PUS ORGANISMS.

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Tp the casual observer the term, pus organism, means little more than a boil with a yellow top, a red swelling, an incision and the gushing out of a yellowish pus matter, or a sensation of pain may suggest itself. But to the scientific mind, afield of intense interest is spread out before it and in a moment beholds the organism as a living microscopic plant, producing suppuration in the living animal tissue, sees it in the soil, in the water, the air, milk, and in the vegetable and animal tissue. Any organism which, by its physical presence or activity in chemical elaboration, acting on the living animal tissue, producing tissue necrosis, inflammation, suppuration, and finally, the formation of pus, may be termed, puss organisms. They occur widely distributed in the external world, and have been found in milk, in wash-water and in waste water, as well as in the air of opperating-rooms and sick-rooms

Giving attention to pus organisms in the animal tissue, there are four aspects from which they may be considered. Namely, conditions favoring infection, their effects and how caused, their removal from infected parts, and their importance in surgery.

By infection is ment the communication of disease germs. The conditions favoring such communication may be either natural or artificial. The fact that the various fluids and tissues of the body differ greatly in their chemical constituents, their reactions, their protection from infection, their access to free oxygen, their temperature, and their other less well-known respects, affords many natural conditions for infection. It is easily proved and has been accurately demonstrated that these natural conditions

of the body, while they are proof against some organisms, they are still f favorable to othersWounds in the body of all kinds, are favorable to communicationand rightly come under natural infection. To personally observe the effect of these organismsin the animal bodyis of scientific value. To do this artificial methods of infection are used and is termed experimental infection. The effect upon the body as a whole may be very slight and again it may be very extensive, depending upon the nature of the organism and the length oftime of infection. Some have a very irritating effect from the beginning, while others are more mild. The infected parts become inflamed or congested. The swelling and stretching of the nervesmay produce a continuous aggrivation of the whole animal system, The more common cause, however, is the toxic properties of the organisms themselves or the elaboration og their poisonous chemical products acting upon the body tissues. It may h happen agter a period of time has elapsed since infection took place, that the whole body becomes congested. This is due to metastasis. It may be called blood poisoning since it is only through the blood that these organisms may be transported to different parts of the body. When these are the conditions of a case, it is a serious one. Their effect upon the tissue is not so easily observed as that upon the body as a whole. By the aid of the microscope, however, the difficulty is overcome and the real activity of the organisms revealed. Their effect upon the tissue is termed tissue necrosis. This is caused by the toxic cpmposition of the bodies of some and the chemical elaboration of others.

Removing the organisms from the body may be accomplished through the natural protective forces of the body or by artificial methods. Just as all conditions prejudicial to the body lessen its power of resistance to sia bacterial infection, so all conditions favorable to it increase its re-

sistance. Some substances as nuclein and others have a germicidal effect. When these substances are innoculated into the blood serum,the natural eliminating powers of the body are increased, Bacterial poisons are partially iliminated by the free intestinal evacuation and encouraging the functions of the skin and kidneys. Leucocytes,in most cases are destroying agents of bacteria.They may also be removed by surgical operations and disinfectants. Surgically,the infected parts may be removed entirely,either by the cauterization process or the cutting away with a knife.An incision may be made into a swelling and the orgamisms greatly reduced in numbers by drawing them off with the pus. Whe any part is newly infected,like fresh wounds,disinfectants such as carbolic acid and corrosive sublimate are used as germicidals.

The importance of organisms in surgery must not be overlooked,since the natural healing processes are seriously checked by their presencr in the wounds.These processes follow directly upon theaction of the protectuve forces and consists of those processes which are able to render harmless or remove any harmful agent that may still be present in the body.Their power to act is very limited some times and inm many cases would fail were it not for scientific resources in protection by the use of disinfectants,cauterization,and sometimes by cutting away the whole infected part.

Before a surgical opperation is made ,it is necessary to take m many precautoons against the infection of the incisio n about to be made. The first step is to disinfect hte hands which is as follows: Mechanically cleanse the hands with warm water and soap and remove all foreign material from beneath the nail. The nails are then trimmed back till even with the ends of the fingers,filed and then sandpapered. The hands are then washed in 95% alcohol followed by wrincing in 1 to 1000 corrosive solution.Next the hands are washed in potassium permanginate solution;about 5% solution.

They are then decolorized with oxalic acid and washed off with boiled water and the hands not allowed to touch any thing but what is strictly aseptic. The field of opperation is prepaired in the same way. Instruments are boiled in sodium bicarbonate and bandages sterilized in the hot-air sterilizer. After the opperation, the hands of some surgeons become cracked or chapped. To avoid this rub them with benzoated oxide of ointment.

