of *Actinomyces lavendulae*[4] and *Actinomyces griseus*[4] to neutron bombardment to see if new strains will similarly result which can advantageously be used to produce more streptothricin and streptomycin respectively and in less time or both or whether new strains will appear which will yield new and more desirable antibiotics. Preliminary results are promising in that new strains are appearing, but less frequently than in the case of *P. notatum*.

We propose similarly to bombard other micro-organisms with neutrons, especially bacteria, molds and yeasts of industrial and medical importance to see if new strains can be isolated which will find advantageous application in industrial and medical microbiologic processes.

A more detailed presentation of the substance of this communication will be submitted for publication elsewhere.

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THE DIFFERENTIAL DIAGNOSIS OF BOVINE BRUCELLOSIS FROM THE BACTERICIDAL ACTION OF BLOOD PLASMA

IN herds of cattle in which several animals are infected with *Brucella abortus*, it has been a common observation that many develop only low serum agglutination titers. According to the standards in vogue to-day, such animals are placed in a border-line category as regards active infection. A long time-interval must intervene and several tests be made before the actual status of such animals can be determined. Very often such a practice is not economical and, too, such animals are considered unsafe when valuable dairy cattle are involved.

It has been observed that most of the animals in the suspicious category, in herds in which infected ones have been present for many years, will in time become negative to the agglutination test. In the herd in which infection is of recent date, it has not been possible by procedures now in use to predict the future of those that show low agglutination titers.

In a comprehensive *in vitro* study of the bactericidal and growth-inhibiting action of bovine blood plasma for *Br. abortus*, sufficient differences were found in the action of plasma from infected and non-infected cows to differentiate one from the other regardless of the agglutination titer. The latter group contained normal animals and animals showing different agglutination titers from a previous natural exposure, or following the injection of a killed *Br. sius* vaccine.

[4] Obtained from Dr. S. A. Waksman, Rutgers University.

[1] Part of a cooperative project between Michigan State College and the Bureau of Animal Industry of the U. S. Department of Agriculture.

PROCEDURE EMPLOYED AND RESULTS

Blood was collected from the jugular vein by means of a sterile needle into sterile bottles containing 0.1 ml of saturated sodium citrate for each 10 ml of blood. Plasma was separated from the cells by centrifugation and tested immediately. If necessary, the sample may be stored at 4° C. for as long as 10 days without impairing its bactericidal action.

A single, smooth strain of *Br. abortus* was used in all experiments. The differential value of the growth inhibition test depends upon the employment of a smooth culture. If a dissociated culture is used, plasma from both infected and non-infected animals will inhibit its growth to an equal degree.

The organisms were grown on beef liver agar slants for 24 hours at 37° C., then removed by means of a wire-loop and suspended in distilled water containing 0.05 per cent. Tryptose peptone and 0.5 per cent. NaCl. The bacterial suspension was then diluted to a scale reading of 28 on the Libby Photronreflectometer. The standard suspension contained approximately 1.5×10^9 live *Brucella* organisms per ml. This was diluted 1:1,000 in the same diluting liquid for final use.

The outline of the method which has proved to be the most practical and the least involved, and at the same time reveals more distinct differences between the action of plasma of normal, immune and infected animals follows: Each plasma sample was diluted two-fold in tubes of Tryptose broth from a 1:10 dilution to 1:1,280; the final volume in each tube was 5 ml plus 0.1 ml of diluting fluid containing 1.5×10^5 live organisms. The tubes were incubated for 48 hours at 37° C. The results were recorded at the 24th and 48th hour. The action of the plasma was measured by the absence or degree of growth (turbidity) in the tubes as compared with that in a control tube inoculated at the same time. The organisms multiplied sufficiently during the first 24 hours to produce considerable turbidity in the control tube of medium. The medium remained clear in those tubes in which growth was completely inhibited.

In Table 1 are set forth results representative of those that have been obtained on plasma samples from a large number of cattle of different statuses toward *Brucella* infection. Not in a single instance has a plasma sample from infected animals inhibited the growth of *Br. abortus* in any of the dilutions employed routinely. That this is not an exhibition of "zone-inhibition phenomenon" has been repeatedly demonstrated by the failure to obtain inhibition of growth in further two-fold dilutions of the plasma up to 1:200 million even after adding bovine or guinea pig plasma to each dilution to provide complement.

