and I will not discuss the various factors involved. It can be said, however, without fear of contradiction, that, provided ventilation is distributed evenly throughout the lungs and alveoli, an increase in lung volume can in no way impair haemo-respiratory exchange. Increase in lung volume could only diminish the fluctuation in the concentration of alveolar gases which occurs during inspiration and expiration. The simile of the large and small room is fallacious, for if you have the same number of people in the small room as in the large room, and the same amount of air used for ventilation, there will be no significant difference in the atmosphere of the two rooms. In any case, increase in lung volume when it occurs is essentially due to increase in the size of individual lobules, and, as I have already stated, diffusion alone could maintain adequate gaseous exchange in a lobule much larger than the average size in emphysema.

(g) An increase in the respiratory dead space has been suggested as the cause of impaired haemo-respiratory exchange, but there is ample evidence that any increase in the anatomical dead space—i.e., the space occupied by the respiratory passages down to the bronchioles—is too small to be of practical significance (Hoover and Gammon, 1915). I will not enter into a discussion on the meaning of the physiological dead space. Most physiologists will agree that those who claim an increase in physiological dead space in emphysema are merely stating in a complicated way that the distribution of ventilation is unequal. In the normal individual the distribution of ventilation is remarkably even throughout the lungs, and consequently samples of alveolar air taken after expirations of varying depths are more or less uniform in composition. This is not the case in severe emphysema: the deeper the patient expires the higher is the CO_2 content and the lower is the O_2 content of the "alveolar air," and these patients show the apparent paradox that, although the amount of air inspired is normal or even increased, the alveoli are under-ventilated. That part of these lectures which deals with the analysis and interpretation of these observations is discussed elsewhere; the conclusion which has been drawn from them is that much of the inspired air is deflected to the enlarged air sacs and bullae, the walls of which are avascular and which are therefore not in contact with the pulmonary circulation. This wastage of ventilation on functionless air sacs cannot be defined as wastage due to increase in physiological dead space, as there is nothing physiological about an emphysematous bulla. Nor can it reasonably be called increase in anatomical dead space. If a definition is wanted I would prefer to give as the cause of impaired haemo-respiratory exchange in emphysema the formation of a pathological respiratory dead space, consisting of bullae and other air sacs which are not in contact with the pulmonary circulation. In very severe emphysema it is possible that all of the inspired air enters this pathological dead space, so that haemo-respiratory exchange would depend mainly on diffusion. In less severe cases it is probable that only some of the inspired air is wasted in this way.

Dyspnoea

The cause of dyspnoea in emphysema is clearly stimulation of the respiratory centre by the CO_2 retained in the blood. Under resting conditions the patient with emphysema either can just get rid of the CO_2 he is forming or, if not, he can compensate by increasing his alkali reserve; and in either case he is not dyspnoeic, because the acidity of his blood is normal. When he exercises, however, he cannot eliminate the extra CO_2 he forms; a gaseous acidosis occurs, and dyspnoea must result. In the absence of bronchospasm there is no orthopnoea, because there is no pulmonary congestion, which is the cause of true orthopnoea.

(Part II, concluding the lectures, will appear in next week's issue, with the list of references.)

The urgent need to prepare a new generation of Jewish physicians, especially in view of the tragic extermination of European Jewry, was urged by Prof. Bernhard Zondek of the Hebrew University when he recently opened the annual conference of the Palestine Jewish Medical Association. The conference was devoted mainly to discussing the problem of establishing a world-wide organization of Jewish physicians with its chair in Palestine. It is planned to issue an English edition of the Jewish medical journal *Harefuah* to be distributed among Jewish doctors throughout the world.