Original investigations were caried on during the summer months of 1903. Specimens of pus were collected from a cut in a bull's foot, pollevil of a horse, abortioned cow, gum-boil from the human mouth, running sore in the matrix of a cow's foot, from a freshly opened lump on a cow's jaw and a collar sore on a horse's neck.

In making these collections of pus for examination, great care was taken so that no organisms were admitted other than those contained in the pus sample. To make this sample isolation, a sterul tube of bouillon, the ordinary looped platinum needle, and an alcohol lamp were used in each case. Just before taking the sample from the infected field, the platinum loop was sterilized in an alcohol flame, then with care, nothing touching before taking the sampleand inoculating the tube of bouillon. Here it was kept for six to ten days till the organisms present had time to develop. Then plate cultures were made. Three tubes were inoculated from this six to ten day old culture. The first agar tube receiving one small loop full the bouillon tube, the second two loopsfull from the first agar tube, and the third three loops full from the second agar tube. These three inoculated agar tubes were then poured into separate sterile petri dishes, allowed to gelatinize, then incubated 35 to 37°C. for different periods of time till colonies developed sufficiently to be examined. At this point all colonies differing in any respect, were isolated by inoculating them into a full set of media and their character-

istics carefully observed and noted each day, covering a period of from five to twenty one days.

Out of seven different sources of infection, ten different organisms were isolated. Their morphology and biological characters are as follows:

The specimens are named A, B, C, etc., and the colonies A col.1. or A(A1) and if there are two or more different colonies in each specimen, they are named A col.1; B col, 2; C col, 3; etc., as the number of different colonies may appear.

From a specimen, A 1, collected from original mucus of a cow that had abortion in such condition as to demand outside asistance for cleansing, one organism was isolated at a temperature of 37°C. Its morphology and biological characters are as follows:

Morphology. Short rods; occurs singly and in chains.

Motility, active, stains readily in carbofuchsin.

Biology. Potato, growth abundent, raised; edges, undulate, color, sebaceous.

Agar slant. Growth rugose; curface elevation, raised; smooth.

Gelatin stab.-Nonliquefying; line of puncture, filliform; surface elevation, raised thick growth.

Bouillon. Becomes opalescent; surface growth, membranous; deposit floculent.

Milk:-Not coagulated in 9days, but does so on boiling, whey is abscent.

Litmus-milk:-color is pink; reaction, acid, curds, soft.

agar:-

Glucose agar:-gas produced.

Glucose, lactose, and saccharose bouillon all have the same reaction. Acid produced; bouillon, turbid.

Glucose:-bouillon in fermentation tube;-tube cloudy; bulb and neck turbid. No flakes on bulb.

From the pus from a wound on a bull's foot, two organisms B1, and B2. were isolated.

Morphology of B1, same as A1.

Biology of B1;-agar plate.

Agar plate.:-colonies, ameboid; surface elevation, flat, thin, spreading.

Agar slant:-same as plate culture.

Potato:-growth, irregular; surface elevation, alveolate.

Gelatin stab;-nonliquefying at temperature of 10°; line of puncture, nodose; surface elevation, flat.

Bouillon:-remains clear; surface growth, membranous; deposit, vicid.

Milk:-not coagulated in 9days; whey is absent.

Litmus-milk:-acid at first; later, alkali.

Glucose-agar:-no gas.

Glucose and saccharose bouillon have no reaction.

Lactose-bouillon:-no gas; bulb heavily clouded.

Morphology:-nonmotil; forms zoglae.

Biology of B2.

Agar plates:-colony round, more or less irregular

Agar slant:-edges of colonies lobate; color, grayish white; growth abundant.

Potato:-form, irregular; surface elevation, raised; edges, entire; color, grayish white.

Gelatin stab:-nonliquefying: line fo puncture, beaded; surface elevation, umbilicate.

Bouillon:-becomes opalescent: deposit, vicid.

milk:-not coagulated in 9days; whey, absent.

Litmus-milk:-reactuon, acid; later, alkali.

Glucose and saccharose bouillon:-no acid produced; liquid, remains clear.

Lactose bouillon:-no gas; both parts of the tube heavily clouded.

From a specimen taken from a collar sore on a horse's neck, two organisms C1. and C2. were isolated

Morphology of C1 and C2. are alike:-rods, short; forms singly or in chains.

Biology of C1.

Agar plate:-colonies round; surface elevation, raised; edges, entire; color, smoky brown by transmitted light.

Agar slant:-same as agar plate with pearly lustre.

