



A New Form of Antiseptic Treatment of Wounds.

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In the previous number of this journal I called attention briefly to a new method of antisepsis for wounds. This method is based upon the following facts:

When gelatine dissolved in water is dried in the vapors of Formalin, a new chemical compound with peculiar properties is formed. If the process is correctly carried out, the material loses its gelatinous character entirely, and becomes a stable, very hard, and transparent substance. It cannot be liquified either in dry or in moist heat, nor is it changed by the action of mineral or organic acids, or alkalies, or salts of any reaction. The firm elastic mass becomes slightly more extensible under the influence of heat, but it speedily returns to its normal condition when cooled. The Formalin is chemically combined in the mass, not merely mixed, for hyphomycetic fungi have been observed on the surface of plates of the material, and, in powdered form, it does not hinder the development of any bacterial growth with which it may be mixed.

The object of my experimentation was to determine whether it was possible to cause the Formalin-gelatine to release its Formalin within the organism, thus effecting an antiseptic action by making the tissue cells prepare their own antiseptic out of a non-antiseptic and non-toxic material.

I began by introducing portions of the Formalin-gelatine into the abdominal cavity of a rabbit. I had done an intestinal suture, and I had introduced a piece of dried Formalin-gelatine the size of an apple into the peritoneal cavity, which was then closed in anticipation of an antiseptic recovery. The rabbit lived and remained perfectly well during the ensuing six weeks and a half. When I then reopened the abdomen, I found immediately under the suture line a radiating mass of connective tissue about half the size of the implanted Formalin-gelatine; but to my great surprise there was no trace of the foreign body. A cut into the new formed connective tissue explained the situation. In the centre of the neoplasm was a hazel-nut sized, soft, whitish nucleus, evidently the residue of the material that had been absorbed by the tissue cells. Thus the leucocytes, tissue fluids, and very vascular new connective tissue had in a comparatively short time

dissolved a substance exhibiting such great resistance to solvents outside the body. Most surprising of all was the fact that in an implantation such as this, done without any special precautions in the body of an animal so predisposed as is the rabbit to lymphomatous change there was not a trace of cheesy degeneration around the smooth cicatrix.

I repeated these experiments on an extensive scale on pigeons and dogs, mixing with the powdered Formalin-gelatine bacteria of various kinds, staphylococci, streptococci, fowl-cholera organisms, etc. In each case the non-interference with bacterial growth of the powdered substance had been previously determined by ordinary cultures. The powder was always absorbed without any reaction whatsoever on the part of the tissues of the animal. I did not hesitate, therefore, to employ the powdered Formalin-gelatine in the treatment of wounds; and I found indeed that it answered all my expectations. The human body decomposes Formalin-gelatine with gradual liberation of the antiseptic substance in the same way that the animal body does. Contact with the tissues alone of this preparation suffices to cause a slow continuous liberation of Formalin in the nascent state; as the gelatine is absorbed, the antiseptic is liberated molecule by molecule, thus forming a method of wound sterilization at once very practical and extremely rational. The antiseptic being continuously formed, its action is a permanent one, and is equally active at all times as long as any of the Formalin-gelatine is present. It therefore differs entirely in principle from all former antiseptic procedures, in which there is a temporary energetic action of the substance employed; soon to be terminated, however, by the formation of insoluble combinations of the tissues and the material used. The injury to the tissues caused by the irritant properties of the ordinary antiseptics when used in sufficient concentration to be effective must also be remembered. As Schimmelbusch has so thoroughly demonstrated, the infectious organisms inevitably left behind, no matter how thorough or often repeated the attempted sterilization of the wound may have been, grow vigorously under the protection of the insoluble compounds on a soil predisposed to harbor them by irritation and inflammation.

The Formalin-gelatine in powder form possesses in itself no antiseptic properties. It is an indifferent body, causing no irritant or toxic effects, and can readily be sterilized. The body cells resolve it into its constituent elements. The more active the cells, the more Formalin is set free, so long as the powder lasts. A continuous stream of Formalin permeates every crevice and corner of the wound under the dressing. Virulent cultures mixed with the powder can be incorporated in wounds; the continuously

appearing Formalin destroys them as they develop, and the reparative processes go on undisturbed.