The *Brucella* organisms always grow in aggregates

TABLE 1

THE GROWTH-INHIBITING ACTION OF BLOOD PLASMA FROM DIFFERENT ANIMALS AGAINST *Br. abortus*

Source	Plasma sample: Agglutination titer	Hours of incubation	Dilution—growth inhibition: 1:10	1:20	1:40	1:80	1:160	1:320	1:640	Control
Normal calf age, 2 weeks	–	24	–	–	–	–	–	–	–	2+
		48	–	–	–	–	–	4+	4+	4+
Normal heifer age, 15 months	–	24	–	–	1+	2+	2+	2+	2+	2+
		48	1+	4+	4+	4+	4+	4+	4+	4+
Heifer, recovered from infection	1:25	24	–	–	–	–	–	1+	2+	2+
		48	–	–	–	–	–	4+	4+	4+
Heifer, 1 month after vaccine treatment	1:1,280	24(a)	–	–	–	–	–	1+	2+	2+
		48(a)	–	–	–	–	–	4+	4+	4+
Infected cow	1:1,280	24(a)	2+	2+	2+	2+	2+	2+	2+	2+
		48(a)	4+	4+	4+	4+	4+	4+	4+	4+

– = Tubes remain clear, no growth.
+ = Degree of growth.
(a) = Growth in aggregates.
Number of organisms added to each tube per ml = 1.5×10^6.

in the plasma dilutions of infected animals up to the corresponding agglutination titer of the sample. This also occurs beyond the zone of inhibition in samples from animals that have been injected with vaccine. When the aggregates of organisms, in the latter, are transferred to agar plates, most of the colonies grow up as dissociants. Transfers of growth in all dilutions of plasma from infected cows remain smooth.

Plasma samples from most young calves inhibit growth in all dilutions up to 1:160. Occasionally calves are encountered whose plasma shows little inhibition of growth in any dilution. The presence of bactericidal substances and degree of action of plasma in the new-born calf has been correlated with the ingestion of colostrum. Before the ingestion of colostrum the blood possesses no growth-inhibiting property for *Brucella*.

Plasma samples from heifers and adult cows after exposure to and recovery from natural infection inhibit the growth of *Br. abortus* in a higher dilution than those from normal ones. This also occurs in plasma from cows injected with a new type of killed *Brucella* vaccine. It is possible that these observed differences in the growth-inhibiting power of plasma can be made use of in determining the resistance of an animal to *Brucella* infection as well as in detecting those that are infected, as the studies conducted by Irwin, Beach and Bell,[2] and Irwin and Ferguson[3] have suggested.

Thus far, the growth inhibition test has proved to be a highly accurate means of identifying both young and adult cows that are infected with *Br. abortus*, and whose agglutination titers range from 1:25 to 1:5,000.

The test can easily be developed into a routine laboratory procedure and by its application bring about the retention of many cattle that might otherwise be disposed of because of the possibility of infecting other cattle.

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DETOXICATION OF ARSENIC TRIOXIDE BY ORAL ADMINISTRATION OF FLUORIDES

PHYSIOLOGICAL antagonism between arsenic and various chemical compounds has been demonstrated by a number of investigators. The work of Rosenthal and Voegtlin[1] indicates that reduced glutathione is an effective antidote against arsenoxide and arsenious acid. Moxon and his associates[2] have markedly reduced the toxicity of selenium by treatment with sodium arsenite. Sandground[3] has found p-aminobenzoic acid to be highly effective as a detoxicant for high lethal doses of carbarsone and certain other phenyl arsonates in rats. Ascorbic and other organic acids are known to exert a protective action against neoarsphenamine.[4] Arsenic has been suggested as a causative factor in goiter and has been shown to be antagonistic to iodine.[5,6]

The experiments to be described in this paper are an attempt to demonstrate *in vivo* antagonism between two elements, arsenic and fluorine, using arsenic in one of its most virulent forms, the inorganic trivalent arsenious acid.

The arsenic trioxide (As_2O_3) was administered

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