further investigation should be made as to the action of this preparation.

We are much indebted to Dr. Eyre for affording us every facility for carrying out the opsonic estimations in the Bacteriological Laboratory at Guy's Hospital.

THE RELATIVE OPSONIC POWER OF THE MOTHER'S BLOOD SERUM AND MILK.

BY

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OUR attention was first called to the question of the relative opsonic power of the blood serum and the milk of the human mother and of the cow by the statement of Professor Sims Woodhead at the Pathological Section of the British Medical Association at Toronto, that he had found opsonins corresponding to complement in cow's milk, and also opsonins of a somewhat different character the result of the injection of tuberculin.

To investigate this subject we estimated the opsonic index to the tubercle bacillus and to the *Staphylococcus pyogenes aureus* of (1) the mother's blood serum, (2) the mother's milk, (3) the blood serum of healthy cows, (4) the same cow's milk, and (5) the ordinary domestic milk supplied by the dairy company.

The usual method of Wright for estimating the opsonic index was used, and we employed our own white blood corpuscles, as we found those of the cow awkward to procure and difficult to work with. The normal standard was our own "pooled" blood serums. The mother's milk was obtained by means of a breast pump, at the same time as the blood was collected. Each cow was milked, and the blood was taken in one of Wright's tubes, by making a small incision into the cow's ear.

In order to obtain the "milk serum," one of the blood-collecting tubes was filled with the milk, and both ends sealed up. It was then centrifugalized until the cream was completely separated. The tube was marked with a file and broken into two parts; the milk serum could then be used quite free from fat.

All the women were healthy and were suckling healthy children.

Mother No. 1 was a primipara, aged 22 years, and the opsonic indices were estimated on the eighteenth day after parturition.

Mother No. 2 was a multipara, aged 24 years, suckling her third child. Blood and milk were examined in the ninth week after parturition.

Mother No. 3, aged 27, was suckling her fourth child. The opsonic estimations were made in the eleventh week after parturition.

The cows were all perfectly healthy, and were certified by a veterinary surgeon as free from tuberculous disease, though no tuberculin test was used. All these cows had calved within the last five or six months. The ordinary domestic milk supply which was examined was that obtained from a city dairy company, and its source was unknown. The saline solution used for the white corpuscles and for the emulsions of the organisms contained 0.85 per cent. of sodium chloride. The results of the opsonic estimations are given in the accompanying table.

It would appear from these figures that whilst the opsonic power of the mothers' blood serum for both the tubercle bacillus and the *Staphylococcus pyogenes aureus* is within the normal range, that of the milk from the same source is very low, averaging 0.077 for the tubercle bacillus and 0.11 for the *Staphylococcus pyogenes aureus*.

The cows' blood serum would appear to have about half the opsonic power of human blood—an average of 0.49 for the tubercle bacillus, and rather more than this, 0.71, for the *Staphylococcus aureus*. The index of the three cows' milk averaged about 0.25 for the tubercle bacillus and 0.18 for the staphylococcus, whilst the ordinary dairy supply averaged 0.20 and 0.05 for the same organisms respectively.

The presence of antitoxin has been demonstrated in the milk of animals immunized against various toxins, as, for example, the tetanus and diphtheria toxins. It has also been shown that the milk of animals immunized against

	Tuberculo-opsonic Index compared to Normal Human Serum.	Staphylococcic Tuberculo-opsonic Index compared to Normal Human Serum.
Blood Serum: Mother No. 1 ...	1.17	0.92
" " " No. 2 ...	1.10	0.98
" " " No. 3 ...	0.92	0.86
" " Cow No. 1 ...	0.45	0.72
" " " No. 2 ...	0.49	0.85
" " " No. 3 ...	0.53	0.55
Milk: Mother No. 1 ...	0.10	0.14
" " No. 2 ...	0.07	0.09
" " No. 3 ...	0.06	0.10
" Cow No. 1 ...	0.40	0.30
" " No. 2 ...	0.12	0.09
" " No. 3 ...	0.22	0.14
" Dairy Supply No. 1 ...	0.22	0.02
" " " No. 2 ...	0.19	0.09

the typhoid bacillus, and of mothers who have suffered from typhoid fever, contains agglutinins for that organism.

It would appear, however, that the amount of these protective substances in the milk is very much less than in the blood, being usually about in the ratio of 1 to 30, in the case of antitoxin.

With the object of comparing the opsonic power of the blood serum of the child with that of the mother's serum and milk, we estimated the opsonic index of the blood of two newly-born children for the same two organisms, and obtained the following result:

	Tuberculo-opsonic Index compared to Normal Serum.	Staphylococcic Opsonic Index compared to Normal Serum.
Mother's blood serum, No. 1 ..	1.09	0.90
Child's blood serum, No. 1 (estimated on 7th day after birth) ..	0.72	0.55
Mother's blood serum, No. 2 ...	1.16	—
Child's blood serum, No. 2 (estimated on 4th day after birth) ..	0.40	—

It will be seen that in both these cases the opsonic power of the child's blood is very much less than that of the mother, and it would be interesting to know whether any absorption of opsonins can take place from the mother's milk. The opinion of authorities seems to be divided on the question of the absorption or not of agglutinins and antitoxins in the intestinal canal of the child.

Another aspect of the question which it would be of interest to investigate is the opsonic content of the milk of mothers and of cows suffering from tuberculosis. If there are tubercle bacilli in the milk we can conceive of these uniting themselves to, or combining with, the opsonin present, and thus becoming capable of absorption by the phagocytes in the intestinal walls. If there is enough opsonin present, will the bacilli become comparatively harmless; or, on the other hand, if the opsonic power of the milk is small, would the admixture of milk rich in opsonin be a means of rendering the milk less harmful?

ANTITOXIN FROM CONVICTS.—We learn from the *Medical Record* that at a recent meeting of the Baltimore County Medical Association, Dr. H. Burton Stevenson said that antitoxins would be more effective if they were prepared in the human body, because only a few animals were susceptible to the diseases of man. He suggested that such antitoxin could readily be produced by using criminals for the production of serums. A law could be enacted making the punishment for certain crimes optional with the convict—imprisonment on the one hand, inoculation with certain disease germs on the other.