congenital malformations at Michael Reese Hospital; 3. a similar clustering of chromosome abnormalities in newborns in Denver, Colorado (PUCK and ROBINSON, Science [1965]) and in spontaneous abortions in London, Ontario (CARR, personal communication). For the second cluster there was a corresponding increase in the abortion population in Canada. There was no statistically significant increase in the reported incidence of 9 infectious diseases including rubella or infectious hepatitis, relative to the three clusterings defined in the newborn population. Prospective studies on the distribution of chromosome aberration in time have been conducted since November, 1964, and reveals that when the spontaneous abortion and newborn populations are considered as one conceptual population, the distribution of chromosome aberrations in time appears random. These findings indicate that either the factors responsible for nonrandom distribution of chromosome aberrations were not operating during the time period covered or that onrandom distribution of chromosome aberrations does not occur in the human population. (APS)

- 30 *Chromosomes of Couples with Repeated Spontaneous Abortions.* R. J. MCKAY, Jr., W. E. HODGKIN* and E. H. WHITE*, University of Vermont College of Medicine, Burlington, Vt.

Because a 20-25% incidence of chromosomal abnormalities has been reported among spontaneously aborted fetuses, it was decided to study the chromosomes of couples who have had 3 or more spontaneous abortions. Using a commercial kit method for culturing peripheral blood leukocytes, approximately 750-1000 metaphases were scanned in each patient in order to obtain 50 satisfactory for counting. For each patient, all metaphases with abnormal counts and 5 with normal counts were photographed and karyotypes made. Among 4 couples with repeated abortions and one or more children with multiple anomalies, 2 husbands showed a balanced translocation in all metaphases studied. Among the other 38 couples studied a number showed abnormalities in a few cells (trisomy, partial trisomy, balanced and unbalanced translocations, fragments, dicentrics, endoreduplication, tetraploidy, XO, long-armed Y, quadriradials and triradials). Partially trisomic cells were seen approximately 5 times as frequently among the women as among the men, and 6 patients were observed to have a single metaphase with a quadriradial chromosome. (APS)

- 31 *The 'Impotent Neutrophil' Syndrome.* L. L. KAHLE.* H. MORENO*, and E. KAUDER*, Dept. of Pediat. Univ. of Cincinnati, Cincinnati, O. (introduced by A. M. Mauer).

Leukocyte function was studied in a 2-2.5-year-old Negro male with the history of repeated abscesses, cervical and inguinal adenitis, recurrent pneumonia, seborrheic eczema of the scalp, hepatosplenomegaly and anemia. An appropriate leukocytosis with neutrophilia occurred with each infection, absolute neutrophil counts ranging from 3,900 to 24,500/mm³. IgG, IgA and IgM globulins were present in increased amounts. Lymph node biopsy contained caseating granuloma. Skin tests and cultures for all types of acid fast bacilli and fungi were repeatedly negative. These findings are characteristic of the syndrome of chronic granulomatous disease of childhood. There was a normal flux of leukocytes into Rebuck skin windows and exudate fluid. Leukocytes appeared normal with alkaline phos-

phatase, peroxidase and Wright's stain and were normally vacuolated after bacterial phagocytosis. Normal leukocyte motility and phagocytosis followed by degranulation were seen with phase microscopy. Decreased bactericidal activity of the patient's leukocytes during in vitro incubation with *Staphylococcus aureus* and *Aerobacter aerogenes* was repeatedly demonstrated in the presence of the patient's serum or normal serum. To determine the nature of this defect a citric acid extract of the patient's leukocyte granules was compared with control specimens and decreased bactericidal activity was found. The deficient or abnormal phagocytin activity of the patient's leukocytes, demonstrated by this study, could account for his clinical syndrome. (SPR)

- 32 *Defective Lymphocyte Response to PHA in Congenital Rubella.* J. R. MONTGOMERY*, M. A. SOUTH*, W. E. RAWLS* and J. L. MELNICK*, Depts. of Ped., Med., and Virology, Baylor Univ. College of Med.; and G. B. OLSEN*, P. B. DENT*, and R. A. GOOD: Ped. Res. Labs., Variety Club Heart Hospital, U. of Minn., Minneapolis, Minn. (introduced by Martha D. Yow).