SUPERVISION OF PREGNANT WOMEN IN FACTORY EMPLOYMENT

BY

J. V. O'SULLIVAN, F.R.C.S., M.R.C.P., M.R.C.O.G.,
M.D., M.A.O.

*Obstetric Surgeon, City of London Maternity, Queen Mary's, and
Bearsden Memorial Hospitals*

AND

L. B. BOURNE, M.R.C.S., L.R.C.P., D.A.

Works Medical Officer

The employment of pregnant women has become of vital importance at the present time, and we think it will be of interest if we record our experience in a factory concerned with a specialized industry (light engineering) in which an ante-natal clinic has been established to supervise women employees. It is realized that the figures are small, but we feel that the time has come for a very careful investigation into all factors connected with pregnancy among industrial workers. To obtain sufficiently large figures from any one industry might take so long that much of the value of the ultimate findings would have lost their importance.

We have attended a total of 178 pregnant women, who have come from North-East London. Of these, 90 have been delivered in the first year—82 in hospital and 8 at home—and the greater number have been followed up after delivery to assess any ill effects. All were employed in such work as soldering, welding, assembling small machine parts, etc. Their heaviest jobs were operating capstan lathes and drills. Some of the workers are engaged in a specialized form of assembly in workshops where the temperature at any time is roughly 10° Fahrenheit higher than normal. A full-time factory medical officer is always at call for emergencies, and there is an adequate staff of State-registered nurses (a proportion of whom are certified midwives), who undertake to deal with normal emergencies of industrial medicine.

The Ante-natal Clinic

With the ever-increasing number of pregnancies being reported to the surgery nurses, it was decided—after consultation—that the most satisfactory arrangement would be to set up an ante-natal clinic within the factory. Women reported their pregnancy to the surgery nurses, to the medical officer, to the welfare department, or direct to the midwife in charge of the clinic. Arrangements were then made for their examination and confinement. If they wished to be confined at a hospital—and the larger proportion did—an appointment was made for them, and they were given a covering letter when they went to book at the out-patient department. Having booked a bed and made financial arrangements with the hospital almoner, the women then continued to receive routine examinations at the works ante-natal clinic until such time as they left their employment. One of us (Mr. J. V. O'Sullivan) visited the factory at fortnightly intervals in order to examine these cases. Later, the scheme was enlarged to include the treatment of gynaecological cases. Women from all the factory departments have taken advantage of the scheme, and they include clerical and canteen staffs and cleaners, as well as the factory bench operators referred to above.

Wherever it was deemed necessary, lighter work or shorter hours were advised, and the management put such medical suggestions into immediate practice. We consider this to be of great importance in the supervision of women's health in factories.

We first made a general rule that all patients should cease work at the fifth month of pregnancy, but as time went on we found that most of them wished to continue at their work in later pregnancy, and as they showed no evidence of fatigue or ill-health we permitted them to do so under the special supervision provided. It would appear that so little is the health of experienced workers affected by pregnancy that they continue to work on night shifts without any apparent strain.

It was felt, however, that this was inadvisable, and it is therefore no longer permitted when the patient is known to be pregnant.

All pregnant women, of course, had the advantages of the extra nourishment and vitamins distributed through the Government scheme. The local health authorities have co-operated by allowing us to set up a distributing centre for vitamins and cod-liver oil within the factory. Many women previously complained that they were unable to take full advantage of the Government scheme on account of the time they spent (with consequent financial loss) in travelling to the various centres. The nursing staff have been able to find cases of pregnancy earlier than if these women had reported to outside ante-natal clinics in the usual way.

The management of the firm has permitted secretarial assistance sufficient to arrange for all appointments, admissions, etc., into any hospital chosen by the woman. This is, of course, of particular value in time saved, for she would otherwise have to go and arrange bookings and appointments herself.

Preparatory Routine

At the ante-natal clinic the usual routine investigations, such as blood pressure, urine testing, etc., were carried out. Originally, routine Wassermann tests were done at the first visit. It was found that this was not wholly satisfactory, as the question of future infection at any given time had to be considered. It was not practicable to carry out a routine Wassermann test at each subsequent visit, and so the present policy is to leave it until there is the slightest suspicious clinical sign. It is the custom to make a routine Wassermann test in all cases of toxæmia of pregnancy (or in any case of an unmarried pregnant woman). In view of the present abnormal living conditions and the breaking up of normal home and family life, the greatest possible vigilance must be exercised by all in attendance on ante-natal patients. We have had only one positive reaction in 43 cases to date. Clinical signs had suggested this, and the W.R. confirmed the necessity for treatment. We would stress the absolute necessity that the test be done by pathologists who have specialized in this field. All our pathological investigations and x-ray examinations are carried out at one of the large general hospitals.

