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The programme may be obtained from CMC on cassette for the Sharp PC-1500 or on microcassette for the PC-1251 for a modest handling charge. A program listing is also available. A version will shortly be available to run on the BBC microcomputer.

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For Debate

Rubella: immunity and vaccination in schoolgirls

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Abstract

Of 191 schoolgirls, 128 volunteered to take part in a feasibility study of serotesting before and after rubella vaccination, and all responded to RA 27/3 vaccine. Had the serum samples been taken by a fingerprick method the number of volunteers would probably have increased considerably. A change in policy for rubella vaccination to testing both before and after vaccination would cost no more than the existing policy, would ensure

primary response, and would differentiate those women who were protected by the vaccine from those with antibody to wild virus.

Introduction

The purpose of the rubella vaccination programme in schools is to ensure that all women are immune to rubella before they reach childbearing age. Some recent studies have failed to show an appreciable reduction in the numbers of susceptible women in the reproductive age group.¹⁻³ As two fifths of the babies damaged by rubella are firstborn children⁴ it is too late to establish the immune state of the mother at the first antenatal visit. We therefore conducted this study to determine the feasibility of a rubella vaccination programme based on the assessment of the immune state of schoolgirls, follow up vaccination, and checks of the immune state of those vaccinated.

Subjects and methods

Two schools in north west Glasgow were chosen for the study, the protocol of which was approved by the local ethical committee. The study sample consisted of 191 girls aged 11-13 who were due to be vaccinated in 1983. Written informed consent was obtained from the parents of the 128

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girls who participated in the study. Sixty three girls accepted only the vaccination. A sample of venous blood was taken from the 128 girls before they were vaccinated with RA 27/3 vaccine (Almevax, Wellcome). Six weeks later a further blood sample was obtained and analysed to establish the immune state.

Laboratory tests consisted of a single radial haemolysis test, and girls who had an antibody concentration of less than 15 IU/ml (a radial haemolysis zone of <7 mm) were considered to be susceptible to rubella. The haemagglutination inhibition test was performed as described by Grist *et al.*,⁵ and specific IgM antibody was estimated using the Rubazyme M (enzyme linked immunosorbent assay) kit (Abbott). All serological analyses were done at the regional virus laboratory.

Results

Serum samples obtained before vaccination from 42 of the 128 girls had no antibody to rubella as measured by single radial haemolysis (table I).

TABLE I—Responses of schoolgirls to susceptibility testing and vaccination. Figures are numbers (%) of girls

	Girls from:		Total
	School 1	School 2	
<i>First visit</i>			
No in cohort	103	88	191
No of volunteers for serotest and vaccine	73 (70.9)	55 (62.5)	128 (67)
No susceptible to rubella	26 (35.6)	16 (29)	42 (32.8)
No immune to rubella	47	39	86 (67.2)
<i>Second visit</i>			
No of samples obtained	73	52*	125 (97.7)
No immune to rubella	73 (100)	52* (100)	125 (100)

*Three girls from school 2 were absent (two had been found to be immune and one susceptible to rubella on first serotests).

Samples obtained after vaccination from 41 of these 42 girls showed immunity—that is, they contained concentrations of antibody ≥ 15 IU/ml. A sample was not available after vaccination from one girl who had been susceptible initially, and so her immune state after vaccination could not be detected. Serum samples before and after vaccination were also tested as a pair for 39 girls, and all showed a fourfold or greater rise in the haemagglutination inhibition titre. Specific IgM was detected in 26 serum samples taken after vaccination, possibly due to the time when it was obtained. Studies of sequential testing of serum samples have shown the presence of specific IgM in almost all vaccinated subjects with a primary immune response, peak concentrations being obtained at three to four weeks.⁶

Eighty three pairs of serum samples were available from the 86 girls who were immune to rubella on the first serotest. Only 12 of these showed a boost in antibody concentration after vaccination. Specific IgM was detected in only one girl, who had static high titres. The serum sample obtained from this girl before vaccination was insufficient to test for rubella specific IgM so a recent subclinical infection with wild virus could not be excluded.

Discussion

The British rubella vaccination policy entails vaccination of all 11-13 year old girls, when 60-70% would already have acquired antibody by natural infection, and screening for immunity to

rubella at antenatal clinics, in hospitals, at family planning clinics, and by general practitioners. This results in some women being repeatedly tested and some not at all. Furthermore, there is no immediate follow up of girls who fail to seroconvert after vaccination, and there is failure to differentiate women with natural immunity from those whose antibody is acquired by vaccination as no serotesting is carried out before vaccination. This differentiation is important as reinfection with rubella is a much greater problem in vaccinated compared with naturally immune subjects,^{7,8} and viraemia, though rare, may occur during reinfection of vaccinated subjects.^{9,10}

We propose an alternative policy of rubella vaccination. The present policy is to vaccinate all girls aged 11-13, serotest at the first antenatal visit, and immunise post partum all women who are susceptible. Our proposed policy is to screen all girls aged 11-13 and immunise those who are susceptible, and to serotest after vaccination and reimmunise those who are still susceptible. The clinical effectiveness of any programme depends on the degree of herd immunity, prevalence of seroconversion, rate of decay of the vaccine, and acceptability of the programme. The first three variables are presumed to be the same for the present and proposed policies. It was disappointing that in our study only 128 (67%) of the girls agreed to have a serum sample taken; the response would have been higher if a fingerprick test had been offered.¹¹ The cost of the initial screening in our scheme is the same as that of the current scheme (table II). The additional cost of our scheme is the second testing of the girls. In the estimation of cost we have included the likely cost of material, sampling, and technical time for analysis, and our figures show that the two schemes are comparable. Fingerprick testing directly on to single radial haemolysis plates would probably offset any need for additional labour that might be required to cope with the demand of increased testing.¹² The costs of the proposed programme would decrease further with the increase in herd immunity (table II).