Persistent viral carrier state in congenital rubella remains an enigma. Defective cellular immune mechanisms may play a role in this persistence. To investigate this possibility the response of leukocytes to phytohemagglutinin (PHA) was studied. 2×10^6 peripheral leukocytes were cultured in routine media. PHA was added to achieve a concentration of 0.025 ml/ml of media. Quadruplicate cultures were incubated at 37°C for 72 h and treated with C¹⁴ labeled thymidine for 5 h prior to termination. Cellular response was estimated by measuring the cellular content of C¹⁴ in a standard liquid scintillation system. A decreased PHA responsiveness of leukocytes was demonstrated in 8 of 14 congenital rubella patients studied, despite evidence in these patients of normal delayed hypersensitivity. PHA response returned to normal later in the course of each patient. To test whether this lack of responsiveness is due to an intrinsic defect in lymphoid cells from these patients or to direct effects of rubella virus, a normal adult's leukocytes were cultured with rubella virus. PHA response was dramatically reduced in every experiment; this effect could be eliminated by pretreatment of the virus preparation with rubella neutralizing antibody. Inhibition was also produced when Newcastle disease virus was substituted for rubella virus. These studies indicate that leukocytes from some congenital rubella patients show a defective response to PHA. The defective response can be reproduced in normal leukocytes by the addition of rubella virus or Newcastle disease virus *in vitro*. The prolonged persistence of virus and the defective reactivity to PHA in babies with congenital rubella may be interrelated. (SPR)

- 33 *A Mitotic Inhibitor Produced by Rubella Virus Infection of Human Fibroblasts.* STANLEY A. PLOTKIN, Wistar Institute and Department of Pediatrics, University of Pennsylvania, Philadelphia, Pa.

When infected with rubella virus, many human diploid fibroblast cell strains show mild to marked degrees of mitotic inhibition (PLOTKIN *et al.*: Amer. J. Epidem. 81: 71 [1965]); cell strains derived from infected fetuses divide more slowly than normal (RAWLS and MELNICK: J. exp. Med. 123: 795 [1966]); and infants congenitally infected with rubella show mitotic

inhibition and growth retardation (NAYE and BLANC: J. amer. med. Ass. 194: 1277 [1965]). In seeking an explanation for these phenomena a substance inhibiting mitosis was found in infected WI-38 cells. WI-38 cells that had gone into mitotic arrest two weeks after rubella virus infection were extracted by freeze-thawing. When freed of virus, extracts of infected cells induced mitotic inhibition of normal WI-38 cells and of a skin fibroblast cell strain. No effect was seen on continuous lines of human cells or on non-human cell lines. The inhibitory substance was trypsin-sensitive and heat-labile but was unaffected by rubella antibody, ether, ribonuclease, or deoxyribonuclease. It was not sedimentable or acid-stable and did not protect cells against the action of vesicular stomatitis virus. Concentrated rubella virus inactivated by ultra-violet irradiation did not itself produce growth inhibition.

This substance offers a potential explanation for the mitotic inhibition associated with rubella virus infection *in vitro* and *in vivo*. (SPR)

- 34 *Clinical Experience with Natural and Attenuated Rubella Virus Infection.* H.M. MEYER, Jr.*, P.D. PARKMAN* and T.C. PANOS, National Institutes of Health, Bethesda, Md., and Univ. of Arkansas Medical Center, Little Rock, Ark.

Experience with attenuated rubella virus (strain HPV-77) indicates that infections in vaccinees are asymptomatic and non-communicable. HPV-77 is fully immunogenic when given parenterally but much less so intranasally. Ninety-six % of 51 subjects given 10 to 10,000 tissue culture infectious dose₅₀ (TCID₅₀) subcutaneously developed antibodies while only 2 of 26 sero-converted after intranasal inoculation. None of 49 susceptible contacts of vaccinees was infected. Antibodies evoked by HPV-77 remained unchanged in titer in 30 persons followed for 1 year. In a group with natural rubella, antibodies also followed a plateau-curve but were 8 to 16 times higher throughout. Vaccine dosage did not influence antibody response; inoculation of 10,100,1000 or 10,000 TCID₅₀ of attenuated virus resulted in similar levels of antibodies. Persons with prior immunity from natural rubella had antibody increases in 2 of 17 instances after rubella exposure and in 3 of 12 after HPV-77 vaccination; none had illness or excreted virus. Five children with antibodies from vaccination 8 to 12 months earlier were challenged intranasally with 200 TCID₅₀ of unmodified virus. All remained asymptomatic and virus was not recovered from pharyngeal swabs or blood. Antibody levels increased in two. Five controls similarly challenged developed typical rubella with virus excretion and viremia. These observations suggest: 1. the HPV-77 strain is a safe and effective immunizing agent; 2. vaccine-induced immunity persists for long periods; 3. under natural conditions rubella exposure may be important in insuring life-long immunity; 4. attenuated virus vaccine can boost antibody levels of persons with declining immunity. (APS)