We feel, at the end of the first year, that this clinic has been of great assistance to the working pregnant women in the factory. It has saved them time and money, and many working hours.

A pregnant patient generally reports to the surgery in the unit in which she is working. The sister-in-charge communicates with the sister in charge of the ante-natal clinic, and an appointment is arranged convenient to the patient and to the demands of routine of the shop in which she works. At the interview with the sister at the clinic full particulars are taken, the patient's local practitioner is informed that this patient has sought advice, and she is then booked to see the consultant at his next visit. Records are kept of all findings, and of the patient's general condition, the type of work she is doing, and her financial position. She is provided with simple instructions as to her personal care, hygiene, feeding, etc. Next a bed is booked for her at the hospital of her choice. Some hospitals prefer to see the patient once early in pregnancy, and then return her to the works clinic. Later in the pregnancy she returns to the hospital with full records as to her progress while she is under our care. After the patient is delivered, she is followed up by the department as to her general health and the possibility of returning to work, and is given information as to day nurseries in her district, etc. Co-operation from the welfare department is whole-hearted, and in this way the patient can be afforded financial assistance or can be permitted to take advantage of all schemes at present available.

Employment Restrictions

The College of Midwives in Dec., 1940, issued a leaflet on the "Restriction of Employment of Women Before and After Childbirth." In this it suggests: (1) four weeks' rest before the expected confinement; (2) eight weeks' absence from the factory after the birth of the child. (The period permitted under the Public Health Act, 1936, is four weeks.) The College

believes that much could be done to make the position of pregnant women easier, particularly as regards financial assistance by the State. It is of interest to note that the proposals adopted at the General Conference of National Labour Organizations of the League of Nations convened at Washington by the Government of the United States of America on Oct. 29, 1919, which binds the countries that ratify it to prohibit the employment of women six weeks before and six weeks after childbirth, and to make provision for their maintenance, was never ratified by the British Government. So far as this country is concerned, there seems to be no standard laid down for the care of working women who become pregnant. The issue of the College of Midwives leaflet was advisory only, and no further steps have been taken by any of the authorities.

The Union of South Africa has dealt with this question through a Factory Act which includes provisions far beyond those in force in this country.* In Germany, too, it appears that the Reich Ministry of Labour ensures the protection of all female workers. It prohibits the employment of pregnant and nursing mothers on jobs which might prove harmful to them. Every woman must be completely exempt from every kind of work for six weeks before and six weeks after the birth of a child. This period is increased to eight weeks in the case of nursing mothers. The nursing of children is encouraged by the granting of a paid nursing period. The law prohibits the employment of pregnant and nursing mothers on overtime, night work, and holiday work. It also extends protection against dismissal. It is a punishable offence to dismiss a woman because of pregnancy, and she must not be given notice of dismissal for other reasons from the beginning of pregnancy until four months after childbirth. Unfortunately this law was modified to apply only to women of German nationality, and with a few exceptions it did not include Poles, Jewesses, Gypsies, etc., who were working under forced labour conditions in the German factories. All they were permitted to do was to refuse to continue to work if they could prove they were likely to be confined within the next two weeks, and they were allowed freedom from employment for six weeks after confinement. It seems likely that the majority of the foreign women working in Germany worked until 8½ months pregnant. The conclusion one can draw from this is that Germany valued female labour, and particularly the breeding of healthy offspring.

