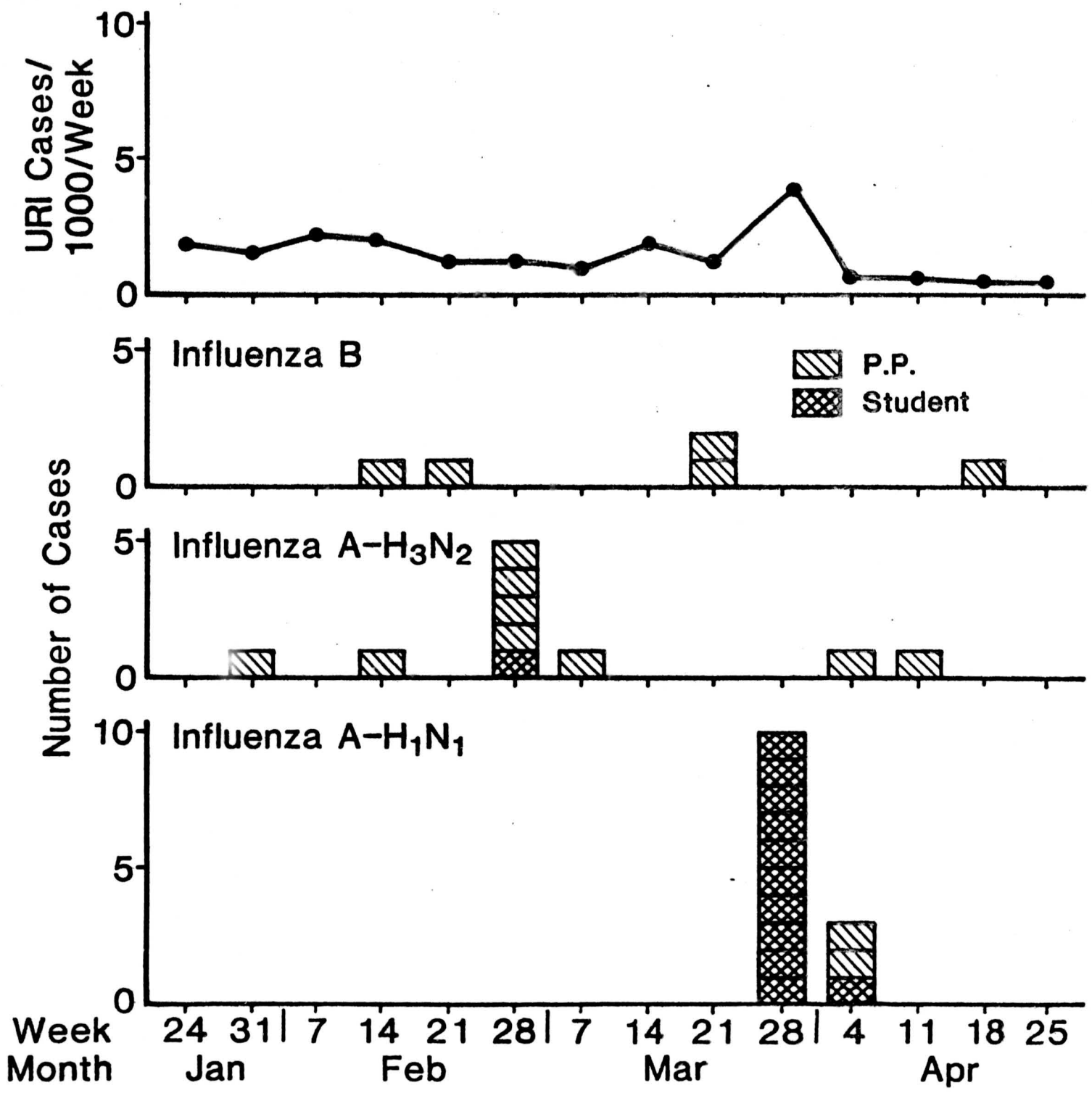

FIG. 1 WEEKLY FEBRILE URI RATES IN STUDENT POPULATION AND THE NUMBER OF CASES OF INFLUENZA H3N2, H1N1, AND B IN STUDENST AND PERMANENT PARTY 1982-1983.