- 35 *Evaluation of a Live Attenuated Mumps Vaccine.* PHILIP A. BRUNELL* and ANTHONY BRICKMAN*, NYU Sch. of Med., New York, N.Y. (introduced by Saul Krugman).

A live attenuated mumps vaccine (Jeryl-Lynn strain) was evaluated in a field trial which included more than 2300 children who had no previous history of mumps. The objectives were to study antigenic potency and side effects of the vaccine. Parents of vac-

cinees recorded daily temperatures and other symptoms on a card which was returned. Paired serum specimens were obtained at the time of vaccination and one month later from 1202 children. The results to date indicate: 1. 45 % of 592 children who had no history of having mumps had detectable serum antibody before vaccination; 2. 98 % of 340 seronegative vaccinees had 4-fold or greater antibody response; 3. the vaccination was tolerated very well; the incidence of febrile responses and of clinical symptoms was essentially the same in 335 successfully vaccinated children as compared with 252 children who were immune prior to vaccination. These studies indicate that the vaccine is antigenically potent and is clinically acceptable. (SPR)

- 36 *Experimental Genital Herpes Simplex infection in the Mouse.* ANDRÉ J. NAHMAS, ZUHER M. NAIB*, ANITA K. HIGHSMITH* and WILLIAM E. JOSEY*, Emory Univ. Sch. of Med., Atlanta, Ga.

In view of the important role of maternal genital infection as the source of herpes simplex virus (HSV) infection in the newborn (J. amer. med. Ass. 199: 1132 [1967]), an experimental model in mice was developed. Female mice could be readily infected by insertion in the vagina of a cotton pellet soaked with HSV. The occurrence of infection was substantiated by the recovery of virus from the vagina for as long as 12 days and by the demonstration of concomitant cytological changes (multinucleated giant cells with intranuclear inclusions). 90 % of the mice died of encephalitis within 20 days after inoculation. Death could be prevented in up to 60 % of infected mice by repeated administration of gamma globulin.

Evidence has been obtained that the newborn mouse becomes infected with herpes simplex virus on passage through the infected birth canal of the mother mouse. Infection in male mice was also induced by direct inoculation of virus in the penis. In addition, sexual transmission of genital infection was demonstrated when uninfected male mice placed in contact with infected females developed herpetic penile lesions.

Using this experimental model, it has also been possible to differentiate herpes strains obtained from human genital lesions from strains recovered from non-genital sites. Such differences between genital and non-genital strains of herpes simplex virus have also been found by immunological methods and by inoculation onto chorioallantoic membranes (genital strains form large pocks, non-genital strains form smaller pocks). (SPR)

- 37 *Studies on the Virulence of Herpes Simplex Viruses Isolated from Different Clinical Entities.* CHARLES ALFORD*, MARTHA SNIDER* and GAYLE STUBBS*, U. of Alabama Medical Center, Birmingham, Ala. (introduced by Herschel Bentley).

Recently, herpes simplex viruses (h.s. No. 1) were isolated at 5 days and 6 months after delivery from an infant with recurrent skin vesicles and microcephaly. Because of the unusual nature of this illness, studies on the virulence of h.s. No. 1 and 4 other strains of h.s. viruses, isolated from cases of recurrent labialis or conjunctivitis, were performed and compared in mice and in plasma clot cultures of human fetal brain. The virus preparations used were produced and quantitated in primary rabbit kidney cell cultures (RK) and, to avoid laboratory attenuation, 2nd to 3rd passage materials were employed as inocula.