rate and mean antibody response remained consistently high for all batches of vaccine used. Sugishita *et al*² have shown that some subjects in whom vaccination apparently fails to elicit an antibody response are protected by low levels of antibody which can be detected by the highly sensitive radioimmunoassay technique.¹ Similarly, subjects who have themselves suffered from congenital rubella and are found to be seronegative for rubella HAI antibody are known to respond poorly to the administration of vaccine.³

Although a standard single dose of Almevax given subcutaneously under optimum conditions contains over 300 times the immunising dose of virus,⁴ live vaccines may still be inactivated by adverse temperature conditions during storage and transportation or by exposure to heat, sunlight, spirit, or other disinfectants following reconstitution.

The techniques employed in rubella HAI antibody titrations vary between laboratories, resulting in different sensitivities.^{5,6} For example, some laboratories find kaolin preferable for removing non-specific inhibitors, although removal of rubella-specific IgG by this method has been reported.⁷ Thus in one laboratory the same low HAI antibody titre may be regarded as evidence of protection and in another an indication for vaccination. The percentage of subjects with low antibody titres in whom vaccination elicits a fourfold or greater antibody response is lower than in seronegative vaccinees.⁸

These considerations may help to unravel the reasons why three of Dr Roberts's 12 subjects have apparently failed to respond to vaccination. Previous experience suggests that the explanation is most likely to lie in the serological testing.

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¹ Freestone, D S, *British Journal of Preventive and Social Medicine*, 1974, **28**, 258.

² Sugishita, C, *et al*, *Clinical and Experimental Immunology*, 1978, **31**, 50.

³ Cooper, L Z, *et al*, *American Journal of Diseases of Children*, 1971, **122**, 397.

⁴ Zealley, H, Morrison, A M, and Freestone, D S, *Journal of Biological Standardisation*, 1974, **2**, 111.

⁵ Schmidt, N J, and Lennette, E H, *Applied Microbiology*, 1970, **19**, 491.

⁶ Liebhauer, H, *Journal of Immunology*, 1970, **104**, 818.

⁷ Cabasso, V J, *et al*, *Applied Microbiology*, 1969, **18**, 410.

⁸ Rowlands, D F, and Freestone, D S, *Journal of Hygiene*, 1971, **69**, 579.

Rubella susceptibility in women

SIR,—The recent correspondence (8 July, p 127; 5 August, p 433; 12 August, p 504) about rubella susceptibility in women of childbearing age emphasised the need for a greater effort to check immune status in such subjects.

The study¹ we carried out in general practice showed that it was perfectly feasible to offer women attending a contraceptive clinic the chance to have their antibody levels measured before they embarked on pregnancy. It was easy to incorporate this in the normal routine of the clinic, and recall of those considered non-immune for vaccination added little to the work load. We hope to publish in the very near future a paper showing the effectiveness of vaccination as shown by the post-vaccination titres. Checking for rubella immunity at the first antenatal visit is too late to offer any active protection for that pregnancy and it is of use

only as a guide to the possible consequences and course of action should the mother come into contact with rubella during the subsequent months.

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¹ Gringras, M, *et al*, *British Medical Journal*, 1977, **2**, 245.

Rubella immunisation

SIR,—Just recently there has been a considerable increase in referrals for termination of pregnancy associated with a high incidence of rubella in the community. This is particularly distressing in view of an active policy of rubella immunisation immediately post partum which has been pursued locally for two years. A great deal of mental distress for pregnant women is produced by the problem of contact with rubella and possible damage to the embryo. All those responsible for health in the community should ensure that everything possible is done to reduce the hazards from rubella in early pregnancy.

Women who are rubella seronegative after obstetric confinement should be offered immunisation within 48 hours of confinement with the advice that they should not become pregnant in the following three months. Other measures should also be considered:

(1) Women contemplating a pregnancy should find out whether they are seropositive before becoming pregnant, and they should be immunised if they are seronegative and should not become pregnant for three months.

(2) All personnel coming into day-to-day contact with women patients—that is, doctors, nurses, receptionists, secretaries—should find out whether they are seropositive.

(3) Patients being investigated for infertility should be screened for rubella immunity and if seronegative they should be offered immunisation.

Only by being more aggressive towards the rubella problem with pregnancy can we hope to reduce the great anxiety that many women suffer in early pregnancy.

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Rubella embryopathy

SIR,—We are happy to see that Mr J R Duncan and Mr A Kenney reiterate (12 August, p 504) our suggestion that women should be stimulated to demand rubella screening before contemplating pregnancy (24 June, p 1695), but we do not think that this will be achieved by placing posters in general practitioners' surgeries or gynaecological outpatient departments—healthy young women usually have better things to do than visit their doctors.

A few wise words from Doris Archer of the eponymous radio programme or from the dreaded but respected hostess of the Rover's Return, Coronation Street, would carry more weight than all the posters in the Chinese People's Republic.

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BARBARA J PILSWORTH

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Relative chloroquine resistance of *Plasmodium falciparum* in Zambia

SIR,—The report by Professor A A Khan and Dr M J Maguire (24 June, p 1669) of the demonstration of relative chloroquine-resistance in *Plasmodium falciparum* is, of course, of great interest to African malaria-watchers, but there are some rather odd inconsistencies about it.

Firstly, the month legends in the figure seem all awry, with "May" under the later June dates, "June" under early July dates, and "July" nowhere.

Secondly, the figure shows the child to have been malaria-positive on the day of admission (4 May), a finding not mentioned in the case report, and whereas the case report refers to a finding of malarial parasites on 20 June the figure shows a negative blood slide on that date.

Thirdly, the text says that the child received 130 mg/kg chloroquine over the 13 days 25 June to 7 July, a dose which obviously calls for a minimum of 10 mg/kg/day. Yet the text speaks of doses varying from 5 to 10 mg/kg and the figure suggests that 5 mg/kg was given for all but one or two of the 13 days, which in no way could cumulate to the 1.3 g stated.

Fourthly, it seems most odd that although the final allegedly curative doxycycline/chloroquine course ended on 24 July, the next reported observation of the blood film was on 24 August, a month later. One would think this must be an error for 24 July, but it appears twice; if it is not, what was the state of the child's blood in the intervening month?

Fifthly, or perhaps as 2(a), while the text states definitely that the child's blood was positive after the 20 June chloroquine course, the figure records $\pm$, whatever that means.

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* * * The author sent a copy of this letter to Dr Maguire, whose reply is printed below.—
ED, BMJ.

SIR,—To answer Dr de Glanville's points, the month legends are all awry, as he suggests. May refers to the first number, 4, which was the day of admission. On that day, as shown in the graph, the blood slide was positive. The graph should then have been broken and the subsequent days given as 20 June–25 July.

I agree that we did not mention in the text that the child had malaria on admission, nor did we summarise the repeat courses of chloroquine and blood slides between 4 May and 20 June. This was felt not to be relevant to our main point, that of apparent chloroquine resistance, and as we were writing only a short report we did not want to clutter it up with irrelevant detail. We did not state that her blood slide was positive on 20 June. The course of chloroquine was given on clinical grounds before we had the blood slide result. On 25 June she had two blood slides, one of which was positive and one negative. It was this that determined us to give a trial of chloroquine treatment with Haskin's tests and repeated blood slides. As Dr de Glanville states, the dosage of chloroquine on 25 June and 7 July does not correspond very well with that shown on the graph. However, the total dose in the period was 1.3 g—that is, 130 mg/kg.