Virus	Antigen	Sera	Percent <8	Cumulative Percent with HI titer of more than 8	16	32	64	128	256	512	1024
A H_3N_2	A/Bangkok/ 1/79	Pre	41	58	17	2	1	0	0	0	0
		Post	1	99	98	92	80	68	56	41	27
	A/Shanghai/ 30/80	Pre	42	57	17	4	0	0	0	0	0
		Post	1	98	95	91	76	60	43	30	21
A H_1N_1	A/Brazil/ 11/78	Pre	24	75	47	28	15	9	5	4	0
		Post	4	96	93	92	92	91	90	86	73
	A/England/ 333/80	Pre	36	64	36	18	8	7	3	0	0
		Post	3	97	96	92	91	91	87	77	71
B	B/Singapore/ 222/79 W.V.*	Pre	53	47	18	13	4	1	0	0	0
		Post	3	97	96	86	69	51	22	14	9
	B/Singapore/ 222/79 E.T.**	Pre	21	80	57	35	16	13	5	1	1
		Post	0	100	100	100	96	87	70	49	36

*W.V. - Whole Virus

**E.T. = Ether Treated

Table 1. Distribution of Pre- and Post-Vaccination HI Antibody Titer of 78 Recruits Who Received Trivalent Whole Virus Vaccine Containing 15 µg of Hemagglutinin of Each of A/Bangkok/1/79, A/Brazil/11/78 and B/Singapore/222/79

Virus	Antigen	Sera	Percent <8	Cumulative Percent with HI titer of more than 8	16	32	64	128	256	512	1024
A H_3N_2	A/Bangkok/ 1/79	Pre	55	45	17	5	1	0	0	0	0
		Post	1	99	98	95	86	76	64	49	35
	A/Shanghai/ 31/80	Pre	49	51	25	4	0	0	0	0	0
		Post	1	98	97	92	83	70	50	37	24
A H_1N_1	A/Brazil/ 11/78	Pre	15	84	60	42	23	9	4	1	1
		Post	1	98	97	97	97	94	90	85	82
	A/England/ 333/80	Pre	23	76	48	25	10	2	2	1	0
		Post	1	99	98	98	95	89	86	81	72
B	B/Singapore/ 222/79 W.V.*	Pre	45	55	29	16	8	2	1	0	0
		Post	3	96	95	87	82	66	44	30	15
	B/Singapore/ 222/79 E.T.**	Pre	21	79	62	38	24	18	9	4	3
		Post	1	99	99	99	95	89	80	70	58

* = Whole Virus

** = Ether Treated

Table 2. Distribution of pre- and post-vaccination HI antibody titer of 78 recruits who received trivalent ether-treated vaccine containing 15 µg of hemagglutinin of each of A/Bangkok/1/79, A/Brazil/11/78 and B/Singapore/222/79.

Week Beginning	Cases/1000/wk. (Students only)	Influenza A								Strep. Pharyngitis	
		A-H_3N_2		A-H_1N_1		B		Adenovirus			
		S.	P.P.	S.	P.P.	S.	P.P.	S.	P.P.	S.	P.P.
Nov. 1	0.2	-	-	-	-	-	-	-	-	-	-
8	0.6	-	-	-	-	-	-	-	-	-	-
15	0.8	-	-	-	-	-	-	-	-	-	-
22	1.2	-	-	-	-	-	-	-	-	1	-
29	0.2	-	-	-	-	-	-	-	-	-	-
Dec. 6	2.6	-	-	-	-	-	-	-	-	-	1
13	1.7	-	-	-	-	-	-	-	-	1	-
20	1.3	-	-	-	-	-	-	-	-	1	-
27	-	-	-	-	-	-	-	-	-	-	-
Jan. 3	2.4	-	-	-	-	-	-	1	-	-	2
10	0.8	-	-	-	-	-	-	-	-	1	3
17	1.3	-	-	-	-	-	-	-	-	-	-
24	1.7	-	-	-	-	-	-	-	-	-	3
31	1.6	-	1	-	-	-	-	-	-	-	1
Feb. 7	2.4	-	-	-	-	-	-	-	1	-	1
14	2.0	-	1	-	-	-	1	-	-	-	1
21	1.3	-	-	-	-	-	1	-	-	-	2
28	1.3	1	4	-	-	-	-	-	-	-	-
Mar. 7	1.1	-	1	-	-	-	-	-	-	-	1
14	1.9	-	-	-	-	-	-	-	-	3	1
21	1.3	-	-	-	-	-	2	-	1	-	-
28	3.8	-	-	10	-	-	-	-	-	4	-
Apr. 4	0.8	-	1	2	11	-	-	-	-	1	2
11	0.6	-	1	-	-	-	-	-	-	-	-
18	0.6	-	-	-	-	-	1	-	-	-	-
25	0.7	-	-	-	-	-	-	-	-	1	1
	TOTAL	1	9	12	1	0	5	1	2	13	19

Table 3. Weekly Rates of Febrile U.R.I. in Student Population and Number of Confirmed Cases of Influenza, Adenovirus and Streptococcal Infections in Students (S) and Permanent Party (P.P.), 1982-3.