Sweden recently implemented a two stage programme of vaccinating all children at both 18 months and 12 years.¹³ This programme depends on a 90% uptake and is aimed at reducing the total pool of susceptible subjects. Currently in the United Kingdom it would be impossible to achieve an uptake of 90% unless there was a change in parental attitude¹⁴ or legislation such as vaccination being necessary for entry to school. The two stage programme is also twice as expensive as the current British scheme. Any additional finances, if available, would be more profitably spent on monitoring and protecting the 30-40% of adolescent girls who are at risk, especially as the Swedish programme may fail to control outbreaks of rubella infection.¹⁵

A separate argument exists for the prospective study of immunity in schoolgirls who are identified as being immune after vaccination. Rubella antibody persists for as long as 18 years after vaccination,¹⁶ although in some subjects it may decay to concentrations below 15 IU/ml.¹⁷ Evidence supports the view that these low concentrations are protective to the fetus.^{18,19} The threshold of antibody used in screening for immunity could, however, be lowered to perhaps 5 IU/ml,²⁰ and then if a pregnant woman came in contact with clinical rubella or had a rubella like illness she could be appropriately investigated even if she had previously been declared immune.

Our small study suggests that an alternative approach to the vaccination of schoolgirls is feasible and has advantages over the

TABLE II—Comparison of costs (£) of existing and proposed rubella vaccination policies according to herd immunity (HI)

Proposed policy: screening and selective vaccination of 1000 girls aged 11-13					Existing policy: vaccination of 1000 girls aged 11-13				
	Average cost per person	Total cost				Average cost per person	Total cost		
		HI 60%	HI 70%	HI 80%			HI 60%	HI 70%	HI 80%
Screening	1.40	1400	1400	1400	Vaccination	1.18	1180	1180	1180
Vaccination	1.18	472	354	236	Serotests of all at antenatal clinics	1.40	1400	1400	1400
Follow up serotests of girls vaccinated	1.40	560	420	280	Postpartum vaccination	1.18	24	18	12
Revaccination*	1.18	24	18	12					
Total	—	2456	2192	1928	Total	—	2604	2598	2592

*Assuming 5% failure to seroconvert.

scheme currently adopted in Britain. Larger scale studies are needed to provide a clearer understanding of the organisational and technical problems that might be encountered in advocating a policy of the kind proposed.

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Medicolegal

Treatment without consent: intervention by the court

BY OUR LEGAL CORRESPONDENT

Discussion of the practical effects of the decision of the Court of Appeal in *Gillick v West Norfolk Area Health Authority* and another has so far largely ignored the possibility of the intervention of the court in decisions about treatment.^{1,2} It is perhaps opportune to remember two decisions of high court judges (both women) concerning medical intervention in the sex lives of young girls. In the one case an abortion and insertion of a contraceptive device was authorised against the wishes of the parents. In the other a sterilisation operation was refused, though a widowed mother wished her handicapped child to be sterilised.

The function of the court was mentioned by Lord Justice Parker when he summarised his view of the law in *Gillick*: "Any doctor who advised a girl under 16 as to contraceptive steps to be taken or affords contraceptive or abortion treatment to such a girl without the knowledge and consent of the parent, save in an emergency which would render consent in any event unnecessary, infringes the legal rights of the parent or guardian. Save in emergency, his proper course is to seek parental consent or apply to the court."³ The court in question will usually be either the juvenile court or the high court.

Children and care

A child may be committed to the care of a local authority after a finding of guilt in criminal proceedings. But more generally a local authority has a duty to receive into its care a child apparently under the age of 17 within its area if it appears that he or she is without parent or guardian or is abandoned or lost or that his parents or guardian are prevented by mental or bodily disease or infirmity or other incapacity or circumstances from providing for his proper accommodation, maintenance, and upbringing; and additionally

that the intervention of the local authority is necessary in the interests of the child.⁴ Moreover, if it sees fit the local authority may go further and remove a child against the wishes of the parents if a parent is unfit to have care of the child either because of mental disorder, or because of his habits and mode of life, or because he has consistently failed without reasonable cause to discharge the obligations of a parent.⁵ If the intervention of the local authority is disputed the question is resolved by the juvenile court. Pending resolution of the question the child is protected by remaining in care of the local authority. The statutory powers relating to children are complex, but these examples give some idea of the powers involved.

The highest power relating to children is vested in the high court, exercised now through the family division. To protect a child application may be made for the child to be made a ward of court. Application is sometimes even made by a local authority which already exercises parental powers in respect of the child. Application of such sort by a local authority will normally be for the purpose of obtaining guidance and directions from the court in difficult or controversial cases.

Request for abortion

In 1981 the London Borough Council of Lewisham made an application for a girl in their care to be made a ward of court.⁶ The girl had been committed to their care in July 1979 at the age of 13 by a juvenile court after a finding of guilt of theft. In November 1980 she had a child whom she looked after well having regard to her age and personal difficulties. In August 1981 she became pregnant again. She, her general practitioner, and a consultant gynaecologist and obstetrician all favoured an abortion. Her parents and grandparents objected strongly on religious grounds (they were Seventh