At the present time there seems to be no special standard laid down for the care of working women who become pregnant, apart from the above. When pregnant women are employed it is of vital importance that they be carefully supervised by experts, and only under these conditions is it fair to allow women to continue to work in factories in the later months of pregnancy. Our experience shows that no women have come to any apparent ill-health during their pregnancy or labour from doing work in this factory. We think this point is of great importance in the present emergency, because many of the women are highly skilled in their work, which they have been doing for years. Labour wastage cannot be made good; it is a great hindrance to production, for it often takes many months before the unskilled new entrant to industry becomes relatively useful as a producer. If, therefore, women can be kept at work for a longer time in the factories without in any way injuring their health, the value to industry must be great; but the fact that working women must undertake

* Factories, Machinery and Building Work Act of 1941 for the Union of South Africa; Chap. III, Par. 23, subsections (1) and (2):

"(1) No female shall work in a factory and no employer or occupier shall require or permit any female to work in his factory during the period commencing 4 weeks prior to the expected date of her confinement and ending 8 weeks after the date of her confinement. Provided that, if the child be stillborn, or dies before the expiration of 8 weeks after birth, the provisions of this subsection shall cease to apply as from a date fixed by an inspector.

(2) The Minister may from public moneys pay to any female who, in circumstances to be determined by him, has discontinued her work in a factory as a result of pregnancy, an allowance equivalent to her ordinary weekly remuneration, but not exceeding 25s. per week, for a period not exceeding 12 weeks, which allowance may be paid in a lump sum or in such instalments as the Minister may determine: Provided that payment of such allowance may be made in respect of an additional period not exceeding 4 weeks if such female discontinued her work in a factory as a result of pregnancy more than 4 weeks prior to the expected date of her confinement."

manifold household duties, etc., after their day at the factory must also be taken into consideration.

We are not in a position to refer to the employment of pregnant women except in the special factories in which we have worked. We feel that co-ordination between employers of labour, trade unions, and Ministries should now be forthcoming, so that a general scheme for rationalizing the position of pregnant women in industry may be worked out for the whole country.

Analysis of Cases

TABLE I

No. of patients, 90 (68 primiparae, 22 multiparae):				
Group 1 (under 20 years)	10			
" 2 (21-25 years)	36	(31 primiparae; 5 multiparae)		
" 3 (26-30 years)	27	(20 " 7 ")		
" 4 (31-40 years)	15	(6 " 9 ")		
" 5 (over 40 years)	2	(- " 2 ")		

TABLE II.—Periods of Pregnancy at which the Women ceased Factory Work

Weeks of Pregnancy	Group 1		Group 2		Group 3		Group 4		Group 5		Totals
	M.	P.	M.	P.	M.	P.	M.	P.	M.	P.	
18		1		3		1					5
20			1	3		2		1	1		8
22						1					1
24				2		4					7
26				7	1		2				15
28		3	1	8	3	6	3	4	1		24
30			1	2	1	2	1				7
32		1		3		3					7
34		2	1	2	1	1	1	1			9
36		3	1	1	1		1				7
Totals	10		36		27		15		2		90

Of the series of 90 cases, 77 confinements were normal, 80 had normal pregnancies, and 87 had an uneventful puerperium. There were 7 cases of toxæmia (including 2 cases of primary hypertension), 2 cases of puerperal pyrexia, 1 case of severe anaemia (below 50%), 9 cases with haemoglobin between 50 and 60%, 38 with haemoglobin between 60 and 75%, and 42 with haemoglobin above 75%. Abnormal labours comprised 1 Caesarean section and 4 forceps; premature labour—2 premature (1 stillbirth of 3 lb.) and 2 breeches. Breast-feeding was established in 77 cases out of a total of 90.

Conclusions

Ante-natal clinics in factories where pregnant women are employed are very advisable under present conditions.

Where insufficient numbers in any one factory render this impossible, clinics to cover groups of factories in an area might be established.

Under medical supervision many women can do suitable work to an advanced stage of pregnancy.

Nursing mothers should not recommence work (particularly if the baby is breast-fed) for at least three months after delivery.

Day nurseries must be established if a return to work becomes necessary.