Entirely apart from these experimental considerations, however, the pre-eminent clinical utility of this material in the healing of wounds is a matter that admits of no doubt whatsoever. *With the aid of the powder any acute purulent process can be cut short; and a wound can be relied upon to run an aseptic course without further precautionary measures.* This I have proven in 120 acute suppurative cases, 93 aseptic wound recoveries, 4 complicated fractures and 2 deep scalp wounds. Even in complicated wounds mechanical cleansing followed by dusting the powder over the entire surface of the injury will satisfactorily replace the strict anti-septic technique usually followed; so that in suppurative cases the inflammation ceases in 24 hours. Thus even complicated fractures run their course aseptically and without fever; and in all aseptic operations the presence of the powder is a guarantee for the uninterrupted healing of the wound.

In uninfected wounds the powder causes the formation in a few hours of a perfectly dry and firm scab. In fresh purulent cases, if tissue necrosis has not occurred, the suppuration ceases within 24 hours, and a pure clear serum often flows from the wound. Such wounds are soft, the skin around them is not reddened, and furuncles, carbuncles and abscesses, if present, are under complete control 24 hours after the powder is in contact with the tissues. It is very noticeable in these cases that the blood on the dressings remains bright red, undried, and undecomposed. Formalin alone possessing the property of thus preserving the red blood corpuscles.

As we have already stated, pus production is usually stopped at once, if no necrotic tissue is present in the wound. Where dead tissue is present, as in old leg ulcers, in the specific infections, such as tuberculosis and syphilis, the Formalin-gelatine is inactive. Its most appropriate field is in the acute inflammations, and for the prophylaxis of infection. Thus I do not any more disinfect fresh wounds, but leave that to the tissues themselves, and the powder. Repair is so satisfactory that the most critical eye can detect no fault therein.

It is a well-known fact that iodoform is supposed to act in a similar way on wounded surfaces. But no free iodine can be demonstrated during the process, and every surgeon knows that iodoform is not capable of preventing infection, and that he can never, by its aid, cut short a suppurative process. It owes its usefulness to its faculty of preventing further complicating decomposition and to its intense dessicating qualities.

Experimental investigation of the new remedy, in which my

friend A. Gottstein has been kind enough to help me, have demonstrated the fact that hydrochloric acid pepsin solutions are capable of decomposing Formalin-gelatine outside the organism. This has enabled me to use the substance in the treatment of wounds where the automatic development of the antiseptic could not occur, where necrotic tissue, and masses of dried secretion prevented the gelatine coming in contact with the tissues themselves. The powder is strewn upon the wound in the usual way, and then the surface is moistened with the following solution:

Pepsini. 5.0 (75 grains.)
Acidi hydrochlorici . . . 0.3 (5 minimi.)
Aq. destill. . . . ad. 100.0 (4 ounces.)

The pepsin hydrochloric acid then effects the molecular disintegration and the consequent continuous evolution of Formalin that the paralyzed or necrobiotic cells cannot accomplish.

To summarise briefly:

In Formalin-gelatine in the powdered form we possess a substance that forms a firm eschar in a few hours, in wounded tissues that are not infected, without further disinfection. It enables us in the very shortest time to obtain a firm resistent and non-infectable scab after primary suture of wounds. Where cellular life is active, the Formalin-gelatine kills the bacteria that may be present with the greatest certainty, by reason of the molecular antisepsis that it effects; thus enabling the tissue cells to master them with ease. It stops purulent processes with the greatest certainty, if after incision and irrigation the cellular activity and Formalin vapor production continues without interruption. And when abundant necrotic material is present, cell activity can be replaced by pepsin hydrochloric acid digestion.

Formalin-gelatine introduced to the medical profession, under the name of "Glutol-Schleich" is to be employed by dusting over the surface to be treated, whether the wound be an open, sutured, or lacerated one. Past experience demonstrates the fact that the *odorless* Glutol is *absolutely non-irritant, and non-poisonous*. On aseptic wounds the powder forms a firm dry scab in a very short time; and after definitive cicatrisation this can readily be removed. In infected or suppurating wounds without necrosis it rapidly terminates the pus formation and helps the separation of the dead portions of tissue. The grated form of the preparation is peculiarly absorbent, and is perhaps preferable to the fine powder. Where there is extensive necrotic tissue in wounds, the latter, the dead tissue, must first be removed mechanically, so that the anti-septic action of the Glutol may be developed.

The efficacy of Glutol depends on the fact that the otherwise indifferent and insoluble body is decomposed by the active and living tissue cells.

*GLUTOL-Schleich, prepared by the Chemische Fabrik auf
Actien, formerly E. Schering in Berlin, Germany, is
supplied by us in one ounce packages.*

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