Influenza A - H_3N_2 Acute/Convalescent Titers in Serologic Tests

Date	Status	Age	Virus Isolated	HI→ H_3N_2	HI→ H_1N_1	HI→ B/Sing.	CF A/Bangkok
2/3	P	26	H_3	16/64	64/64	32/32	8/32
2/28	P	22	H_3	*/128	*/256	*/128	*/32
3/1	P	24	H_3	64/128	64/128	32/32	8/32
3/2	P	36	H_3	8/32	128/128	16/16	8/16
3/3	P	37	H_3	16/64	256/128	8/8	<8/32
3/4	S	18	H_3	*/1024	*/1024	*/128	*/8
3/7	P	37	H_3	32/128	64/128	8/8	8/8
4/6	P	28	H_3	16/64	64/128	8/8	<8/16
4/11	P	23	H_3	TW only			
	Total Positive		9/9	5/6	0/6	0/6	4/6

*sera not available for testing

Influenza B Acute/Convalescent Titers in Serologic Tests

Onset Date	Status	Age	Virus Isolated	HI→ H_3N_2	HI→ H_1N_1	HI→ B/Sing.	CF A/Bangkok
2/16	P	26	B	16/16	16/16	8/256	<8/64
3/2	P	39	B	*/64	*/256	*/128	*/32
3/24	P	29	B	128/128	512/512	16/1024	8/128
3/25	P	26	B	512/512	128/128	16/1024	8/128
	Total Positive		4/4	0/3	0/3	3/3	3/3

*sera not available for testing

Table 4. Results of Laboratory Tests in 9 Cases of Influenza A-H_3N_2 and 4 Cases of Influenza B.

Influenza A-H_1N_1				Acute/Convalescent Titers in Serologic Tests			
				HI		CF	
Onset Date	Status	Age	Virus Isolated	H_3N_2	H_1N_1	B/Sing.	A/Bangkok
3/28	S	20	H_1	1024/512	8/256	64/64	8/128
3/28	S	20	H_1	TW only			
3/28	S	22	-	512/512	<8/512	64/128	8/128
3/28	S	18	H_1	1024/1024	<8/512	64/64	<8/32
3/29	S	19	H_1	128/128	<8/128	16/16	<8/32
3/30	S	20	-	256/256	8/256	32/64	<8/16
3/31	S	18	-	128/128	8/256	32/64	8/8
3/31	S	27	H_1	8/8	8/128	<8/<8	<8/64
4/1	S	18	H_1	1024/1024	<8/512	16/16	<8/128
4/1	S	19	-	1024/1024	<8/512	64/128	8/128
4/4	P	21	H_1	32/32	8/256	16/16	<8/16
4/6	S	19	-	1024/1024	<8/1024	16/16	8/32
4/6	P	29	H_1	128/128	<8/16	8/8	8/128
Total positive			8/13	0/12	12/12	0/12	11/12

Table 5. Results of Laboratory Tests in 13 Cases of Influenza A-H_1N_1.

Strain	Rbc Used	Percent <2	Cumulative Percent with Hemagglutinating Titers Over 2	4	8	16	32	24	128
A-H_1N_1 (57)	G.P.	0	0	0	100	87	55	9	2
	Chicken	49	51	18	9	0	0	0	0
A-H_3N_2 (10)	G.P.	0	0	0	100	90	70	50	10
	Chicken	0	0	100	80	50	30	20	10
B (50)	G.P.	0	0	100	98	74	50	16	4
	Chicken	0	0	0	100	90	64	32	10

Table 6. Comparison of Hemagglutinating Titers of First Passage for RMK Isolates of H_1N_1, H_3N_2, and Influenza B Viruses in Tests with Chicken and Guinea Pig Red Blood Cells.

Test	Antigen	Serum	Percent <8	Cumulative Percent with HI titer of more than 8	16	32	64	128	256	512	1024
(2/17/83) (50)	A/Bangkok/1/79	Pre	20	80	32	4	0	0	0	0	0
		Post	2	98	98	94	88	68	48	34	14
	A/Philippine/2/82 X-79	Pre	56	44	18	8	2	0	0	0	0
		Post	4	96	94	90	76	64	48	38	18

Table 7. Distribution of Pre- and Post-Vaccination HI Antibody Titers of 50 Recruits Who Received Vaccine Containing 15µg H_3N_2 Strain A/Bangkok/1/79 in Tests with A/Bangkok/1/79 and A/Philippines/2/82 (Strain X-79).

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