A national scheme should be set up to supervise employment of pregnant women and investigate the possibility of increased financial benefits.

We wish to express our gratitude to Sister W. M. Brown, who did much of the original work in establishing the clinic and making the arrangements with local authorities and the hospitals concerned. We must also express our thanks to the City of London Maternity, St. Mary's Islington (L.C.C.), the Royal Free, the Royal Northern, and other hospitals, and also to the municipal midwives who have co-operated so whole-heartedly in the scheme.

M. H. Shulman (*New Engl. J. Med.*, 1942, 226, 260), impressed with the results in epilepsy of sodium diphenyl hydantoinate, and because of recent work on the psychogenic aspect of bronchial asthma, has tried the drug on six or seven patients suffering from severe asthmatic attacks. The proprietary preparation, dilantin sodium, gave pronounced relief in his small patients aged between 5 and 14 years. He observes that the drug must be given continuously to prevent attacks. In some of these patients the personality was improved.

FIVE CASES OF JAUNDICE FOLLOWING TRANSFUSION OF WHOLE BLOOD OR HUMAN PLASMA

BY

R. E. STEINER, M.B.

(From an E.M.S. Hospital)

In the last few months 5 cases of jaundice have been observed in this hospital. It was found that these patients had all received transfusions and some time later developed the disease. A similar occurrence has been recorded previously by other writers: Morgan and Williamson (1943) reported 9 cases of jaundice following the administration of human blood products, and Beeson (1943) recorded 7 cases of delayed jaundice in subjects who had received blood or plasma transfusions. It seemed, therefore, to be of importance to report the present cases.

Our patients were battle casualties from North Africa, and had been admitted to this hospital from two to three months after having been wounded; they then developed jaundice. All of them had had transfusions of whole blood, human plasma, or both, in varying quantities. The treatment in every case was primarily some form of surgical intervention plus chemotherapeutic measures such as antitetanic and anti-gas-gangrene serum and massive doses of the sulphonamide group of drugs.

Case I

Male aged 23; sustained multiple shrapnel wounds of both legs on April 7, 1943. A transfusion of 500 c.cm. of whole blood, followed by 2,500 c.cm. of plasma, was given on the same day. Jaundice was noticed for the first time three months after injury, the patient having had very slight prodromal symptoms of nausea and headache for some days. Thereafter he felt perfectly well. The jaundice deepened considerably during the first three days, was then stationary for one week, and disappeared in the next two weeks.

Physical examination showed slight tenderness on deep pressure over the right subcostal region for a week after the onset of jaundice; the liver and spleen were never palpable, and the temperature and pulse remained normal throughout the illness.

Laboratory Findings.—Blood count: Normal during the course of the illness, except for a mononucleosis of 8%. Urine: There was never bile in the urine, but excessive urobilin was present. Faeces: Stercobilin diminished. Van den Bergh: Direct positive reaction; quantitative indirect, 2 mg. per 100 c.cm.

Case II

Male aged 28; wounded by a machine-gun bullet in the left thigh on April 11, 1943. A plasma transfusion of 3,000 c.cm. was given on the same day. Three months afterwards he developed loss of appetite and headache, which were followed by jaundice two weeks later. The jaundice deepened steadily over the first week, then became stationary for two weeks; after four weeks only a very faint trace was noticeable. The appetite returned about one week after the onset.

Physical examination after the appearance of jaundice revealed a just palpable liver, which was not tender. The spleen was never palpable. The temperature was slightly raised for the first week of the illness; the pulse remained normal.

Laboratory Findings.—Blood count: Normal during the illness. Urine: Slight trace of bile, large amount of urobilin for four weeks. Faeces: Very much diminished stercobilin for 17 days. Van den Bergh: Prompt positive direct after the first week; quantitative indirect, 4.2 mg. per 100 c.cm.

Case III

Male aged 21; sustained multiple shrapnel wounds on May 9, 1943. A transfusion of 1,000 c.cm. of whole blood was given on the same day. Jaundice was first noticed three months after the wounding. The patient had no symptoms or