Potato:-surface, pulvinate and smooth; edges, entire.

Gelatin stsb:-liquefying.

Bouillon:-becomes opalescent; surface growth, present; deposit, coherent.

Milk:-curds, fragments; whry, clear.

Litmus milk:-reaction, acid; changes color, pink; whey, clear.

Glucose agar:-gas present in small amount.

Glucose and saccharose bouillon have the same reaction:-acid is produced; liquid, turbid.

Lactose bouillon:-gas produced in two days, 3cc; tube, heavily clouded.

Biology of 02.

Agar plate;-form, irregular; surface elevation, flat, spreading over surface; growth, abundant.

Agar slant:-same as plate culture; edges entire; color, grayish white and smoky brown by transmitted light; growth, abundant.

Petato:-form, irreguiar; surface elevation, flat; color, chalky white.

Gelatin stab:-liquefaction, crateriform; surface elevation, raised.

Bouillon:-opalescent; surface growth, farinaceous; deposit, floculent.

Milk:-coagulated; curds, soft; whey, clear.

Litmus milk:-coagulated and then digested; whey, clear.

Glucose agar:-gas produced.

Glucose and saccharose bouillon:-reaction same; no gas; acid, produced; bouillon, turbid.

Lactose bouillon:-gas produced in two days; bouillon, clouded heavily.

From a gum-boil of the human mouth, two organisms D1 and D2 were isolated. The morphology and biology of D1 are like A1.

Morphology of D2 is the same as B2.

Biology of D2.

Plate culture:-firm, irregular; color, translucent and yellow.

Agar slant:-surface elevation, pulvinate; edges smooth; color pearly lustre.

Potato:!surface elevation, pulvinate.

Gelatin stab, liquefying.

Bouillon:-liquid, clear; surface elevation, farinaceous; deposit, vicid.

Milk:-coagulated; reaction, acid.

Litmus milk:-coagulated; reaction, acid; in three days digested.

Glucose and saccharose bouillon in fermentation tube:-branch of tube not cloudy; bulb clouded heavily. Aerobic.

From a running sore in the coronet of a cow's foot one organism was isolated. Its morphology and biology are the same as that of A1 and D1.

From the pus of pollevil in the horse, one orgmism, F1 was isolated.

Its morphology is the same as A1. D1. ,andE1.

Biology of F1.

Plate culture:-form,irregular;surface elevation, raised;color grayish white and smoky brown by transmitted light.

Agar slant:!form,irregular;surface elevation, pulvinate;

Potato:-grows at a tem. of 26°C;surface elevtion,raised;edges,undulate.

Gelatin stab:-nonliquefying;line of puncture, filiform.

Bouillon:-turbid;surface growth,membranous; deposit,granular.

Milk:!not coagulated in four days.

Litmus milk:-coagulated in 2 days;reaction, acid;curds,soft,becoming white like.

Glucose bouillon:-gas produced;liquid,turbud.

Sugar-free bouillon in fermentation tube:- stem and bulb both heavily clouded.

From a freshly opened abscesson a cow's jaw,one organism,G1 was isolated. Its morphology is the same as A1,D1,E1,F1,B1,C1,andC2.

Biology og G1.

Plate culture:-form,irregular;surface elevation, thin,spreading;edges,lobate.

Agar slant:-surface elevation,raised;edges, erose;color,butreous and yellow.

Potato:-color, deep brown.

Gelatin stab:-liquefaction, infundibulaform.

Glucose and lactose bouillon are alike, no gas produced; both parts of the tubr are heavily clouded.

Sugar-free bouillon:-no growth in verticle tube; bulb, turbid.

Owing to the unsuccessful attempts at flagella staining, these organisms cannot be accurately named. Three showed morphology and biological characters alike. The remaining six varied quite widely from each other; seldum agreeing in any one particular.

Their microscopical appearences are conspicuous for their similarity. Morphologically, eight presented distinctive short-rod forms and were seen singly or in pairs and showed very active motility. Two were sphericle, non-motil and firmed zoglae.

From the morphology and biological characters, eight of these organisms belong to the family, Bacteriaceae; Genus, bacillus or pseudomonas; and two Coccaceae; Genus, Micrococcus. Namely, B2, M. Candicans and D2, M. Demnei.

In conclusion little may be said in commendation of the original investigation. Though it lacks the exprrimental test of the pathogenic characteristics of the organisms and the determination of the arrangement of their flagella and number, yet it has one feature, the prrdominence of the rod-shaped bacillus in the samples instead of the Cocci; which which stands out very prominently and may be an aid to others in becoming more successful in their attempts.